

**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.

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**STATEMENT OF EVIDENCE OF WILLIAM REEVE  
ON BEHALF OF THE APPLICANT  
(ACOUSTICS)**

Dated: 9<sup>th</sup> February 2023

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**KeaX Limited**  
Applicant  
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(campbell@keaenergy.nz)

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## 1 INTRODUCTION

- 1.1 My full name is William Peter Reeve. I am employed as a Senior Acoustic Engineer with Acoustic Engineering Services.
- 1.2 I hold a Bachelor of Engineering with Honours from the University of Auckland. I am a member of the Acoustical Society of New Zealand.
- 1.3 I have over 11 years' experience in the field of acoustic engineering consultancy and have been involved with many environmental noise assessments on behalf of applicants, submitters and as a peer reviewer for Councils. My experience includes working for groups representing primary production interests in relation to noise and assessing energy infrastructure and other noise generating activities in rural catchments.
- 1.4 Acoustic Engineering Services was engaged by KeaX Limited in July 2022 to undertake a noise assessment of a proposed solar array on Buckleys Road, Brookside. Since I was not the author of the original assessment, I have reviewed the underlying calculations and conclusions and undertaken the following site investigations:
  - (a) I visited an existing KeaX Limited Solar Farm installation in the Wairau Valley and measured noise emissions there.
  - (b) I visited the subject site twice to observe the existing environment and deploy and retrieve ambient noise monitoring equipment.
- 1.5 Based on this analysis I confirm that I agree with the content of the noise assessment report submitted with the Application. I am satisfied that I can adopt the conclusions as my own.
- 1.6 In preparing this evidence, I have reviewed the following:
  - (a) The AEE submitted with the Application;
  - (b) All submissions as they relate to noise effects;
  - (c) The Section 42A report for Selwyn District Council;

- (d) The peer review undertaken by Marshall Day Acoustics;  
and
- (e) Consent conditions.

1.7 Whilst this is a Council hearing, I acknowledge that I have read and agree to comply with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2014. My qualifications as an expert are set out above. Other than where I state that I am relying on the advice of another person, I confirm that the issues addressed in this statement of evidence are 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.

## 2 **EXECUTIVE SUMMARY**

- 2.1 This proposal is for solar panel arrays which will be connected to inverter / transformer skids distributed across the subject site, with future battery sites alongside. At each skid location the air-cooling systems on the inverter and battery are expected to be the dominant source of noise.
- 2.2 The noise emitting items of solar farm plant would not operate outside of the hours of 7:30 am to 8:00 pm, seven days per week, and I have therefore limited my assessment of noise from the activity to that time period.
- 2.3 There will also be construction noise associated with the installation of the solar array and ancillary equipment. I have assessed noise from piling, civil works, panel construction and tree clearing which are expected to be the key stages.
- 2.4 I have undertaken ambient noise monitoring at the site. This has confirmed that there are extended daytime periods where noise levels are between 38 – 48 dB  $L_{Aeq}$  (15 min), often with several louder periods throughout the day.
- 2.5 I have considered what noise levels may be appropriate in this environment, based on reference to the Operative District Plan (ODP) and Proposed District Plan (PDP) which outline daytime noise limits

which are effectively 55 – 59 dB  $L_{Aeq}$  for a steady source, received at the notional boundary of residences.

- 2.6 I have 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.
- 2.7 When considering this, along with the relatively steady state nature of the noise source proposed, I consider that a 50 dB  $L_{Aeq}$  daytime limit for operational noise, as suggested by the acoustic peer reviewer could be implemented as a reasonable control in this instance. This is more restrictive than the ODP and PDP limits. The reviewer has also suggested a lower night-time noise limit of 40 dB  $L_{Aeq}$  for completeness, and I agree this is reasonable.
- 2.8 For construction noise I consider it best practice to rely on the guidance outlined in the relevant New Zealand Standard 6803:1999 *Acoustics – Construction noise* (NZS 6803), which is used widely in New Zealand to control the effects of noise from construction activity.
- 2.9 I have predicted operational noise levels expected from the equipment associated with all three stages of the proposed development, including future batteries, under worst case meteorological conditions. 324 Branch Drain Road and 870 Hanmer Road are predicted to receive the highest operational noise levels, at 48 and 47 dB  $L_{Aeq}$  respectively. All other dwellings will receive noise levels of 46 dB  $L_{Aeq}$  or lower.
- 2.10 There may be times during the day when noise from the solar farm is clearly audible in the areas outside those dwellings, depending on the weather conditions and the presence or absence of other sources of environmental noise, like noise from birds or animals and agricultural activity. Overall, I expect even for these two properties, the noise will not interfere with typical domestic activities and the noise effects will be minimal.
- 2.11 Construction noise levels are expected to comply with the noise limits of 70 dB  $L_{Aeq}$  and 85 dB  $L_{AFmax}$  outlined in NZS 6803 at all the adjacent receiver locations, except at 324 Branch Drain Road during the piling activity, where I expect there could be an exceedance of up to 4 dB during that activity, for a period of a few days.

- 2.12 I recommend implementing a Construction Noise and Vibration Management Plan (CVNMP) for use during the construction phase of the project. The CNVMP should be prepared with consideration of the guidance from NZS 6803 and specifically include an element of community relations management and controls for 324 Branch Drain Road.
- 2.13 The acoustic peer review and s42a report generally record agreement with the methodology and findings of my assessment, subject to the provision of appropriate conditions of consent. I agree that the conditions of consent proposed by the Selwyn District Council acoustic reviewer are appropriate, with only minor wording clarifications required. Additional conditions regarding construction noise monitoring and an operational noise management plan have been proposed by the s42a report author, however I do not consider these will provide any real benefit in the context of this application.

### **3 SCOPE OF EVIDENCE**

- 3.1 My evidence addresses:
- (a) The proposed noise generating activities;
  - (b) The receiving environment;
  - (c) The assessment undertaken of the potential noise impacts of the proposal;
  - (d) The submissions which raise noise issues;
  - (e) The s42A ECan Officer's Report in relation to noise; and
  - (f) The proposed conditions of consent.

### **4 NOISE GENERATING ACTIVITIES**

- 4.1 The proposal is for the construction and operation of a solar array on the subject site. The solar array will comprise 5,844 solar panel frames, being installed on the site in three stages over three years.
- 4.2 The panel arrays will be connected to inverter / transformer skids distributed across the site, with future battery sites alongside. The "Single Skid" locations allow for one inverter, one battery and one transformer. The "Twin Skid" locations allow for two inverters, two

batteries and one transformer. The plant items will be arranged near each other to allow easy connection.

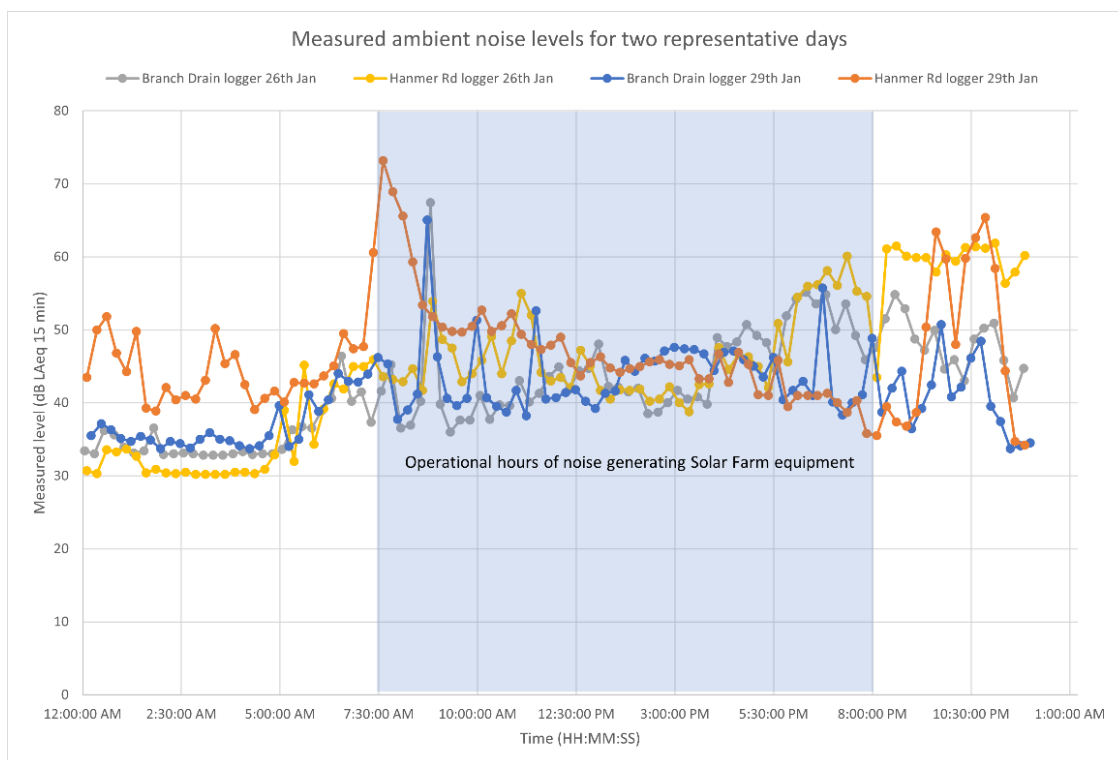
- 4.3 At each skid location the air-cooling systems on the inverter and battery are expected to be the dominant source of noise. While there will be audible noise from the transformer and switchgear near the equipment, at distance the noise from the cooling fans will be dominant. I understand that the fan on the inverter is variable speed but will operate in some capacity constantly during operating hours.
- 4.4 The solar farm will also include other sources of noise such as operation of the site office and intermittent vehicle movements relating to staff moving to and from the site and undertaking maintenance inspections. I expect noise from those sources will be inconsequential when compared with the noise from the fixed plant items.
- 4.5 I have been advised that noise emitting items of solar farm plant would not operate outside of the hours of 7:30 am to 8:00 pm, seven days per week, and I have therefore limited my assessment of noise from the activity to that time period.
- 4.6 There will also be construction noise associated with the installation of the solar array and ancillary equipment. I have assessed noise from piling, civil works, panel construction and tree clearing which are expected to be the key stages.

## **5 THE RECEIVING ENVIRONMENT**

- 5.1 The site and surrounding area are zoned Outer Plains in the Rural Volume of the Operative District Plan (ODP) and General Rural under the Proposed District Plan (PDP). The area is generally used for agricultural activities, with several dwellings in the wider area on a mixture of large and small land parcels.
- 5.2 To better understand the existing background noise environment in the area, I deployed noise monitoring equipment at two separate locations on the subject site on the afternoon of the 25<sup>th</sup> of January 2023 and collected this equipment on the 1<sup>st</sup> of February 2023. One noise logger was close to the western edge of the subject site near 324 Branch Drain Road, and the second near the eastern extent close

to 870 Hanmer Road. These loggers recorded six days of data each, although on many days there were extended periods with moderate to high wind speeds.

- 5.3 During my visits to the site, I observed that the existing noise environment was typical of a rural area distant from major roads. The main contributors to the ambient noise environment when wind speeds were low were insects and birds, livestock, intermittent traffic on nearby roads and irrigator systems. Distant farm machinery was also audible at some locations. At higher windspeeds, wind generated noise in shelterbelts and other vegetation became more apparent. Some low-level electrical noise was observed close to the substation at the northwest extent of the subject site.
- 5.4 I reviewed the monitoring data for days and periods when the wind speeds were relatively low during the proposed operational hours of the solar farm. This confirmed that in these conditions there are extended periods where noise levels are between 38 – 48 dB  $L_{Aeq}$  (15 min), often with several louder periods throughout the day. The results from two representative days are presented on the next page. At higher windspeeds, there will be more noise induced by vegetation.
- 5.5 I note that my description of the ambient environment and measurement results are generally consistent with what was expected by Mr Farren, the acoustic peer reviewer. Mr Farren anticipated existing daytime residual noise levels in the area in the range of 40 to 50 dB  $L_{Aeq}$ . There are also parallels with how submitters describe their expectations of living in a rural area, being that it is often relatively quiet, with higher levels of sound associated with machinery and other rural activities present on a more transient basis.



## 6 POTENTIAL NOISE EFFECTS OF THE PROPOSAL

6.1 I have considered what noise levels may be appropriate in this environment, based on reference to relevant accepted acoustic guidance and my further study of the existing noise environment in the vicinity of the site.

6.2 The ODP outlines daytime noise limits of 60 dB  $L_{A10}$  (which equates to approximately 59 dB  $L_{Aeq}$  for a steady mechanical plant source, or 57 dB  $L_{Aeq}$  for other general environmental noise) and 85 dB  $L_{AFmax}$ . Night-time limits of 45 dB  $L_{A10}$  (approximately 44 dB  $L_{Aeq}$  for a steady mechanical plant source, or 42 dB  $L_{Aeq}$  for other general environmental noise) and 70 dB  $L_{AFmax}$  are also outlined. The daytime limits, which are the relevant control for this proposal, apply between 7:30 am and 8:00 pm at the notional boundary of rural dwellings. Activities of a limited duration required by primary production, for example general use of farm machinery, are not required to comply with these limits but must not generate unreasonable noise in line with Section 16 of the RMA.

6.3 Under the PDP, the limits for noise received at the notional boundary of any dwelling on receiving sites would become 55 dB  $L_{Aeq}$  between 7 am and 10 pm and 45 dB  $L_{Aeq}$  / 70  $L_{Amax}$  outside these hours. Rural



production activities using equipment which is mobile or portable during normal use is a permitted activity and not subject to these limits.

- 6.4 Because both the operative and proposed district plans have exclusions for rural production activities such as mobile machinery, it appears that the general limits are intended to apply to sources which are fixed in nature, for example a pump, machinery associated with a cowshed, or ventilation fans associated with a poultry farm.
- 6.5 NZS 6802:2008 *Acoustics – Environmental noise* outlines a guideline daytime limit of 55 dB  $L_{Aeq}$  (15 min) and a night-time noise limit of 45 dB  $L_{Aeq}$  (15 min) for "*the reasonable protection of health and amenity associated with the use of land for residential purposes*". Where no time frames are given when noise limits apply, NZS 6802 prescribes the daytime period as between 0700 hours and 2200 hours (15 hours day, 9 hours night).
- 6.6 Guidelines for Community Noise, a document produced by the World Health Organisation (WHO) based on extensive international research recommends a guideline limit of 55 dB  $L_{Aeq}$  (16 hours) to ensure few people are seriously annoyed in residential situations. A guideline limit of 50 dB  $L_{Aeq}$  (16 hours) is recommended to prevent moderate annoyance. A guideline night-time limit of 45 dB  $L_{Aeq}$  (8 hours) is recommended to allow occupants to sleep with windows open.
- 6.7 The ambient measurement exercise I have described in paragraphs 5.3 to 5.5 confirmed that existing noise levels in the area will often be below the daytime noise limits in both the ODP and PDP (effectively 55 – 57 dB  $L_{Aeq}$ ) and other guidance (50 – 55 dB  $L_{Aeq}$ ).
- 6.8 When considering this, along with the relatively steady state nature of the noise source proposed, I agree with the peer reviewer comments that a 50 dB  $L_{Aeq}$  daytime limit could be implemented as a reasonable control in this instance.
- 6.9 The operational noise limit condition suggested by the Council's reviewer has been adopted into the Applicants proposed Conditions of Consent and I have not recommended any further changes.

- 6.10 For construction noise I consider it best practice to rely on the guidance outlined in the relevant New Zealand Standard 6803:1999 *Acoustics – Construction noise* (NZS 6803), which is used widely in New Zealand to control the effects of noise from construction activity.
- 6.11 Between 7:30 am to 6:00 pm on weekdays and Saturday, NZS 6803 outlines noise limits of 70 dB  $L_{Aeq}$ , and 85 dB  $L_{Amax}$  for long term duration activities exceeding 20 weeks. The noise limits are intended to be applied at 1 metre from the most exposed wall of dwellings.
- 6.12 Construction noise limits during the daytime are much higher than other general operational noise limits. NZS 6803 discusses how the provided limits provide for the "*reasonable protection of health and amenity*", in the context of an activity which is inherently loud but occurs for a shorter duration. NZS 6803 notes that communities are often more tolerant of higher construction noise levels, provided they are no louder than necessary, and occur within appropriate hours of the day.

## 7 **PREDICTED OPERATIONAL NOISE LEVELS**

- 7.1 As outlined above, the most significant potential noise sources associated with the operation of the solar farm are expected to be the air-cooling systems on the inverter and battery at each skid site, along with some secondary transformer noise.
- 7.2 I have calculated the propagation of noise from these sources using computational noise modelling software SoundPLAN. This model implements the calculation standard ISO 9613 which means that predictions are representative of conditions favourable to sound propagation, such as light downwind conditions or ground-based temperature inversions.
- 7.3 The equipment for all three stages, including the future batteries, has been modelled as operating at the same time, in the locations shown in Appendix 4 of the AEE.
- 7.4 I have used noise emission data for the equipment provided by the manufacturers for the inverter (a sound power of 98 dB  $L_{WA}$ ) and battery (a sound power of 101 dB  $L_{WA}$ ). The transformer noise levels have been predicted using guidance from the Australian and New

Zealand Standard AS/NZS 60076.10:2009 *Power Transformers*. I have used a sound power of 75 dB  $L_{WA}$  for the single skid transformer and 78 dB  $L_{WA}$  for the double skid transformer.

- 7.5 A +5 dB penalty to the transformer noise levels has been applied to address the potential for special audible characteristics which is common from that source. No such penalty has been applied to the inverter or battery sources as I do not consider it likely the operation of these plant items would result in special audible characteristics.
- 7.6 This is consistent with my site visit to a similar KeaX installation in the Wairau Valley. This installation also has a similar skid arrangement with a single Power Electronics inverter, and a transformer. The inverter model is the previous generation of what is proposed on this site. In that case, the noise from the ventilation fan intake was dominant and not tonal.
- 7.7 324 Branch Drain Road and 870 Hanmer Road are predicted to receive the highest operational noise levels, at 48 and 47 dB  $L_{Aeq}$  respectively. All other dwellings will receive noise levels of 46 dB  $L_{Aeq}$  or lower. Noise from the operation of the project will therefore be below the 50 dB  $L_{Aeq}$  daytime limit suggested by Council. It is also 10 dB or more below the ODP daytime noise limits, and more than 5 dB below the PDP daytime limits.
- 7.8 While this noise level is well below the acceptable level in the zone, there may be times during the day when noise from the solar farm is clearly audible in the areas outside those dwellings, depending on the weather conditions and the presence or absence of other sources of environmental noise, like noise from birds or animals and agricultural activity. The noise levels inside those dwellings would be in the order of 10 to 17 dB lower (with windows open) than the external levels, depending on the aspect of the internal spaces. Overall, I expect even for these two properties, the noise will not interfere with typical domestic activities and the noise effects will be minimal.
- 7.9 I also note, that for the following reasons, I consider the predicted levels are likely to be conservative, and noise levels will often be considerably below the predicted level:

- (a) Both my measurements of the second-generation inverter at Wairau, and the manufacturers data for the third-generation inverter show that this source has some directionality. It is likely that the battery will exhibit similar characteristics. However, all sources have been modelled as dispersing sound uniformly in all directions.
- (b) The third-generation inverter has a variable speed fan, and the manufacturers data indicates that noise levels reduce by in the order of 10 – 12 dB, depending on orientation, when the fan speed is reduced.
- (c) The modelling does not account for any local screening provided by the inverters to each other, or from the panel array itself. Indicative modelling shows that there will likely be a small benefit from panel screening for some dwellings.

## 8 **PREDICTED CONSTRUCTION NOISE LEVELS**

- 8.1 I have predicted construction noise using four construction activity groups likely to be used at each stage. The stages assessed are piling (using a piling rig and a truck), civil works (using an excavator, grader and truck), panel construction (using a telehandler, hand-tools and a truck) and tree clearing (using a chainsaw, loader and a truck).
- 8.2 The sound power levels for this equipment were sourced from British Standard BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites, and AES's noise source database.
- 8.3 While the construction activity will move around the site, I have modelled the noise from each activity group at the closest distance to each receiver, to capture a worst-case situation. These predicted noise levels may only be received for a matter of days at any one location.
- 8.4 I understand there could be more than one piling rig used on the site concurrently, however the piling teams would be spaced apart and there would not likely be a noticeable increase in the cumulative noise level from piling at any one receiver location. I have assumed that the piling rig may be driving for 30% of any given 15-minute assessment period.

- 8.5 Construction noise levels are expected to comply with the noise limit of 70 dB  $L_{Aeq}$  and 85 dB  $L_{AFmax}$  at all the adjacent receiver locations, except at 324 Branch Drain Road during the piling activity, where I expect there could be an exceedance of up to 4 dB during that activity.
- 8.6 As there is potential for the noise levels during piling works to exceed the construction noise limits when the activity occurs within 50 metres from the most exposed (north facing) facade of the dwelling, I recommend that noise be managed to specifically minimise the effects of noise during that activity.
- 8.7 Temporary noise barriers around construction plant can provide a noticeable reduction in noise levels if they can be arranged correctly, however given the height of the piling head, a typical two-metre-high temporary noise barrier may not provide compliance in this case.
- 8.8 Given the piling works will likely only be within 50 metres of the dwelling for a period of a few days, it may be practical and effective to communicate with the residents around scheduling the piling works for times that will be most suitable for them, to minimise the effects.
- 8.9 Should this not be practical, I understand that the Applicant is investigating options for a custom temporary noise barrier using the likes of a Hushtec Acoustic Curtain, or rig attachment.
- 8.10 While the noise from construction activity can generally comply with the noise limits, the duration of the construction activity (in three stages over three years), and the likelihood that noise levels will at times be significantly higher than the background noise levels, means that it is appropriate to be considerate of neighbours to minimise noise effects as far as practicable. I therefore recommend implementing a Construction Noise and Vibration Management Plan (CNVMP) for use during the construction phase of the project. The CNVMP should be prepared with consideration of the guidance from NZS 6803 and specifically include an element of community relations management.

## 9 SUBMISSIONS

- 9.1 A total of six submissions have been received in relation to the application. All oppose the application and all wish to be heard.

- 9.2 Noise is raised as a matter of general concern in all the submissions, with the joint submission describing providing more detail. I have paraphrased concerns below and provided a response.
- 9.3 The submitters appear concerned that the standards relied upon, and limits discussed in our assessment, are more appropriate for an urban environment than a rural one. I note that the District Plan limits are specific to the rural zone. NZS 6802 is also widely used in both urban and rural settings and includes discussion in the standard about appropriate assessment locations in rural areas (being the notional rather than zone boundary).
- 9.4 While I agree with the submitters that many sources in the rural area are often more seasonal or transient when compared to this proposal, the ODP and PDP noise limits are a relevant point of reference, as they would apply to continuous sources a neighbour would be permitted to establish as of right in this rural area (for example a pump). As outlined previously, short duration and mobile primary production activities are excluded from complying with the general ODP or PDP limits, and these limits would otherwise apply to fixed sources.
- 9.5 I am predicting levels well below the District Plan limits at the relevant receivers and the Applicant is willing to adopt a set of noise limits which are 5 dB lower than the PDP limit. I consider this to be a reasonable and conservative control given the ambient noise monitoring I have undertaken at the site.
- 9.6 Submitters have noted an inconsistency between the hours of operation in the AES report and the AEE. I understand that the hours of operation in our report are correct, and noise generating equipment will only operate between 7.30 am and 8.00 pm.
- 9.7 Submitters have raised concerns that noise levels will be higher under certain weather conditions. The submitters are correct that there are light downwind and temperature inversion conditions more favourable to the travel of sound. In line with normal practice, our predictions have been undertaken on a worst-case basis, allowing for favourable conditions (in all directions at the same time).

- 9.8 This means that in weather conditions which are not as favourable to sound propagation, noise levels will actually be lower than I have predicted.
- 9.9 Submitters note that it is unclear whether “additive” noise levels have been assessed, from all equipment operating at the same time. I can confirm that our modelling includes the cumulative noise emissions from all the solar array fixed plant items (in all three stages) operating concurrently.
- 9.10 Some of the submitter questions may arise from the fact that the noise levels in the original AES report were presented as a table, rather than a noise contour which includes the location of various noise sources. I have presented the results of this modelling below, showing the noise source locations and predicted levels down to 45 dB LAeq.



- 9.11 Submitters have also made the point that there is the potential for noise from this proposal to add cumulatively with other sounds in the environment (for example birds or a pump) and result in noise levels that are higher than the PDP limits. I agree that there are other sources in the environment which will mean that the total noise levels

measured will at times be higher than that predicted for this proposal alone.

9.12 However, I note that the ambient monitoring shows that there are already periods where the noise levels are higher than the District Plan ODP limits. These limits do not apply (for example) to traffic noise on roads, or natural noise from birds, or wind in vegetation. I expect that when background noise levels near a dwelling are high, or of a similar order to the predicted noise levels from this proposal, they will often provide some level of masking.

9.13 Submitters appear to raise concerns about the possibility of sleep disturbance due to the proposed activity, for people trying to sleep with windows open. I note that the underlying District Plan limits do not provide any particular protection for sleep during the daytime and this would be unusual due to the restrictions it would place on typical activities. Ambient noise monitoring has also confirmed that daytime noise levels in the area are often higher than the 45 dB  $L_{Aeq}$  threshold set in the WHO Guidelines for Community Noise, to allow residents to sleep with windows open, during the night-time.

9.14 Submitters comment on how there will be a different individual response to the same noise, as a result of many factors including age, gender, subjective noise sensitivity, attitude to the noise generator and the like. This is correct. I note that in annoyance studies the average response of groups of people is typically considered (or the percentage of highly annoyed people for a given level of noise) and this is the basis for the noise levels and limits discussed above.

## 10 **SECTION 42A OFFICER'S REPORT**

10.1 Mr Jesse Aimer prepared the section 42a report for Selwyn District Council (SDC) in relation to KeaX Limited's land use consent application. On acoustic matters, Mr Aimer relies on the acoustic peer review undertaken by Mr Gary Walton and Mr Jon Farren of Marshall Day Acoustics.

10.2 The acoustic peer review generally records agreement with the methodology and findings of the AES assessment, subject to the provision of appropriate conditions of consent.



- 10.3 To this end, the reviewer recommends a set of operational noise limits which are lower than those originally recommended in the AES report to ensure noise effects are acceptable. As outlined above, the Applicant is willing to adopt the recommended condition.
- 10.4 The reviewer agrees that there is the potential for some construction activities to exceed the noise limits outlined in NZS 6803 and considers that the potential adverse noise effects should be managed by a construction noise and vibration management plan (CNVMP), provided after consent is granted. I agree that the suggested condition requiring a CNVMP is reasonable (draft condition 29 in the s42a).
- 10.5 However I note that there is a minor inconsistency, as draft condition 32 in the Section 42a requires compliance with the long duration noise limits in NZS 6803, where our assessment outlines (and the review agrees) that this may not be achieved at 324 Branch Drain Road. To address this, it would be typical to amend the condition as follows (shown in italics):
- Construction activities must be conducted in accordance with NZS 6803: 1999 "Acoustics – Construction Noise" and must comply *as far as practicable* with the "typical duration" noise limits contained within Table 2 of that Standard.
- 10.6 The reviewer records two items of uncertainty in their review as follows:
- (a) That no ambient monitoring had been undertaken at the time of the review, and that this makes it difficult to confirm the assertions about audibility.
  - (b) That the location of the noise sources and calculation methodology had not been provided.
- 10.7 Further explanation has been provided earlier in this evidence which I believe may remedy those concerns.
- 10.8 The reviewer has suggested a monitoring condition to confirm the operational noise levels and that the overall noise generated will not attract a +5 dB penalty for special audible characteristics. I agree that this would be appropriate.

10.9 After considering this review, and comments by submitters, the noise and vibration section of the s42a ultimately concludes that construction and operational noise effects can be effectively managed in accordance with appropriate noise measures.

10.10 I note that Mr Aimer appears to discuss operational noise limits in the context of construction noise (paragraph 102 of the s42a). This appears to be an error, as the construction limits are an order of magnitude higher than the recommended operational noise limits.

10.11 I also note that Mr Aimer has introduced some noise related conditions which are additional to those proposed by the acoustic peer reviewer. These require construction noise monitoring (draft conditions 33 - 34 in the s42a) and an operational noise management plan (draft condition 35 in the s42a). While these types of conditions would often be helpful, I am not convinced that they provide much benefit in the context of this particular proposal.

10.12 On construction noise monitoring, I have identified only one dwelling where construction noise is likely to exceed the guideline limits in NZS6803, and only for a matter of few days. I consider the most useful way to approach this exceedance would involve discussing suitable times for critical work with the occupiers of the dwelling or implementing further screening if practical. These procedures would be formalised in the CNVMP.

10.13 Since the main noise generating equipment on this site is fixed, and there is already a condition proposed requiring a complaint register, I am not sure what useful information could be contained within an stand-alone operational noise management plan.

## 11 **CONSENT CONDITIONS**

11.1 I have reviewed the draft proposed consent conditions to be attached to the planning evidence of Ms Claire Kelly and have provided feedback in line with my comment above.

## 12 **CONCLUSION**

12.1 My key conclusions are as follows:

- (a) Operational noise levels associated with the solar farm are predicted to be well below the ODP and PDP noise limits at the relevant receivers.
- (b) The Applicant is willing to adopt a set of noise limits which are 5 dB lower than the PDP limit. I consider this to be a reasonable and conservative control given the ambient noise monitoring I have undertaken at the site.
- (c) My analysis confirms that noise from construction activity can generally comply with the noise limits outlined in NZS 6803 except when piling activity occurs within 50 metres of 324 Branch Drain Road where I expect there could be an exceedance of up to 4 dB.
- (d) Given the piling works will likely only be within 50 metres of the dwelling for a period of a few days, it may be practical and effective to communicate with the resident around scheduling the piling works for times that will be most suitable for them, to minimise the effects. Local screening may also be possible if this is not practical.
- (e) Given that construction noise levels will at times be significantly higher than the background noise levels, I recommend implementing a CNVMP for use during the construction phase of the project. The CNVMP should be prepared with consideration of the guidance from NZS 6803 and specifically include an element of community relations management.
- (f) The acoustic peer review generally records agreement with findings of my assessment, subject to appropriate conditions of consent. The Applicant is willing to adopt the conditions proposed by the acoustic reviewer with only minor wording clarifications. Additional conditions requiring construction noise monitoring and an operational noise management plan have been suggested in the s42a, however I do not think these will provide any material benefit in the context of this application.

**William Peter Reeve**

**9<sup>th</sup> of February 2023**