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29 August 2023

Meridian Energy
Level 2
55 Lady Elizabeth Lane
Wellington 6011

Attention: Gene Sams

Dear Gene

S92 ADDITIONAL INFORMATION REQUEST - NOISE

I have reviewed the noise matters contained in the s92 request from the combined councils and offer the following responses.

OLD COACH ROAD CONSTRUCTION

38. *Construction traffic on Old Coach Road is discussed in 4.4 of the Noise Effects Assessment. The Noise Effects Assessment identifies that additional construction traffic will be "very significant". However, there is no assessment made of the resultant noise or of any mitigation measures other than managing noise through the CEMO or similar "such as controlling the hours" of construction traffic movement. The Noise Effects Assessment considers that the 8 months of construction traffic represents a temporary effect which is more readily tolerated. It is also anticipated that Old Coach Road will require a significant upgrade to be suitable for wind farm deliveries and construction traffic and the noise of this should also be factor in.*

    A. *What are the construction noise impacts relating to the upgrades to Old Coach Road that are necessary to accommodate wind farm construction and delivery traffic?*

    B. *What is the noise impact of the windfarm construction and delivery traffic on residents of Old Coach Road?*

    C. *What noise mitigation measures are available?*

Five external dwellings located on Old Coach Road will experience noise initially and briefly from improvements to the road, and later and for a much longer period, from vehicle movements – particularly trucks delivering aggregate and turbine components to site. Typical dwelling setbacks are between 20 and 35 metres from Old Coach Road. We discuss the matters raised in point 38 below.

Road Improvement

Widening will occur along Old Coach Road to accommodate construction traffic. This will generally occur at distances of at least 100 metres from a given dwelling, with shorter periods (several days) of activity directly in front of each dwelling.

When activity occurs directly in front of a dwelling 20 metres from the road, noise levels of up to 78 dB L_{Aeq} may be experienced at the façade at times. When the activity is further from the property, the longer-term noise level will be around 60 – 65 dB L_{Aeq}.

Construction and Delivery Traffic

There may be up to 150 heavy vehicles per day at the peak of construction works while earthworks and platform construction are carried out.

During the peak construction period there will typically be up to 5 truck movements per 15-minute period during daytime hours Monday - Saturday. The calculated sound level for this traffic is 59 dB L_{Aeq} for a dwelling with a 20-metre setback from Old Coach Road.

Noise Effects

The context of this noise can be estimated from measurements taken at Dwelling 9 during daytime hours. This dwelling is on Falkner Road but shares a similar proximity to SH2 as the Old Coach Road dwellings. At this property the typical daytime background noise level is between 40 and 50 dB L_{A90}. Although the ambient L_{Aeq} noise levels are not shown in this data set, they are expected to be around 5 dB higher than the L_{A90} values, or 45 - 55 dB L_{Aeq}.

In this context:

- Road construction directly in front of a given dwelling would represent an increase in noise level of 25 dB, a very significant increase lasting several days;
- Road construction along the more distant portions of the road relative to a given dwelling would represent a doubling of loudness – a substantial increase;
- Aggregate truck traffic represents a substantial increase in noise level during daytime hours for these dwellings over the limited construction period.

Mitigation Options

The noise levels emitted by the activities described above comply with the construction noise guidelines in NZS6803:1999 by a comfortable margin, with the exception of roadway widening when directly in front of a dwelling. The details of these noise levels are described in sections 4.2 and 4.3 of the Mt Munro Noise Effects Assessment report, Rp 002 R03 20210951.

The degree to which noise from roadway widening will exceed these guidelines will depend on the particular works required at each portion of the road. As described above, the highest noise levels from road construction are calculated to reach 78 dB L_{Aeq} for short-term road construction activities when dwellings are within 20 metres of the road. Although this would comply with the "short term" construction noise limits, we recognise that these residents will be exposed to "long term" construction activities. This 8 dB exceedance then becomes the subject of mitigation options.

The actual noise effect will also depend on the particular circumstances of each resident, and so mitigations of this activity noise should be decided in consultation with these neighbours. Suggested mitigations are as follows:

- At a minimum, works should be coordinated with the neighbours, in case there are particular accommodations around scheduling that can alleviate the noise effects. For instance, if the house is unoccupied during the day, no actual effect would occur. Limitations on hours of operation within the construction noise management plan should be used to ensure that residents have certainty about when noise effects would arise.
- For the brief periods when activity noise exceeds the noise trigger levels of 70 dB L_{Aeq}, more significant mitigations may be warranted. This could include assisting in the temporary relocation of residents during daytime activity periods.
- To limit noise effects, the normal suite of recommendations included in construction noise management plans should be implemented – avoiding unnecessary shouting or external radio use, using non-tonal reversing alarms, maintaining equipment and particularly engine exhausts, watering equipment tracks to reduce squeaking, etc.
- If significant activity is required directly in front of a dwelling for a period longer than can be mitigated by scheduling discussions, temporary barriers can be erected to reduce the noise level received at the dwelling by up to 10 decibels.
- Minimising the noise effects can be aided by ensuring the works are carried out efficiently and quickly, to minimise the amount of time spent in front of a given dwelling.

DETAILS OF NOISE MONITORING

39. *Wind farm sound monitoring is shown in Figures 8 to 13 inclusive of the Noise Effects Assessment. The (purple) line of best fit in the night-time results is the most critical. There are often times when the background sound levels are significantly below the line of best fit showing that the areas are regularly quieter when the wind farm hub height wind speed are less than 10 m/s. Because of the spread of background sound levels, the line of best fit is not representative of these quieter times and the assessment of wind turbine noise effects in 6.2 of the Noise Effects Assessment does not reflect the true picture. To clarify the situation:*

    A. *Please justify where higher than normal background sound levels were measured at night-time or remove them from Figures 9. 11, and 13 (and subsequent charts).*

    B. *Please advise whether the monitoring equipment used can measure sound levels below 20dBA and, if not, whether this influences the charts in 6.1 of Appendix H and/or truly describes how quiet the area is.*

The procedure for assessing "preconstruction" background noise at a wind farm site is well established in NZS6808:2010. The measurement is intended to include both natural and man-made noise received over a representative period of several weeks, but does require that "unusual" events are removed. Examples of these sounds are rainfall, cicadas or other insects, and animal noise. These events have been removed in the presented data set – by excluding daytime measurements and by manually removing events with significant rainfall.

It is expected and required that natural and anthropogenic sound which is normally present in the area – including wind in trees, noise from water, traffic, etc – are included in the data set. It would not be reasonable to select only the quiet time periods to establish an artificially low average across the measurement period. The statement of noise effects is meant to relate to the average noise environment, which in the case of these sites does include a significant number of periods where the noise level is higher or significantly higher than the quietest periods.

The monitoring equipment used (01dB Cube) has a rated self-noise of 16 dBA – meaning that the microphone contributes this level of noise to the measured values. This is typical of all noise measurement equipment used in the industry, and is well below the noise levels at which judgements of noise impacts are made.

The quietest values shown in the Figures of the noise assessment report are around 21 dBA. The quietest of these data points will have been slightly influenced by this noise floor – a reading of 21 dBA will likely represent a noise environment of 20 dBA; however, data points higher than 24 dBA will not be numerically affected by this self-noise. The overall influence of sound level meter self-noise is very small and will not materially affect the average noise levels shown by the regression curve.

This equipment (01dB Cube) is therefore fit for purpose, can measure sound levels below 20 dBA, and has accurately captured the background sound environment in the area.

OPERATIONAL NOISE EFFECTS UNDER QUIET CONDITIONS

40. *The predictions are that the night-time background sound levels are often low at wind farm wind speeds of 10m/s and less. The Noise Effects Assessment relies on compliance with NZS 6808:2010 without assessing the actual impacts of wind farm noise on the residents.*

    Please undertake a FIDOL (frequency, intensity, duration, offensiveness and location) analysis of wind farm noise predicted in 6.2 of the Noise Effects Assessment against the (commonly quieter) background sound level sin Figures 9, 11 and 13, including an assessment of how often the different conditions would apply and the possible noise impact on residents.

The noise effects assessment report contains a summary of the conditions under which the wind farm is a dominant or significant noise source, and describes the noise effects in terms of the reasonableness of the noise. By way of addressing the concerns of this query, a more granular approach to summarising the noise effects can be made by considering the FIDOL properties of the noise.

Of the FIDOL parameters, intensity and offensiveness may be considered in relatively simple terms. *Intensity* is reflected in the predicted turbine noise levels in Table 8 of the report. All of the "external" properties will receive noise levels of less than 40 dBA at full turbine power, which is a noise level that produces a reasonable indoor sleeping environment with respect to World Health Organisation recommendations.

The *offensiveness* of the noise is related to the character of turbine noise. Modern turbines such as provided by Siemens and Vestas are designed to minimise the tonality and low-frequency noise associated with older designs – such as exhibited by downwind rotors, active stall speed control, and turbines with poorly designed gearboxes. The character is similar to the sound of surf or wind in trees and can be described as neutral in character. Safeguards around noise character are contained in the consent conditions requiring that special audible characteristics (SAC) are tested and mitigated.

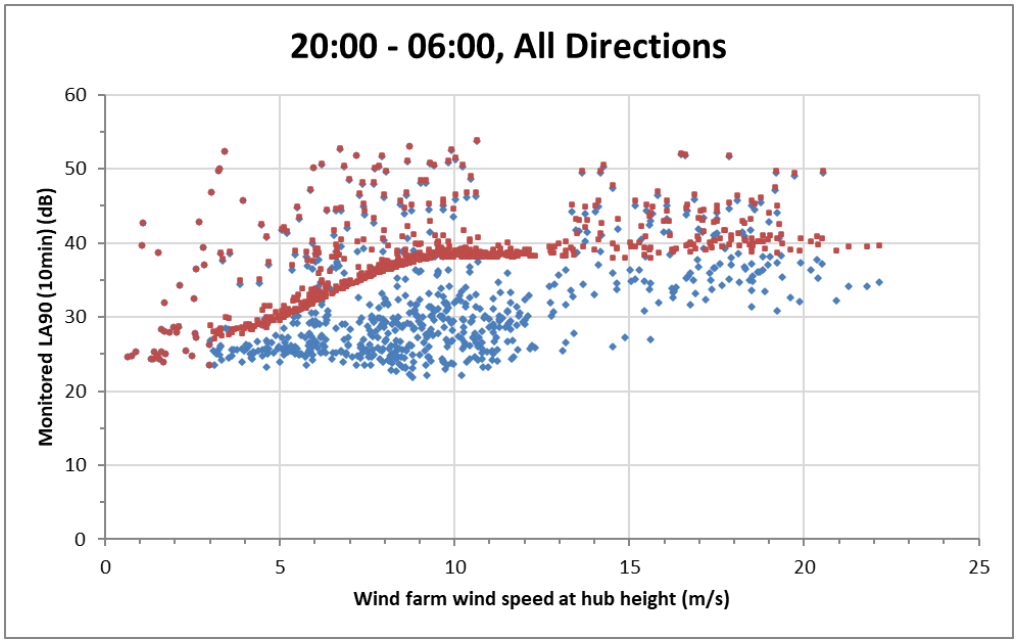
The *location* may be considered broadly in terms of the use of NZS6808:2010 and its recommendations to satisfy the objectives and policies of the District Plan. It is anticipated that some noise will arise from wind farms as a consequence of achieving renewable energy objectives, and the assessment procedure and noise limits contained in the standards has been chosen to afford that particular degree of protection in this location. More details of the *location* are incorporated into the assessment as discussed below.

Frequency and *duration* of turbine noise, and their relationship to the context specific to the *location* are wrapped into the scatter plots presented in Figures 9, 11 and 13 of the Report. These plots contain information about the range of existing background noise levels present (defining the *location)*, and by comparing the predicted noise level of the turbines it is possible to describe how often the existing environment is changed (frequency of an 'event') by the operation of the turbines.

To provide a more complete picture of these matters, we have calculated, for each of the 10-minute background noise samples, the expected noise level that would have occurred had the turbines been in operation during these measurements, and described how frequently different ranges of noise level increase would have occurred.

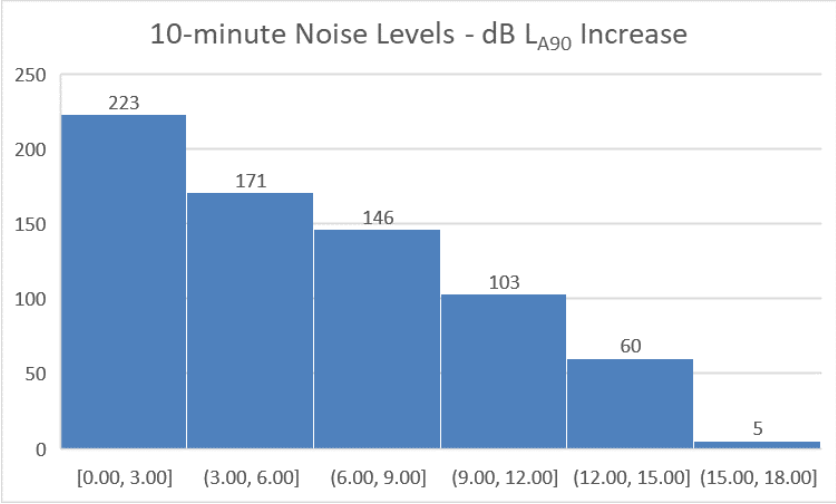
Dwelling H09

The calculated noise level at dwelling H09 is 38 dBA for the DD120 turbine running at full power. In the following figure, the background noise measurements (shown in blue) are accompanied by the calculated total background noise, plus turbine noise, that would have occurred with the wind farm constructed.



In general, the noise increase is slight at low wind speeds when the turbine output is low, and also slight when the background sound level is already high. The noise increase is significant when the turbine is operating near full power under quieter background conditions.

The following figure shows the frequency of occurrence of different degrees of noise level increase – grouped into 3 dB intervals.

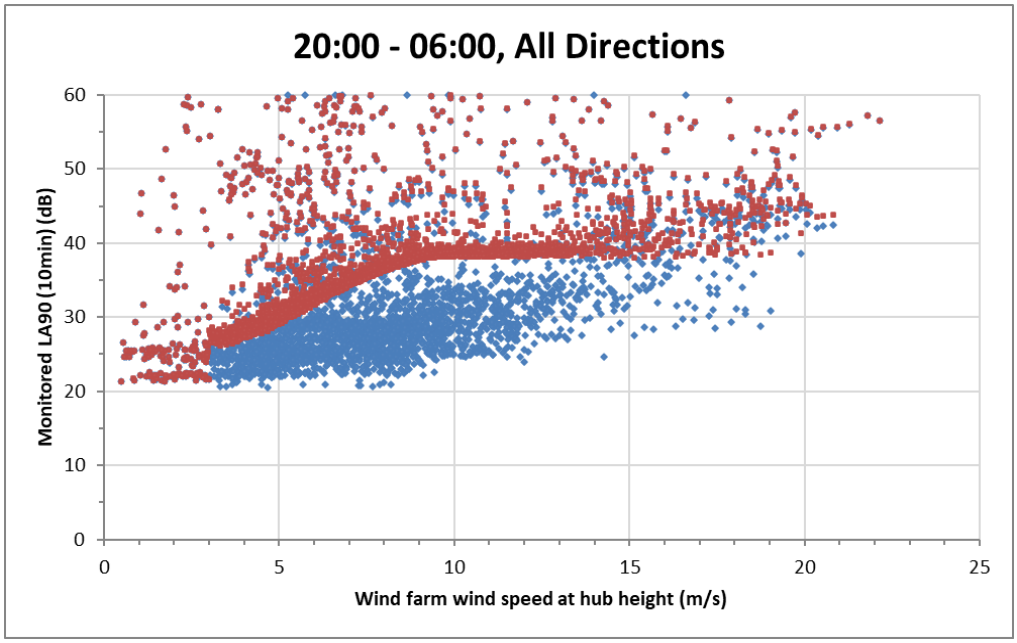


From the 708 night-time noise samples:

- 223 (31%) exhibit an undetectable increase in noise level
- 171 (24%) exhibit a discernible change
- 146 (21%) exhibit a noticeable change
- 103 (15%) exhibit a substantial change
- 65 (9%) exhibit a very significant change

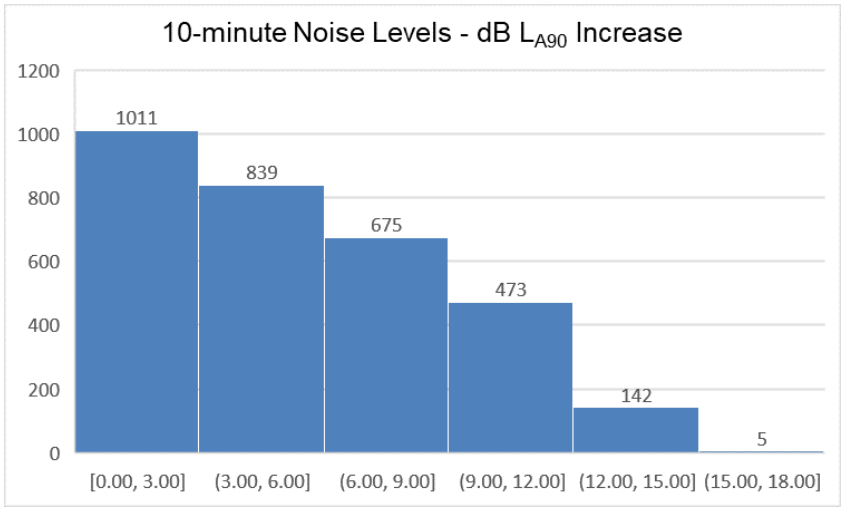
Dwelling H21

The calculated noise level at dwelling H21 is 38 dBA for the DD120 turbine running at full power. In the following figure, the background noise measurements (shown in blue) are accompanied by the calculated total background noise plus turbine noise that would have occurred with the wind farm constructed.



In general, the noise increase is slight at low wind speeds when the turbine output is low, and also slight when the background sound level is already high. The noise increase is significant when the turbine is operating near full power under quieter background conditions.

The following figure shows the frequency of occurrence of different degrees of noise level increase – grouped into 3 dB intervals.

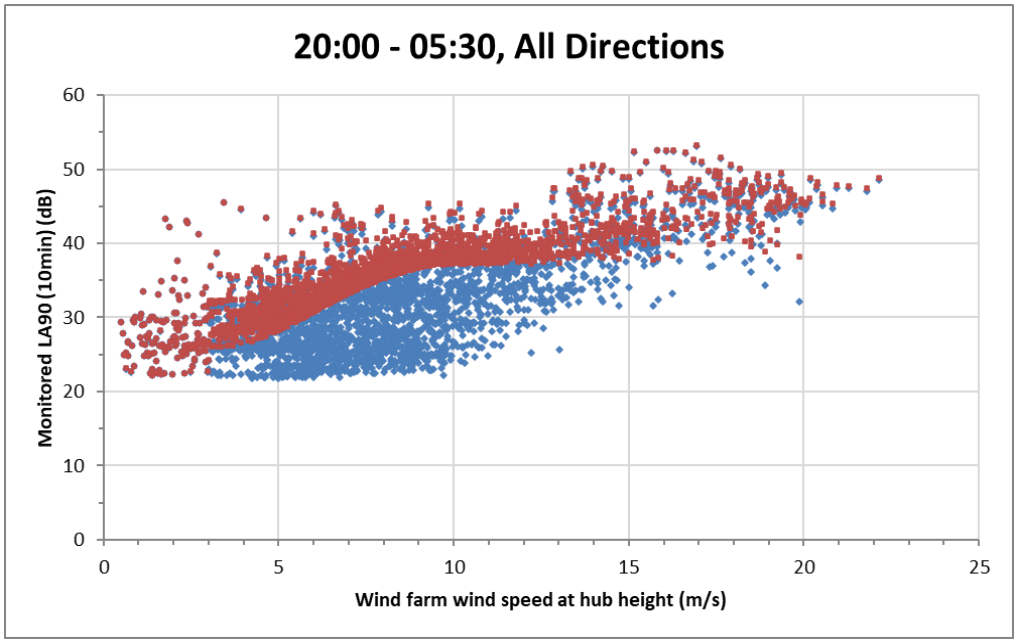


From the 3145 night-time noise samples:

- 1011 (32%) exhibit an undetectable increase in noise level
- 839 (27%) exhibit a discernible change
- 675 (21%) exhibit a noticeable change
- 473 (15%) exhibit a substantial change
- 147 (5%) exhibit a very significant change

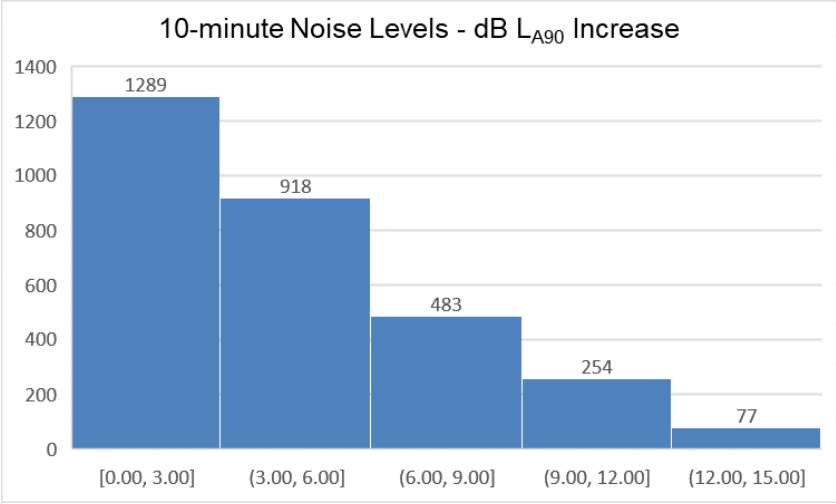
Dwelling H26

The calculated noise level at dwelling H26 is 37 dBA for the DD120 turbine running at full power. In the following figure, the background noise measurements (shown in blue) are accompanied by the calculated total background noise plus turbine noise that would have occurred with the wind farm constructed.



In general, the noise increase is slight at low wind speeds when the turbine output is low, and also slight when the background sound level is already high. The noise increase is noticeable when the turbine is operating near full power under quieter background conditions.

The following figure shows the frequency of occurrence of different degrees of noise level increase – grouped into 3 dB intervals.



From the 3021 night-time noise samples:

- 1289 (43%) exhibit an undetectable increase in noise level
- 918 (30%) exhibit a discernible change
- 483 (16%) exhibit a noticeable change
- 254 (8%) exhibit a substantial change
- 77 (3%) exhibit a very significant change

Summary of Effects

At the dwellings considered in this assessment, the wind farm would be the dominant background noise source for about 2/3 of the time – 57% for Dwelling H26 and its neighbours, and around 66% for others.

The overall noise level during these times would be consistent with noise levels anticipated by the District Plan, NZS 6808, and would meet WHO sleep criteria. We are satisfied that the noise character will not be penalizable for SAC under the criteria of NZS6808:2010. Taking these factors into consideration we do not consider the noise will be unreasonable.

CONCRETE BATCHING PLANT NOISE

41. *The Noise Effects Assessment (section 4.1.3) envisages locating the concrete batching plant at a distance of 35 metres from a dwelling when there is opportunity to maximize this separation distance. Concrete batching is a manufacturing activity with characteristics that are different to construction works e.g., it does not change its location or noise generating characteristics during the construction period.*

    Is the proposed concrete batching plant noise more appropriately controlled using the relevant district plan (NZS 6802) noise limits in favour of the Construction Noise (NZS 6803) Standard given concrete batching is a manufacturing process and generates noise that is different to construction activities? If not, then what would the noise impact be on a dwelling located 35 metres from a concrete batching plant as identified in 4.1.3 of the Noise Effects Assessment?

The distinction between activities which are controlled by the construction noise standard, and those which are controlled under the permitted activity limits in the District Plan is not made on the basis of noise character, but rather on whether the activity is temporary (for the duration of the construction) or permanent. A construction activity may well retain the same location and character throughout a construction duration – for example a generator or dewatering pump which runs continuously.

In the case of concrete batching, the batching plant would only operate for a portion of the period of wind farm construction, and so is clearly a construction activity. If the batching plant were intended to continue operating after the completion of construction, for instance to service other projects, then it could be considered a permanent manufacturing activity. This is not the case.

The mention of the batching plant being able to be located as closely as 35 metres to a dwelling was only made to illustrate the setback associated with the applicable noise limit. The requirement to adopt best practicable option would still apply, and so it would be mandatory to consider alternative locations further from dwellings, which would reduce the noise received below that of the construction noise limit.

The noise effects of a concrete batching plant 35 metres from a dwelling would be significant, although they would be consistent with what is anticipated in the District Plan which uses NZS 6803:1999 to establish reasonable construction noise levels.

Similarly, if aggregate crushing were also to occur at the batching plant, or at another location within the site, a setback distance of approximately 50 metres would produce a compliant noise level of 70 dB L_{Aeq}. As with concrete batching, moving this activity further from dwellings would constitute best practicable option.

Yours faithfully

MARSHALL DAY ACOUSTICS LTD

Miklin Halstead

Associate