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Dear Nick,

Far North Solar Farms- Greytown solar farm: Acoustic review

South Wairarapa District Council have engaged Styles Group to review the construction and operational noise effects from the resource consent application to establish and operate a 175-megawatt (peak) solar farm at 415 Moroa Road, Greytown (the **Site**). We understand that the application is subject to a request for Direct Referral and has been publicly notified.

We have reviewed the Assessment of Noise Effects prepared by Marshall Day Acoustics (the **MDA Report**) dated 17 August 2023. The MDA Report has been provided in response to a Section 92 request.

We understand the overall activity status of the application is restricted discretionary. The application proposes to comply with the noise standards of the Operative Combined Wairarapa District Plan (the **District Plan**). Non-compliance for noise reasons is not identified as a reason for consent.

This advice comprises a review of the operational and construction noise effects of the proposal.

1.0 General comment on solar farm noise in Rural Zones

The proposal is to establish a solar farm in the Rural (Primary Production) Zone of the District Plan. The mechanical plant noise associated with solar farms operates on a relatively constant basis¹ and differs from the character, duration and timing of noise sources that are typically associated with rural production activities. The Primary Production Zone is typically dominated by the seasonal and intermittent noise effects of production activities, such as those described in Section 4.3.6 of the District Plan:

“residents living in the rural environment need to recognise the accepted management practices of these activities, including agricultural spraying, the use of farm machinery, the seasonal operation of birdscarers, frost protection devices, odour, and night harvesting that may occur”

In this case, we understand that the District Plan provides for the establishment and operation of renewable energy facilities. Section 4.2(11) of the District Plan recognises that large scale

¹ In this case, we understand that the proposed noise sources will operate during sunshine hours only and that the proposal does not include any battery storage infrastructure or plant that will generate noise overnight

connected facilities “*need to locate in the rural environment because of their land area and siting requirements*”.

We consider that the District Plan provides a reasonable expectation to the community that noise associated with large scale connected renewable energy facilities should be expected in the rural zone, along with the noise from traditional primary production activities.

We therefore consider that the permitted noise standards are generally appropriate to control the noise levels from the solar farm.

However, we also note that noise at levels up to the permitted noise standards would be likely to generate a significant level of adverse noise effect. Noise levels at a notional boundary at a constant level of 55 dB L_{A10} during the day or 45 dB L_{A10} during the night time would be likely to be experienced as annoying and intrusive and would likely be the dominant noise above all other noise sources.

In this case, the highest predicted² noise level at an existing notional boundary is 39 dB L_{A10} , and well below the permitted daytime and nighttime³ noise standards. We note that the District Plan’s prescribed timeframe for night time commences at 7:00pm and extends until 7:00am. The lower night time noise limits provide the rural receivers with a higher level of noise amenity during the evening and night-time periods.

We recommend that mechanical plant should be selected, designed and located to minimise noise emissions to the adjacent receivers to the greatest extent possible. We agree with the approach identified in the AEE that states “*the inverters will be placed as centrally as possible within the site to minimise any potential disruption to neighbours.*”

2.0 Operational noise sources and predictions

We generally agree with the inputs and assumptions adopted by MDA in their noise modelling.

MDA have predicted the noise levels of 39 central inverters distributed across the array, with two transformers located in the switchyards. The rating level predictions in Table 6.3 include a +5dB special audible character adjustment for tonality, with no adjustment for duration.

MDA’s statements regarding the low level of noise from tracker motors is consistent with our findings. We agree that noise from tracking motors will have a negligible contribution to the overall noise emissions from the Site.

2.1 Noise emissions from selected plant

The MDA Report confirms that the applicant has not confirmed the exact plant that will be used. It is our experience that there can be considerable variation in the sound power levels of transformers and inverters. If the applicant seeks flexibility for the plant to be selected after consent is granted, we recommend a condition of consent is included to ensure that the noise

² The predictions assume that the plant is operating at full load. The facility is not expected to generate during typical sleeping hours.

³ The prescribed timeframe for nighttime commences at 7:00pm and extends until 7:00am

emissions from the selected plant are no greater than those considered in the MDA Assessment. Our recommended condition is provided in Section 5.0.

3.0 Operational noise effects

The AEE states that operational noise effects will not be noticeable from the boundary of the Site. This statement conflicts with MDA's overall findings that:

“Solar farm noise levels at dwellings on Moroa Road, Settlement Road and Battersea Road would be in the order of 27 to 39 dB LA10 at times of solar generation. As the Moroa, Settlement and Battersea Road area is further removed from State Highway 2, it is subject to generally lower noise levels (noting that background noise levels in this area vary depending on local activity). Noise from the solar farm generation is expected to be above the existing background (LA90) noise level at times, but generally similar to or quieter than the existing ambient (LA10) noise level. In this area on settled weather days, the solar farm would be audible at times as a low-level constant noise source”

We do not expect that that the noise levels will be audible inside dwellings.

3.1 Noise effects across adjacent land

The MDA Assessment identifies that the surrounding land is used for a combination of rural farming and rural lifestyle purposes. Table 1 and Figure 1 of the MDA Assessment identifies the sites where there is an existing dwelling (notional boundary). Table 5 includes noise level predictions at each notional boundary.

Figure 1 shows that the receiving environment *may* include vacant sites on which a residential dwelling has yet to be constructed. The MDA Report does not describe or assess the potential noise effects across vacant sites. The MDA Assessment is not accompanied by noise contours that would enable the level and extent of noise emissions across potentially vacant sites to be better understood.

Where a noise maker is unable to internalise noise effects within site boundaries and proposes to generate noise effects across adjacent vacant land, we recommend that the noise effects on the permitted use and development of that land are clearly understood in the decision-making process. The assessment should inform an assessment of the following matters:

1. The extent of the daytime and nighttime noise levels across the vacant land. Noise contours should be provided to illustrate the extent of the 55 dB LA10 (daytime) or 45 dB LA10 (night time) contours across the adjacent land parcels.
2. If the noise contours show that the area of vacant land inside the 55 dB LA10 (daytime) or 45 dB LA10 (night time) contour is highly unlikely to be developed for a noise sensitive activity, the noise effects may potentially be acceptable. This determination would require consideration of the underlying zoning, the permitted use of that land and the associated outdoor amenity expectations in that zone.
3. If the noise contours show that the area of vacant land inside the 55 dB LA10 (daytime) or 45 dB LA10 (night time) contour is likely to include a building platform

for a future notional boundary⁴, the noise effects should be considered in the decision making process. We understand that the District Plan anticipates and provides for the establishment of a residential dwelling on each site, and it is reasonable to assume that landowners may seek to exercise this permitted development right and receive protection from the District Plan noise limits that control the noise levels that can be generated and received between rural zoned sites.

4. If a future notional boundary is likely to be exposed to noise levels greater than the permitted noise standards, non-compliance with the noise standards should be identified as a reason for consent. Notification may be required where the noise contours demonstrate the future permitted use and development of the vacant land may be constrained by the noise effects that the activity seeks to authorise. The notification/ submission process would typically enable the landowner to have input on how the noise effects may affect the use and development of their land. If the application is not notified to the landowner, the landowner may have no knowledge of the application, or the noise effects the activity seeks to authorise. The landowner may have no knowledge of the noise effects across their land until a residential dwelling is established. The noise effects may give rise to noise related conflict and complaint between the landowner and the noise generating activity.

In this case, it would appear that some adjacent sites may be vacant, however we note that rural land ownership can be complex, with parcels often held together. We recommend that noise contours are provided by the applicant, and the planners determine the likelihood of any notional boundaries being established on vacant land that is inside the 55 dB L_{A10} and 45 dB L_{A10} noise contours. This assessment would enable the potential implications of MDA's proposed date-stamp condition to be more clearly understood.

3.2 Proposed date-stamp in Condition 1

MDA's proposed condition 1 includes a "date-stamp" condition that would require the solar farm to only comply with the District Plan noise limits at the "*notional boundary of dwellings existing at the time of consent*". Condition 1 would mean that no noise limits apply at any adjacent dwelling that "exist" after consent is granted and creates a "first-in, first-served" arrangement.

Condition 1 does not clarify whether "existing" includes include dwellings on vacant sites that in the process of obtaining building consent. Condition 1 effectively seeks to exempt the activity from compliance with any noise limits at future dwellings.

We fundamentally disagree with MDA's proposed use of a date-stamp for the following reasons:

1. **The District Plan noise limits apply at any notional boundary in the Rural Zone:** We are not aware of any acoustical basis for recommending that no noise limits should apply to dwellings constructed after resource consent is granted. The District Plan noise limits are designed to ensure that all notional boundaries in the

⁴ This may require a planner to identify the likely permitted building platform, taking into account access, services and compliance with permitted activity standards

Rural Zone are provided with an adequate level of daytime and night time noise amenity. An activity that does not require resource consent must comply with the noise limits at all notional boundaries. An activity that requires a resource consent is therefore also required to comply with the noise limits at all notional boundaries, unless the application identifies non-compliance with the noise standards as a reason for consent, and consent is granted to authorise those noise limits. We consider this approach is no different to compliance with the District Plan's bulk and location controls. An applicant is required to comply with the controls that apply to their site. Compliance should not be contingent on how the neighbouring site is used.

2. **The proposal is to comply with the District Plan noise limits:** We understand this proposal is to comply with the District Plan's permitted activity noise standards. The wording of Condition 1 seeks to authorise potentially non-compliant noise levels at future notional boundaries. The District Plan noise standards require noise levels to be complied with at any notional boundary. Condition 1 should therefore ensure compliance is achieved on an ongoing basis, at all notional boundaries.
3. **Date-stamping can give rise to noise conflict and legal argument:** Landowners are likely to have a reasonable expectation that they can exercise their development rights to a) construct a dwelling on their vacant site and b) be protected by the District Plan noise limits. The wording of Condition 1 exempts the noise maker from any noise limit on land that was vacant at the time of consent. If a noise sensitive activity is established on land exposed to noise levels that are incompatible with residential activity, it is likely that noise-related complaint and conflict will occur in the future. Council may be required to moderate the noise conflict, with this process often resulting in significant time and cost to all parties involved and potentially legal or enforcement action. In this case, there is no way for a landowner to understand the noise effects that could potentially be generated across their land. The noise effects are not visible on District Plan maps, and would not be disclosed as part of a LIM.
4. **The date-stamp does not require the applicant to manage their noise effects across adjacent land in the future:** We recommend that the noise effects across adjacent land and the potential for encroachment are clearly understood by the noise-maker as part of the design and consenting stage. This enables the noise maker to have a clear understanding of whether there is likely to be a current or future need to reduce, mitigate or otherwise internalise noise emissions to achieve compliance and compatibility with permitted land use activities on adjacent sites. In its current form, Condition 1 seeks to exempt the activity from compliance with any noise limits on sites that are currently vacant. If consent is granted, the noise maker will have no requirement to manage their noise effects across the sites that are currently vacant. The lack of any noise limits on currently vacant sites could theoretically enable the applicant to install additional noise generating plant in the future.

5. **The use of a date-stamp relates to complex legal/ planning considerations that are generally beyond the expertise of an acoustics expert:** The use of a date-stamp condition may potentially authorise non-compliant noise levels at a future notional boundary. The legal and planning implications of date-stamping is outside the expertise of an acoustic expert. We recommend the planning and legal implications of the date-stamp are considered by the relevant experts, taking into account the permitted use and development of that land. The acoustics experts can assist to interpret the noise contours in terms of effects, when the permitted use and development of any vacant land is confirmed.

4.0 Construction noise

We generally agree with MDA's assessment of construction noise effects.

Our key area of disagreement relates to MDA's determination that the "typical duration" noise limits in NZS6803:1999 will apply to the project. The "typical duration" noise limits in NZS6803:1999 apply to a project that can be completed in more than 14 calendar days and less than 20 weeks.

The AEE states that construction activities will take place over a 6-9 month period. The construction phase may therefore exceed 20 weeks. If the total duration of the construction phase exceeds 20 weeks, the long-term construction noise limits in NZS6803:1999 apply. These noise limits are lower than the noise limits applying to typical duration projects.

We expect that the construction timeframe will be confirmed as part of the detailed design phase. The CNMP proposed in Condition 3 will use this information to confirm the applicable construction noise standards based on the expected duration of the project.

We recommend that the reference to "typical duration limits" in Condition 2 is deleted. Condition 2 is reproduced below, along with our suggested amendments:

Noise from construction activities shall not exceed the ~~typical duration~~ limits recommended in, and shall be measured and assessed in accordance with, New Zealand Standard NZS 6803: 1999 "Acoustics – Construction Noise".

We support the wording of Condition 3.

5.0 MDA's Recommended noise conditions

This section sets out our recommended amendments to the applicant's proposed noise conditions.

5.1 Condition 1 - operational noise limits

Condition 1 controls the noise levels that may be generated from the solar farm and received at any notional boundary on an adjacent site. Our recommended changes to Condition 1 are identified as **additions** and ~~deletions~~:

1. The noise level from operation of the solar farm shall meet the following noise limits at the notional boundary of dwellings ~~existing at the time of consent~~ on any

other site (excluding ~~these~~ **the sites at [insert addresses]** where written approval has been obtained):

Daytime 7:00am to 7:00pm 55 dB LA10

Night-time 7:00pm to 7:00pm 45 dB LA10

9:00pm to 7:00pm 75 dB LAFmax

Noise levels shall be measured and assessed in accordance with NZS 6801:2008~~1999~~ Acoustics – Measurement of Environmental Sound and NZS 6802:2008~~1991~~ Acoustics – Environmental Noise.

The recommended changes to Condition 1 are designed to:

1. Remove the date-stamp, for the reasons discussed earlier in this advice.
2. Ensure that the site(s) where written approval have been provided are identified in the condition. This enables the condition to be administered efficiently and effectively.
3. Ensure that the noise measurement metrics and standards align. The application is based on compliance with the Operative District Plan noise limits that refer to the L₁₀ descriptor. While we support the use of up-to-date acoustical standards, the use of the L₁₀ descriptor in the relevant plan rule will require measurement and assessment to be undertaken in accordance with the standards referenced in the District Plan as the L₁₀ descriptor is not used in the 2008 versions of NZS6801 and NZS6802. There is no material change in the level of effect that would arise from this change.

5.2 Recommended new condition

The MDA Report confirms that no specific model of inverter has been selected. MDA recommends that “*suppliers confirm that the final equipment selected can operate accordingly*” and “*the final determination of inverter selection can inform if any further noise mitigation package is required*”. MDA have not recommended conditions that would ensure these outcomes are delivered.

We recommend that the following condition is included. This condition is designed to ensure that the noise emissions of the final plant arrangements are considered in the detailed design process.

The consent holder shall provide [insert delegation] with an acoustic assessment from a suitably qualified and experienced acoustic expert that demonstrates the proposed plant and layout will achieve compliance with the noise limits in Condition 1. The report shall be provided to the Council a minimum of 6 weeks prior to construction of the solar farm.

5.3 Condition 2

We have recommended minor changes to Condition 2, as detailed in the previous section.

6.0 Key findings of this review

1. We understand that the District Plan anticipates and provides for solar farms in rural zones. On this basis, we consider that mechanical plant noise from solar plant is a noise source that could be reasonably expected in the zone. We consider that the District Plan noise standards are appropriate to control the noise effects from the proposal.
2. We generally agree with the inputs and assumptions used by MDA to predict the noise levels from the solar farm. As the applicant has not confirmed the final plant that will be used, we have recommended a new condition to ensure that the noise emissions from the final plant arrangements are consistent with those considered in the MDA Report.
3. The MDA Report confirms that the solar farm is able to comply with the noise limits at any physically existing notional boundary. The highest predicted noise level at an existing notional boundary is 39 dB L_{A10} , and well below the permitted daytime and night time noise standards. The facility is expected to generate noise during evenings during the warmer months but is not expected to generate noise overnight.
4. We agree that the noise levels from the solar farm are likely to be audible at the closest receivers. The noise levels are likely to be clearly audible to the receivers when they are outdoors, during calm meteorological conditions and in periods when background noise levels are low. These periods may coincide with times when expectations for outdoor amenity are greatest.
5. The MDA Report does not include an assessment of noise effects across vacant land and have recommended that no noise limits apply at future dwellings established after consent is granted. We recommend that a vacant land assessment is undertaken to enable the potential implications of the proposed date-stamp condition to be more clearly understood. We are unable to determine whether the noise emissions across vacant land are likely to result in non-compliance with the noise standards at future notional boundaries. We recommend that noise contours are provided by the applicant, and the planners determine the likelihood of any notional boundaries being established inside the 55 dB L_{A10} and 45 dB L_{A10} noise contours. In any event, we recommend the date-stamp is removed from Condition 1 and that the District Plan noise limits apply to the proposal.
6. We have not reviewed the submissions relating to noise effects. We can provide further comment on specific submissions if required.

Please contact me if you require any further information.

Yours sincerely,



Jon Styles, MASNZ
Director and Principal