Before the Hearing Commissioners
appointed by the Selwyn District Council

Under	the Resource Management Act 1991
In the matter of	Resource consent applications by KeaX Ltd for a Solar Array at Buckleys Road, Brookside (RC235464)

Statement of evidence of Jon Farren

29 January 2024

Qualifications and experience

1 My name is Jon Farren.

2 I am the Manager and Principal of the Christchurch office of Marshall Day Acoustics (MDA).

3 I hold a Bachelor of Engineering with Honours in Electroacoustics from the University of Salford in the United Kingdom. I hold full Membership of the Institute of Acoustics (UK), a requirement of membership being that I am active in the field of professional acoustics and satisfy the Institute's requirements with regard to level of qualifications and experience.

4 I have been employed as an Acoustic Consultant for 30 years, approximately 22 of which have been with Marshall Day Acoustics (MDA). I have considerable experience in the areas of planning with regard to noise, the assessment of noise and vibration, and noise control in relation to both environmental noise and building acoustics.

5 On this occasion I have been engaged by Selwyn District Council to conduct a peer review of the noise assessment that accompanied the application. I have reviewed:

(a) Application for Resource Consent and Assessment of Environmental Effects (AEE) – Boffa Miskell – 9 August 2023

(b) Assessment of Environmental Noise Effects – Acoustic Engineering Services (AES) – 19 July 2023

Code of Conduct for Expert Witnesses

6 While this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of evidence

7 I have prepared evidence in relation to:

(a) The key findings of my peer review;

(b) Matters raised by submitters to the Application; and

(c) Proposed conditions of consent.

Key findings of my peer review

The proposed noise limits are appropriate

8 For their report, AES has reviewed both the operative and proposed (now partially operative) District Plans and have proposed a daytime noise limit of 50 dB L_{Aeq} at the notional boundary of the nearest dwelling. I agree this is an appropriate limit and note it is more stringent than both District Plans' permitted activity standards.

9 AES has confirmed[1] there will be no activity on site at night and the batteries and inverter will be switched off by their PLC (controller). However, for completeness, I recommend a night-time noise limit of 40 dB L_{Aeq} should also be adopted. I note this noise limit is more stringent than both District Plans' permitted activity standards and the World Health Organisations (WHO) guidance of 45 dB L_{Aeq}.

10 AES has considered potential construction noise effects with reference to New Zealand Standard *NZS 6803: 1999 Acoustics - Construction Noise* and I consider this to be appropriate.

Operational noise

11 During the operational phase, I understand the dominant noise sources will be the inverters, batteries and transformers which are distributed across the site. AES has predicted noise levels based on source data provided by the manufacturer and the resulting noise levels are plausible.

12 AES consider that a 5 dB penalty for special audible characteristics is not appropriate for some of the noise sources (inverters and batteries). I consider that, if consent is granted, this should be verified through compliance monitoring. AES state that a 5 dB penalty has been applied to transformers on the site.

13 The predicted noise levels comply with the proposed daytime noise limit of 50 dB L_{Aeq} and are notably lower than the permitted activity standards in the Operative and Partially Operative District Plans.

14 On that basis, I agree with AES that operational noise effects will be acceptable in the context of the receiving environment.

Construction noise and vibration

[1] William Reeve AES email correspondence dated 4 September 2023

15 Construction noise levels have been modelled based on sound data supplied by the applicant or BS 5228 and are appropriately conservative. Piling and tree clearance are the construction activities that generate the highest activity noise levels, with piling generating the highest level of 69 dB L_{Aeq} at 324 Branch Drain Road which just complies with the applicable construction noise limit of 70 dB L_{Aeq}.

16 I consider piling noise has the potential to result in notable adverse effects at the nearest dwellings. Driven (percussive) piles are proposed and several piling rigs will operate at the same time across the site. Based on the information provided with the application, I estimate that more than 15,000 piles will be required to support the solar array. The AEE states that piling will occur for approximately six months.

17 Based on the current information, piling noise will range from approximately low 50s to 70 dB L_{Aeq} at the nearest dwellings which, based on existing ambient noise levels, means that piling will be clearly audible for most of the piling period at dwellings adjacent the site. Based on my experience of other construction sites, I consider the quantity, noise level and duration of percussive piling that is proposed, will potentially result in adverse community reaction and requires further justification.

18 Should consent be granted, I consider that construction noise should be managed and assessed in accordance with *NZS 6803: 1999 "Acoustics – Construction Noise*". Inherent in this Standard, is the requirement to adopt the best practicable option (BPO) to ensure noise from the site is minimised. I consider this is best demonstrated through the preparation of a Construction Noise and Vibration Management Plan (CNVMP) that is prepared in accordance with Annex E3 of NZS 6803, and submitted to Council for approval before construction commences. I have attached Annex E to my evidence for reference. I note the Applicant has stated a willingness to adopt a CNVMP.

19 With reference to NZS 6803, I would expect the CNVMP to include a discussion of piling methodologies (driven, screw etc) with respect to factors such as source noise level, efficiency (exposure duration) and practicality. If driven piles are the BPO, mitigation options should be evaluated such as screening around the hammer and pile head and/or a pile dolly. For example, a shroud[2] around the piling head can result in notable noise level reduction. The CNVMP will also provide a method for liaison with the community.

[2] (e.g. https://duraflex.co.nz/hushtec/pile-rig-attachments/)

20 If this CNVMP process is followed, I consider that construction noise effects will be reasonable.

21 Vibration effects are briefly discussed by AES but not evaluated in detail. I agree that vibration effects during the operational phase are likely to comfortably comply with the guideline values from DIN 4150 and therefore comply with PODP Rule NOISE-R14. I consider that any construction vibration effects can be effectively managed with a CNVMP and will largely be determined by the piling methodology used.

Matters raised by submitters

22 Several submissions raise concerns about general noise effects. In my view the Applicant's noise assessment largely addresses these concerns and adverse effects will be controlled though my proposed conditions of consent

23 I have reviewed each of the submissions and comment on each below:

Submitter	**Submission point**	**Comment**
Kewish, Donna and David	- General comment regarding noise - Sound barriers around inverters	I consider the submitters' general concerns to be addressed in the application and the proposed consent conditions. Noise barriers are not required to comply with the proposed noise limits.
Krygsman, Corey	- Acoustics in the area	As above, I consider the submitter's comment is appropriately considered in the application
Robinson, Simon	- Reduced sleep - Noise above WHO guidelines	As the proposed activity will not operate at night, I do not expect noise emissions will affect sleep. Operational noise emissions are predicted to be below WHO guideline values.
Ward, Paul and Jenny	- No comments regarding noise	None
Clark, Casey	- No comments regarding noise	None

Submitter	Submission point	Comment
Glenmore Farming-	- No comments regarding noise	None
Haurere-Farms	- Noise impact on birds and bees - Noise effects at night on surrounding neighbours - Noise above WHO guidelines	The noise effect on bird and bee populations is outside my area of expertise. I consider the submitter's general concerns on noise to neighbours are addressed in the application and the proposed consent conditions. Operational noise emissions are predicted to be below WHO guideline values
Te Taumatu Rununga Henderson,-Raymond	- Low frequency hum - Upgrade to Hights Corner substation	I note the Applicant's noise assessment[3] has taken account of the "low frequency hum" and included a 5dB penalty for the special audible characteristics of the transformers that will be provided on the site. Whilst the Application indicates future upgrades may be required to the Hights Corner substation, that is outside the scope of the current application.

Proposed conditions of consent

24 Should Council be of a mind to grant consent, I recommend that appropriate conditions be developed to ensure that operational noise emissions results in acceptable noise effects, and that construction noise is appropriately managed. I provide the following suggested text:

[3] Page 7 of the Appendix 15 - AES Assessment of Noise Effects Report

(a) The consent holder shall ensure that all activities on the site measured in accordance with *NZS6801:2008 Acoustics - Measurement of environmental sound*, and assessed in accordance with the provisions of *NZS6802:2008 Acoustics - Environmental noise*, shall not exceed the following noise limits at any point within the notional boundary of any residential site, during the following timeframes:

(i)	0730 to 2000 hrs	50 dB L_{Aeq}
(ii)	2000 to 0730 hrs	40 dB L_{Aeq} and 75 dB L_{Amax}

(b) Within 6 weeks of the solar array becoming operational, a suitably qualified and experienced acoustic consultant shall perform measurements to confirm compliance with both the daytime and night-time noise limits in Condition 24(a). The assessment shall include an objective analysis of any special audible characteristics during the day and at night in accordance with Appendix B4 of NZS 6802:2008 Acoustics - Environmental Noise.

(c) Construction activities must be conducted in accordance with *NZS 6803: 1999 "Acoustics – Construction Noise*" and must comply with the "long-term duration" noise limits contained within Table 2 of that Standard.

(d) At least 20 working days prior to any construction occurring on site, a Construction Noise and Vibration Management Plan (CNVMP) shall be prepared and submitted to Council for certification. The CNVMP shall address, as a minimum, the measures identified in Annex E3 of NZS 6803: 1999 "Acoustics – Construction Noise".

(e) For the avoidance of doubt, within the CNVMP required by Condition 4, the Applicant shall demonstrate the proposed piling methodology has been selected with respect to the best practicable option.

Jon Farren

Dated this 29 day of January 2024

Appendix A ANNEX E FROM NZS6803:1999

ANNEX E
PROJECT MANAGEMENT
(Normative)

E1 General

The intention at each stage of the project should be to reduce construction noise by the best practicable option. This should include giving consideration to:

(a) Applicable noise limits or restrictions on working hours;

(b) Site layout, for example the location of static noise sources, and the use of site buildings, material dumps etc. as ad hoc noise barriers;

(c) The construction methods and machinery likely to be used, and whether alternatives would achieve less noisy operations;

(d) Specific measures such as the use of silencers, mufflers, shielding, enclosures and barriers;

(e) Planning the hours of working to be considerate of the people in the neighbourhood.

E2 Noise management plans

Noise management requirements for a project should be identified at an early stage and integrated into all phases of the project planning and development, and incorporated into tender documents and contracts. Measures include:

(a) Process of community liaison;

(b) Need for educating management and workers in maintaining community goodwill;

(c) Likely affected persons and special needs of those people or the public in general;

(d) Designating responsible public relations persons;

(e) The role of the local/regional authority;

(f) Complaints procedures;

(g) Establish likely noise emissions;

(h) Establish likely durations of exposure on a specific neighbourhood basis;

(j) Determine the need for any special construction activities, e.g. activities that must take place outside normal working hours;

(k) Consultation procedures for special works;

(m) The practicable noise control measures available;

(n) The applicable noise performance standards;

(o) Any resulting limits on hours of operation;

(p) Site screening and landscaping;

(q) Noise monitoring procedures;

(r) Education and training of workers in noise management.

E3 Planning stage

E3.1
It is essential that planners, developers, architects and engineers all play their part in ensuring the lowest practicable noise levels. Acoustical advice should be sought at the outset and integrated into stages of the project.

E3.2
Each project should be considered to ensure that its design keeps to a minimum the number of operations which are likely to be noisy.

E3.3
It will be necessary to determine the expected sound level of construction noise received off-site in the neighbourhood. The developer, architect and engineer will need to know whether the processes they intend to use are likely to be permitted. An early consultation should be made with the responsible authorities in order to ascertain the noise limits which apply, and a survey of the immediate surroundings should be conducted to determine the location of noise-sensitive areas.

E3.4
Account should be taken of other remedial measures and their effects. For example, where permanent barriers are a feature of the final design, consideration should be given to their early construction so as to provide protection during construction operations.

E4 Design stage

E4.1
All available information should be assessed in order to consider the implications of construction noise.

E4.2
The design of the project will have considerable influence on the contractor's use of the site. It will partially determine where such items as haulage roads, batching plants, generators, and pumps will be sited.

E4.3
Preferred off-site vehicle routes should be established to keep access traffic away from noise sensitive areas, such as dwellings, hospitals and schools.

E4.4
Site sub-soil conditions should be thoroughly investigated in order to consider methods of working that minimize site noise.

E5 Tender and contract stage

Both the tender and contract documents should take into account, where appropriate:

(a) The noise limits for the construction site;

(b) The proximity of neighbouring noise-sensitive areas;

(c) The obligation of the contractor to use the best practicable options to minimize noise;

(d) The obligation of the contractor to predict noise levels;

(e) Noise monitoring methods to be used.

E6 Training of personnel

Personnel should be informed about the need to reduce noise and about the hazards of excessive noise. As part of their training, special attention should be given to the following:

(a) Proper selection, use and maintenance of tools, machinery, and related noise control devices;

(b) Positioning of machinery on site;

(c) Avoidance of unnecessary noise;

(d) Operation of sound measuring equipment by selected personnel;

(e) Procedures for receiving, referral and investigation of complaints.