

Before the Hearing Panel

Under the Resource Management Act 1991

In the matter of an application by Cromwell Certified Concrete to replace Discharge Permit - RM16.108.02 (ORC), Water Permit RM16.108.01 (ORC) and Land use consent - RC150052 (CODC) and seek resource consent for the discharge of contaminants to air to authorise the operation and expansion of the Amisfield Quarry

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**Statement of Evidence of Darran Humpheson**

For the Hayden Little Family Trust, Nicola and Bryson Clark, and Amisfield Orchard Limited

8<sup>th</sup> December 2021

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**anderson  
lloyd.**

## **Qualifications and experience**

- 1 My full name is Darran Humpheson.
- 2 I am a Technical Director of Acoustics at Tonkin & Taylor Ltd.
- 3 I hold a Bachelor of Science degree with Honours in Applied Physics and a Master of Science degree in Environmental Acoustics. I am a Member of the Acoustical Society of New Zealand and a Member of the United Kingdom's Institute of Acoustics. I am a New Zealand representative of the International Standards Organisation (ISO) technical committee ISO/TC 43 SC1 "Noise".
- 4 I have been employed in acoustics since 1991, and I have previously held positions as a consultant for international firms AECOM (Associate Director 2013-2019), Bureau Veritas (Technical Director 2012-2013), RPS Group plc (Technical Director 2002-2012) and as a UK Ministry of Defence scientist working with the Royal Air Force (Head of the RAF's Noise and Vibration Division 1991-2002). I specialise in environmental noise.
- 5 I have previously undertaken noise assessment work for quarrying operations and have undertaken technical reviews of resource consent applications.
- 6 I have been engaged by Hayden Little Family Trust, Nicola and Bryson Clark, and Amisfield Orchard Limited to provide acoustic expertise as to noise effects from the proposed quarry extension.
- 7 I am familiar with the location of the quarry site and local area having visited the Site on 14 October 2021 and again on 4 November 2021.

## **Code of Conduct for Expert Witnesses**

- 8 I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014. This evidence has been prepared in accordance with that Code and I agree to comply with it. I confirm that the issues addressed in this brief 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 expressed.

## **Scope of evidence**

- 9 In preparing this evidence I have reviewed the following reports and statements:

- (a) Styles Group report – Assessment of noise effects, Amisfield Quarry, August 2020.
  - (b) Statement of evidence of Dr J Trevathan, for Central Otago District Council
  - (c) Statement of evidence of J Exeter, for Cromwell Certified Concrete Limited
  - (d) Statement of evidence of T Allison, for Cromwell Certified Concrete Limited
  - (e) Submissions Amisfield Orchard Limited, Hayden Little Family Trust and the Clarks.
- 10 I have prepared this evidence in relation to the noise effects arising from the extension of the Amisfield Quarry. I consider the significance of these noise effects on the Clark dwelling (1308 Luggate-Cromwell Road) and Amisfield Orchard Ltd (1286 Luggate-Cromwell Road – building platform and consented dwelling). I also consider the existing noise environment and consider whether suitable conditions have been recommended to reduce these effects.

### **Executive Summary**

- 11 Having reviewed the various application documents, noise assessments, and the Applicant's expert evidence, there are a number of gaps in the information which make it difficult to predict with confidence, anticipated adverse effects of the proposal, namely:
- (a) There is no context provided as to whether the existing noise environment is dominated by quarry operations. I consider that it would be best practice to measure noise at the nearest sensitive receivers to understand the noise environment and to provide confidence that predicted noise levels for existing operations match measured noise levels.
  - (b) There is no information provided as to how the processing plant will operate with the additional aggregate and material that will be produced. As there are no changes proposed for the processing plant, the frequency and duration of use must increase to accommodate the extra throughput.
  - (c) The noise assessment report does describe the activities which have been modelled, however no further detail is provided. There are potential uncertainties in the modelling; source levels for some

activities being lower than I would normally anticipate for similar sized equipment and the height of some noise sources being set too low in the noise model.

- 12 I support the adoption of best practice by requiring noise to be assessed using the LAeq(15min) noise metric rather than the L10 of the District Plan. The 'real-time' of the noise is important when understanding the actual noise experienced when the activity is occurring, which is better reflected by use of the 15 minute assessment period, and not the longer 'averaged' noise level which is used to assess compliance with the District Plan's noise standard or the noise limit of the existing resource consent (RC150052).
- 13 Based upon the Applicant's proposed conditions, and the predicted noise effects, I consider the proposal would have more than minor short term adverse noise effects on the dwelling at 1308 Luggate-Cromwell Road and building platform (and any subsequent dwelling) at 1286 Luggate-Cromwell Road.
- 14 With the adoption of further conditions of consent I have proposed, including in particular the 15 minute averaging period and the need to undertake ongoing compliance monitoring, the adverse effects of the proposal could be predicted to reduce to a minor extent.

### **Proposal and existing activities**

- 15 I have read the statement of Mr Allison which outlines the existing site activities and those proposed. Of relevance to my statement are the following activities.
- 16 The quarry currently operates between 0700-1900 Monday to Saturday. There is no processing on Sundays or public holidays. The only proposed changes are:
  - (a) Limited loading of customer's trucks on Monday to Friday 0600-0700, and 1900-20:00. This is needed for early morning concrete pours. Loading trucks will not take place more than twice per week, and will be limited to 22mm concrete aggregate only;
  - (b) To allow staff to leave the site between 19:00 to 20:00, Monday to Saturday (no quarrying activities); and
  - (c) To allow dust control measures including the operation of a water cart outside of operating hours.
- 17 The existing processing plant and crusher will remain in their current locations.

- 18 Activities within the proposed expansion area would include use of a single wheeled excavator and dump trucks transporting material to the main processing and stockpile area. Early morning and evening loadout would occur in the existing quarry site away from the two neighbouring properties. Loadout in the early morning would only occur twice per week.
- 19 Mr Allison describes how material will be quarried and that quarrying in the expansion area will start in the southern part of the site and progress north. This will maximise the distance of the initial activities away from the Clark dwelling at 1308 Luggate-Cromwell Road. As quarrying progresses, the elevation of the noise sources will get lower and lower as the depth of the quarry increases. This staging will be a noise benefit as it will maximise both the distance and the potential shielding effects of having the working face more effectively screened from local ground height at 1308 Luggate-Cromwell Road. A 50 m setback is also proposed<sup>1</sup> and the outer face of the noise bund will have a gradient of 1:3-1:5. It is only when the extraction face is inline with the Clark dwelling that noise levels may be marginally higher as the combined shielding from the western bund and face will be diminished.
- 20 I understand that the garage to the south of the main Clark dwelling is used as a sleepout. The building is closer to the expansion area than the main dwelling house and will therefore experience higher noise levels than those predicted by Mr Exeter. The exact level of noise increase is unknown as the assessment does not apportion the noise level contribution from the existing activities. I discuss this more in my paragraph 28 and the implications for the sleepout at paragraph 24.
- 21 At Amisfield Orchard Ltd, Mr Allison describes<sup>2</sup> the 25 m setback and that a bund will be constructed which may mean that the overall height could be 6 m on its inside face. These measures will assist in reducing the noise at the building platforms and consented dwelling on the Amisfield Orchard site. However unlike the Clark dwelling, more of the works will progress in parallel to the building platform and therefore there will not be the same degree of screening. It would be preferable if the face could operate west to east as this would provide the greatest reduction to the building platform at 1286 Luggate-Cromwell Road. As works then move closer to the Clark buildings (parallel to the sleepout / garage) it would be beneficial to swap

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<sup>1</sup> Allison 5.11

<sup>2</sup> Allison 5.12 & 5.13

to an east to west working pattern. I have therefore recommended that this is formalised within the proposed Quarry Management Plan (QMP).

- 22 Bunds constructed for noise reduction need to be of a sufficient dimension and be located either close to the source of the noise, or to the receiver, to be effective. When noise sources are further away from the bund, the effectiveness of the bund will be less, i.e. less screening, but the effective noise level of the source will be reduced due to the increased distance between the source and receiver. The effectiveness of a noise bund is also reduced as the gradient of the slope decreases. If practicable, I would recommend that bunds are constructed with a 1:3 slope to provide the greatest noise benefit.

### **Noise assessment**

- 23 I have reviewed the Styles Group report and the noise assessment included in Mr Exeter's statement. I have also reviewed Dr Trevathan's statement and the appended noise review dated 8 April 2021. Overall I have no technical concerns with the approach adopted by Styles Group or by Mr Exeter. Similar to Dr Trevathan's observations, there are minor differences of opinion such as appropriate source levels and heights of the sources<sup>3</sup>. These differences may increase predicted noise levels by 1-2 dB. However, as Mr Exeter's notes<sup>4</sup>, his noise modelling only takes into account the shielding of the bunds and not the additional shielding provided by the cut. Therefore the presented noise levels in his updated Table 1 are likely to be conservative estimates.
- 24 During the day time hours (0700-1900) predicted noise levels are 2 to 9 dB lower at 1308 and 1286 Luggate-Cromwell Road than the District Plan noise standard of 55 dBA L10. I estimate that noise experienced at the Clark sleepout will be 1 dB higher than that at the main dwelling house, i.e. a level of 54 dBA L10. If the actual noise level increase is 2 dB then the District Plan noise standard would be equalled during the day. At night the controlling noise source will be the main site. The sleepout is approximately 35 m closer to the existing quarry area than the main house and therefore noise levels may increase by 1 dB, which would be 1 dB less than the 40 dBA L10 noise standard. Any uncertainty in the assessment may result in

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<sup>3</sup> The source levels used in the noise modelling are on the low side of what would normally be expected and the height of sources are low. I would typically expect the source level of an excavator to be 2-2.5m high not 1.5 m.

<sup>4</sup> Exeter 7.8

a non-compliance (source levels being underestimated or incorrect height of noise sources). I consider it essential that compliance monitoring takes place more than once. I have drafted a condition that includes the requirement for additional monitoring when quarrying works are at specified distances from the Clark dwelling.

- 25 Mr Exeter's predicted noise levels are for the cumulative noise from quarrying operations, i.e. consented and proposed activities. Mr Exeter's assessment does not discuss the noise level contribution of the proposed activity, i.e. how much additional noise will be generated compared to the present day noise environment. He also does not describe the residual noise environment when quarrying operations do not take place, i.e. noise in the absence of the quarry. There is no context provided as to whether the noise environment is dominated by quarry operations. Best practice would have been to measure noise at the nearest sensitive receivers to understand the noise environment, which would then provide confidence that predicted noise levels for existing operations match measured noise levels.
- 26 The Clark dwelling is approximately 500 m from the state highway and road traffic noise will be audible at times at the property. I have estimated<sup>5</sup> that the traffic noise level would be 50 dBA L10 at the Clark dwelling during the day. This is just below the quarrying noise level predicted by Mr Exeter and suggests that when quarrying operations occur they are likely to be more noise dominant than the residual noise environment (traffic noise and natural sounds). Therefore the masking of quarry noise by other sources of noise is unlikely.
- 27 The Styles Group assessment provides source levels for the plant and activities which will remain in the existing quarry site. The processing plant, including crusher and associated mobile plant are the most noise dominant sources. However without separating out the noise contribution from each source, the level of noise increase due to the proposed extension is unknown. There is no information provided in the statements how the processing plant will operate with the additional aggregate and material that will be produced. As there are no changes proposed for the processing plant, the frequency and duration of use must increase to accommodate the extra throughput. Knowledge of the operating times is therefore

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<sup>5</sup> <https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/tools/road-traffic-noise-calculator/> traffic data taken from statement of evidence of Ravindu Fernando p

important as this will impact the degree of the noise effects. I discuss this issue in my paragraphs 30-32.

- 28 If two noise sources are comparable, then the overall noise level will be 3 dB higher than if only one noise source was operating. A 3 dB increase in sound level is considered to be just perceptible<sup>6</sup> and is considered to be a minor effect when assessing noise. Mr Exeter states<sup>7</sup> that the level and character of the noise at the two closest notional boundaries is unlikely to be discernibly different from the existing noise emissions from the quarry, because the processing plant will still be the controlling noise source. Based on Mr Exeter's description, I consider that noise levels are unlikely to increase by more than 3 dB as a result of the proposed extension. If noise were to increase by more than 3 dB, I would consider that potential annoyance would occur and that the resulting noise effects would increase to a more than minor extent.
- 29 NZS 6802 recognises in clause 6.4.1 of the standard that 'if a sound is not present all of the time, it is likely to create less annoyance than the same sound [level] is it were continuously present'. Unlike processing noise which generally operates for most of the time, extraction of material varies and therefore noise levels will fluctuate and there will also be periods when there is little to no activity, hence minimal noise being generated at certain periods.
- 30 The noise standards in the District Plan, require noise to be assessed in accordance with NZS 6802<sup>8</sup>. The standard allows noise to be averaged. For example, the relevant time periods of the District Plan are 0700-2200 during the day and 2200-0700 at night. RC150052 defines the day time as 0700-1900 (applicable Monday to Saturday) with 'night' being all other times (1900-0700). If an activity only generates noise for a short period, then that noise can be averaged over the relevant (prescribed) time period. A maximum averaging correction of -5 dB is allowed in NZS 6802:2008 if the noise source is present for less than 30% of the prescribed time period. This adjustment reduces to 3 dB if the noise is present for 50% of the time and 1 dB if only for 80% of the time. As the L10 is a statistical level and the LAeq is an energy average level, the 'on-time' of the noise is important when understanding the actual noise experienced when the activity is

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<sup>6</sup> [https://www.who.int/occupational\\_health/publications/noise1.pdf?ua=1](https://www.who.int/occupational_health/publications/noise1.pdf?ua=1)

<sup>7</sup> Exeter 7.11

<sup>8</sup> Both the 1991 version and the 2008 version of the standard allow for noise to be averaged.



occurring and not the 'averaged' noise level which is used to assess compliance with a noise standard or noise limit.

- 31 For example, if the relevant noise limit during the period 0700-1900 is 55 dB LAeq and the activity is only emitting noise for 30% of the time, i.e. 4 hours, then the activity could generate a maximum of 60 dB LAeq of noise (when averaged over the relevant time period the averaged noise level would be adjusted by 5 dB, resulting in 55 dB LAeq). When the resident is home during those 4 hours (if the noise was continuous for 4 hours), adverse noise could be experienced. It is therefore important to understand the variation of the activity and hence noise levels.
- 32 Mr Exeter has not commented whether he has averaged noise. The noise assessment report does describe the activities which have been modelled, however no further detail is provided. I have assumed that the modelling is conservative and that the plant operates continuously for the whole of the assessment period. Therefore I propose that the noise limits should be defined as the LAeq(15min), i.e. the average noise level over a typical worst case 15 minute period. Use of this noise metric reflects current best practice and provides greater certainty when demonstrating compliance with noise limits as required by NZS 6802.
- 33 Additional disturbance can arise if a noise source exhibits special audible characteristics (SAC) such as tonality or impulsivity. NZS 6802 requires the application of a 5 dB SAC penalty in recognition of the increased potential for annoyance from such noise sources. The noise assessment considers that only tonal reversing alarms would qualify for a SAC penalty. I fully support the proposed condition restricting reversing alarms to broadband only. However SACs can apply to equipment that is not well maintained or due to poor operator behaviour, e.g. impulsive noise such as banging tailgates or hitting shovels against truck bodies. I have therefore recommended a condition for the site operator to demonstrate the Best Practicable Option (BPO) for all on-site sources of noise under their control.
- 34 Finally I support the adoption of best practice by requiring noise to be assessed using the LAeq(15min) noise metric rather than the L10 of the District Plan. If the 15 minute averaging period is not included in the proposed noise limits then I consider that short term adverse effects may occur which would result in more than minor effects.

## **Vibration**

- 35 I have reviewed the statement of evidence of Mr Exeter and I agree that vibration generated by activities in the new expansions area will generally

be imperceptible to any residents. I agree that vibration effects will not be significant.

**Conditions**

36 I have reviewed the draft conditions and I understand from Mr Exeter that the applicant is in the process of updating the conditions. To assist the hearing, I have recommended proposed changes or amendments/edits (underlined) as follows:

There shall be no stockpiling or processing of aggregate in the quarry extension area, only excavation of material.

14. Operation of processing plant shall be restricted to the hours of 07:00 to 19:00, Monday to Saturday.

15. Noise from the operation of the quarry must comply with the following noise limits as assessed at the notional boundary of any dwelling when measured in accordance with NZS 6801:2008 Acoustics – Measurement of environmental sound and assessed in accordance with NZS 6802:2008 Acoustics – Environmental noise.

<u>Day</u>	<u>Time period</u>	<u>Noise limit</u>
<u>Monday to Saturday</u>	<u>07:00 to 20:00</u>	<u>55 dB LAeq(15min)</u>
<u>At all other times</u>		<u>40 dB LAeq(15min) and 70 dB LAmx</u>

16. All vehicle reversing alarms on quarry-based equipment or trucks, shall only be broadband reversing alarms.

17. The Consent holder shall undertake compliance noise monitoring by a suitably qualified and experienced acoustic consultant within the first 12 months following the commencement of quarrying within the expansion area and again when excavation initially advances to within 200m of the dwelling at 1308 Luggate-Cromwell Road and again when the cut face is within 50m of the dwelling. For each survey excavation should be occurring at the highest ground elevation.

A consent holder shall submit each monitoring report to the Consent Authority within two weeks of each survey being completed. The report shall include:

- a) Daytime noise readings taken at a time when processing machinery is operating simultaneously with extraction in the expansion area.
- b) A comparison between the noise limits of Condition 15 and measured noise levels.

If measured noise levels exceed the noise limits, then the consent holder shall investigate and implement additional mitigation to ensure compliance with Condition 15. The consent holder shall submit a mitigation report to the Consent Authority within one month of the monitoring report detailing the mitigation measures that will be

implemented and shall undertake further compliance monitoring within 14 days of any mitigation measures being agreed with the Consent Authority and implemented to demonstrate the effectiveness of that mitigation.

Noise shall be measured in accordance with NZS 6801:2008 and assessed in accordance with NZS 6802:2008. No duration adjustment in accordance with NZS 6802:2008 shall be permitted.

18. Construction activities shall be managed in accordance with the requirements of NZS 6803:1999 Acoustics – Construction Noise and any noise generated shall comply with the limits given in Table 1 of that standard.

*For the purposes of this consent “construction activities” means activities associated with the establishment, or rehabilitation of the quarry, such as: site establishment; the construction and removal of bunds, topsoil stripping, creation and removal of the underpass to the expansion area, constructing slope batters and contouring the final land. If ongoing backfilling activity associated with the construction of slope batters occurs at the same time as the quarry is operational, this is not considered to be construction noise and shall comply with the operational noise limits for the site.*

Quarrying operations shall utilise the best practicable option to minimise noise at all times. This includes regular replacement of worn parts, maintenance of mufflers, lubrication of all moving parts to avoid squeaks and squeals, and appropriate operation of all equipment.

- 37 I understand from Mr Exeter that the applicant will accept the following restrictions on trucks and loading outside of 0700 to 1900:
- (a) 0600-0700 Monday to Friday only, no more than 5 trucks, no trucks or loading before 7 am on more than two days per week, no product larger than 22 mm concrete aggregate to be loaded; and
  - (b) 1900-2000 Monday to Friday only, no more than 5 trucks.

## **Conclusions**

- 38 The proposal will result in quarrying operations closer to the neighbouring sites of 1308 Luggate-Cromwell Road and 1286 Luggate-Cromwell Road than currently exist, including by surrounding the site at 1308 on three sides. The applicant’s noise expert has predicted noise levels (both existing and proposed) that would be compliant with the District Plan’s noise standards and the proposal’s LAeq noise limits.
- 39 I have recommended changes to the draft noise conditions to address potential adverse effects from noise resulting from quarry operations. In addition to this, I also recommend that the QMP requires that the slopes of bunds should be no shallower than 1:3 and that extraction should initially

occur in a west to east direction as the cut progresses from a south to north direction and then changes to an east to west direction when works are parallel to the sleepout / garage of 1308 Luggate-Cromwell Road. These recommendations and the applicant's loadout restrictions will assist in reducing and controlling noise levels.

- 40 Mr Exeter's assessment does not discuss the noise level contribution of the proposed activity, i.e. how much additional noise will be generated compared to the present day quarrying noise environment, or the likely increase in the frequency of use of the processing plant to handle the increased throughput of material. He also does not comment on the noise contribution of the quarry when compared to the residual noise environment, i.e. the prevailing noise environment in the absence of the quarry. The queries and other factors such as appropriate source levels and heights of sources introduce uncertainties and therefore regular monitoring should occur to demonstrate ongoing compliance with the noise limits. A single monitoring visit as proposed by Mr Exeter is insufficient when considering that quarrying operations will be close to the neighbouring residential dwellings.
- 41 I consider that noise effects will be no more than minor at the two closest properties if the conditions I have proposed are accepted. However if these are not accepted, and in particular if the 15 minute averaging standard is not included, effects on those properties are estimated as likely to be more than minor.

Dated this 8<sup>th</sup> day of December 2021

**Darran Humpheson**