UNDER	the Resource Management Act 1991 ("**RMA**")
AND	
IN THE MATTER OF	an application for resource consent to subdivide land at 60 Otatara Road and 190 Dunns Road, Otatara, Invercargill ("**Application**")

STATEMENT OF EVIDENCE OF STEPHEN JACK PEAKALL
ON BEHALF OF INVERCARGILL AIRPORT LIMITED

NOISE

1. INTRODUCTION

Qualifications and Experience

1.1 My full name is Stephen Jack Peakall**.**

1.2 I am an Acoustical Consultant with Marshall Day Acoustics. I have been in this position since May 2005.

1.3 I hold a degree in Environmental Engineering obtained from the University of West England (United Kingdom) and a postgraduate diploma in Acoustics and Noise Control from the United Kingdom's Institute of Acoustics, of which I am also a member. I am also a full professional member of the Acoustical Society of New Zealand.

1.4 I have over 20 years' experience in environmental noise issues, specialising in environmental noise assessment and control. Over the last 17 years I have been involved in the investigation, assessment and reporting on numerous environmental noise matters, covering a wide variety of noise generating activities.

1.5 My professional experience includes noise and vibration advice on projects for various clients, including most New Zealand airports, Waka Kotahi NZ Transport Agency, Transpower NZ, KiwiRail and several quarries and mines throughout the country. I am currently involved in environmental noise and

vibration assessment work that includes computer noise modelling, noise measurement surveys, strategic noise mapping and noise effects assessments.

1.6 As well as being the principal acoustical consultant engaged by Invercargill Airport Limited ("**IAL**"), I also fulfil this role for many airports in New Zealand, including Queenstown, Wanaka, Napier, New Plymouth and all the West Coast Airports.

1.7 My experience includes preparing for and attending both local authority and Environment Court Hearings. I have been involved in work in support of Notices of Requirement for Designations, as well as District Plan Review processes for both the Council and several airports.

1.8 I have been providing advice to IAL since 2012 on a variety of matters, including noise management and land use planning.

Code of conduct

1.9 I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2014. I have complied with the Code of Conduct in preparing this evidence and will continue to comply with it while giving oral evidence. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

Scope of evidence

1.10 In my evidence I will:

(a) outline the approach taken for land use planning around airports;

(b) provide an overview of IAL's noise boundaries;

(c) discuss the effects of aircraft noise of the site at 60 Otatara Road and 190 Dunns Road, Otatara ("**Site**"), and potential mitigation; and

(d) respond to relevant aspects of the section 42A report and the applicant's acoustic evidence (which I also refer to throughout).

2. SUMMARY

2.1 Establishing noise sensitive activities, including residential activities, in areas affected by aircraft noise can result in adverse noise effects on residents and reverse sensitivity effects on the airport and its users.

2.2 In my view, noise environments greater than 55 dB L_{dn} and 95 dB L_{AE} are not suitable for residential or other noise sensitive activities because of the high noise levels that residents will be exposed to.

2.3 As a desirable starting point, new noise sensitive activities are incompatible with such levels of aircraft noise and should be prohibited. This is primarily because not all of the effects of aircraft noise can be mitigated by insulating buildings, particularly for residential activity.

2.4 High aircraft noise levels give rise to aircraft noise effects on nearby noise sensitive activity, mainly in the form of annoyance (as aircraft noise will still be audible) and sleep disturbance. It also places a burden and requirement on people to have doors and windows shut at all times to achieve a reduction in indoor noise levels. Putting more people in this environment runs a greater risk of complaints about aircraft noise and Invercargill Airport ("**Airport**") having to constrain its operations.

2.5 For aircraft noise environments of 55 dB L_{dn} (as is the case with this Site), 27% of the population are likely to be highly annoyed by the noise, which is of significance. In terms of sleep disturbance effects with windows ajar for ventilation, 80 -85 dB L_{AE} indoors could be received, which is a significant noise level with a relatively high likelihood of awakenings. With windows closed and with sound insulation installed there remains a small percentage of awakenings likely to occur.

2.6 The current noise exposure on the Site is also less than what the Airport can lawfully emit, and it will be difficult for a prospective resident to easily understand the lawful noise exposure they may receive in the future as part of a due diligence exercise. This may accentuate reverse sensitivity effects.

2.7 Notwithstanding the aircraft noise levels at the Site, Mr Styles suggests that with the use of sound insulation mitigation and no complaint covenants, the impacts on internal noise amenity are controlled to acceptable levels and are therefore reasonable. I do not consider that Mr Styles has adequately assessed the effects, including effects on the outdoor environment, and in some instances, the effects have been downplayed, and I consider several aspects of his report and evidence are not accurate.

2.8 Overall, I consider the noise environment is not suitable for residential development. If this development is to proceed, very careful attention needs to be given to the way effects are managed, and the controls that are put in place.

3. APPROACH TAKEN FOR LAND USE PLANNING AROUND AIRPORTS

3.1 Establishing noise sensitive activities, including residential activities, in areas affected by aircraft noise can result in adverse noise effects on residents and reverse sensitivity effects on the airport and its users.

3.2 In 1992, the Standards Association of New Zealand published New Zealand Standard NZS 6805:1992 "A*irport Noise Management and Land Use Planning*" ("**Standard**") with a view to providing a consistent approach to noise and land use planning around New Zealand airports.

3.3 The Standard uses the "Noise Boundary" concept as a mechanism for local authorities to do two things:[1]

(a) establish compatible land use planning around an airport; and

(b) set noise limits for the management of aircraft noise at airports.

3.4 The Noise Boundary concept involves fixing an Outer Control Boundary ("**OCB**") and a smaller, much closer Airnoise Boundary ("**ANB**") around the Airport. The location of the ANB is normally based upon the 65 dB L_{dn} contour, and the location of the OCB is based on the 55 dB L_{dn} contour. Clause 1.4.3.1 of the Standard stipulates that the boundaries are prepared taking account of future growth of aircraft operations, recommending a minimum 10-year projection be made. Often 20 or 30 years are used, or airport capacity, for this purpose.

3.5 Inside the ANB, the Standard recommends that new noise sensitive uses (including residential) are prohibited. Between the ANB and the OCB the Standard recommends that new noise sensitive uses should also be prohibited unless the district plan permits such uses subject to appropriate sound insulation.

3.6 The Standard is based on the Day/Night Sound Level (L_{dn}) which uses the cumulative 'noise energy' that is produced by all flights during a typical day with a 10 decibel penalty applied to night flights. L_{dn} is used extensively

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[1] New Zealand Standard NZS 6805:1992 "Airport Noise Management and Land Use Planning" at 1.1.2 (page 5).

overseas for airport noise assessment and it has been found to correlate well with community response to aircraft noise.

4. INVERCARGILL AIRPORT'S NOISE BOUNDARIES

4.1 There are 3 noise boundaries implemented at Invercargill, the ANB (based on the 65 dB L_{dn} future noise contour), the OCB (based on the 55 dB L_{dn} future noise contour) and the SESEB (based on the 95 dB L_{AE} contour). The ANB and OCB are consistent with the provisions of NZS 6805.

Airnoise Boundary (ANB)

4.2 In my opinion, noise environments greater than 65 dB L_{dn} are not suitable for residential or other noise sensitive activity because of the unacceptably high noise levels. Sound insulation measures can improve internal noise environments but do not fully mitigate the effects for residential activity, particularly in outdoor living areas or where residents wish to open windows and doors.

4.3 NZS 6805 recommends that land use controls to prohibit new noise sensitive activities should be imposed within the ANB which is the approach implemented in Invercargill.

Outer Control Boundary (OCB)

4.4 For noise environments between 55 and 65 dB L_{dn} noise levels are still moderately high to high. In respect of the OCB, Table 2 of NZS6805 recommends that:

> New residential, schools, hospitals or other noise sensitive uses should be prohibited unless a district plan permits such uses, subject to a requirement to incorporate appropriate acoustic insulation to ensure a satisfactory internal noise environment.

4.5 My interpretation of this clause is that as a desirable starting point, new noise sensitive activities are incompatible with such levels of aircraft noise and should be prohibited. Ms O'Sullivan explains in her evidence that the Invercargill District Plan enables new residential activities in the Otatara Zone within the OCB, provided sound insulation requirements are complied with (non-compliance with these requirements makes residential activity prohibited).[2]

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[2] Statement of Evidence of Kirsty O'Sullivan, dated 29 April 2022, at paragraph 4.9.

4.6 The NZS 6805 approach also recognises that not all of the effects of aircraft noise can be mitigated by insulating buildings, particularly for residential activity. I discuss this further below.

Single Event Sound Exposure Boundary (SESEB)

4.7 NZS 6805 also requires that night-time operations be considered when establishing the ANB. The Standard recognises that individual aircraft noise events at night may result in sleep disturbance effects that are not adequately managed using the night weighted sound exposure metric L_{dn}.

4.8 At other airports[3] in New Zealand the 95 dB L_{AE} (previously referred to as the 95 dB SEL) contour has been implemented and adopted on the basis that it defines the onset of significant sleep disturbance. Specific land use controls often apply inside an airport's 95 dB L_{AE} contour that restrict the establishment of residential activity.

4.9 In the case of Invercargill, the 95 dB L_{AE} contour is implemented as the 'Single Event Sound Exposure Boundary' ("**SESEB**"), and should be treated with the same approach as the ANB. Therefore, much like the noise levels experienced inside the ANB, I consider new noise sensitive activities should be prevented from establishing inside the SESEB in the first instance. This is because (for the same reasons as explained below) sound insulation is generally the option of last resort and does not avoid adverse noise effects on those living within that environment nor on the airport generating those effects.

5. ADVERSE EFFECTS OF AIRCRAFT NOISE

5.1 The typical way adverse noise effects are experienced is by a change in noise level received, annoyance effects from a given aircraft noise exposure and sleep disturbance effects. As the Application will result in new noise sensitive activities coming to the noise source, the change in noise level is not relevant here. I discuss annoyance and sleep disturbance effects below.

Annoyance

5.2 Individual responses to a certain level of aircraft noise vary greatly. A large number of studies have been carried out overseas in relation to the overall relationship of a given community's annoyance with reference to varying noise

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[3] For example Christchurch, New Plymouth and Hamilton have adopted specific controls, and other airports adopt a composite 95 dB SEL and 55/65 dB L_{dn} noise boundary (Napier, Dunedin, Timaru).

levels they receive (known as a dose response relationship). Much of this was taken into account when NZS 6805 was developed.

5.3 A dose response relationship specific to aircraft noise was developed by Miedema and Oudshoorn and has been used extensively here and overseas since that time in assessment of noise effects studies. This relationship has until recently generally been regarded as the latest research in this area.

5.4 MDA has completed a literature review of 45 of the latest studies. Of the 14 most significant studies:

(a) 6 reported an increase in noise annoyance over time (FAA, Guski x3, WHO, Janssen and Vos).

(b) 1 reported a decrease (Vietnam).

(c) 4 reported no change (Gjestland x 2, Fidell, Gelderblom).

(d) 3 did not report on a change (NZTA, Brink, Gjestland 2021).

5.5 The two largest studies in this set were the World Health Organisation ("**WHO**") study in 2018 and the Federal Aviation Administration ("**FAA"**) study in the US in 2021.

5.6 Both the FAA and WHO studies show a higher level of annoyance than the Miedema 2001 dose-response curve. The dose response curves from the FAA and WHO studies are shown below along with the Miedema study for comparison.

5.7 I consider the WHO curve the most appropriate as it represents the latest research in this area internationally. Whilst the FAA study is also valid, this study only considers the annoyance response from one country whereas the WHO curve is an amalgamation of data from European and Asian cities.

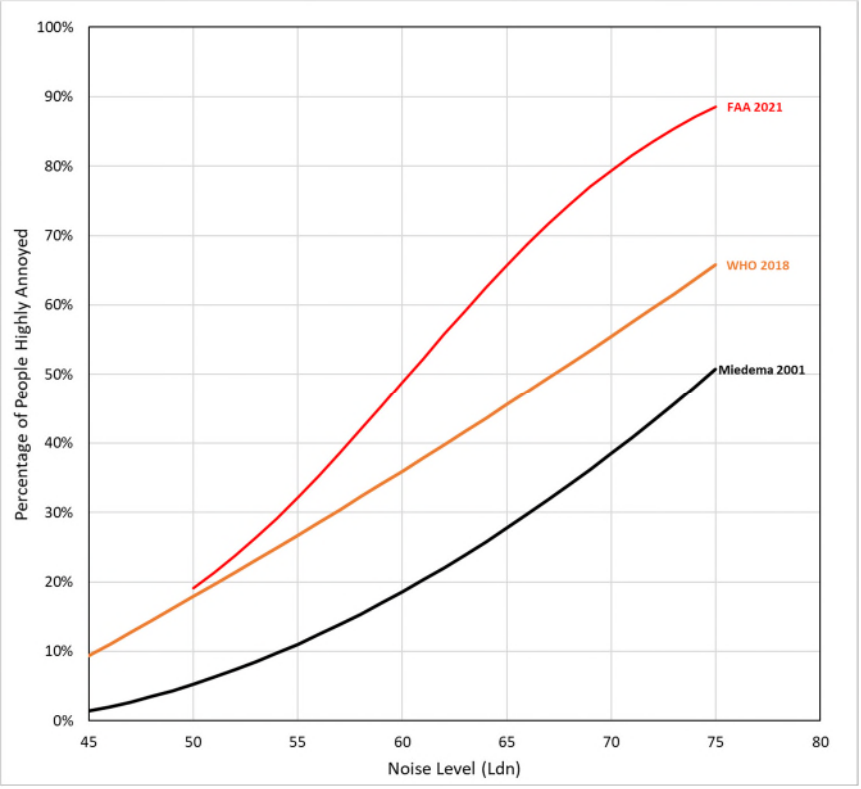

Figure 1 major dose response curves

5.8 The WHO 2018 dose response relationship indicates that for aircraft noise environments of 65 dB L_{dn}, 46% of the population are likely to be highly annoyed. This shows why NZS 6805 recommends prohibition of noise sensitive activity inside the ANB. For aircraft noise environments of 55 dB L_{dn}, 27% of the population are likely to be highly annoyed by the noise, which is also of significance.

5.9 Annoyance effects are not confined to noise levels in excess of 55 dB L_{dn}. Although the 55 L_{dn} contour forms the basis of the OCB, and the outer extent to which land use planning and airport noise controls apply, I expect annoyance effects for a percentage of people in areas outside the OCB. This is because aircraft movements outside of the OCB would still be audible. This is supported by the data in Figure 1.

5.10 Because it is now recognised that aircraft noise is perhaps more annoying to people than previously thought, I consider it important to reduce aircraft noise exposure through land use planning controls wherever possible.

Sleep disturbance

5.11 There are a number of recognised relationships for quantifying sleep disturbance in relation to noise events which have been developed from various research studies.

5.12 The effects can be quantified in general terms by applying a dose-response relationship. The relationship developed in 1997 by FICAN[4] (shown in Figure 2) predicts the maximum percentage of an exposed population[5] expected to be behaviourally awakened for a given indoor L_{AE}.

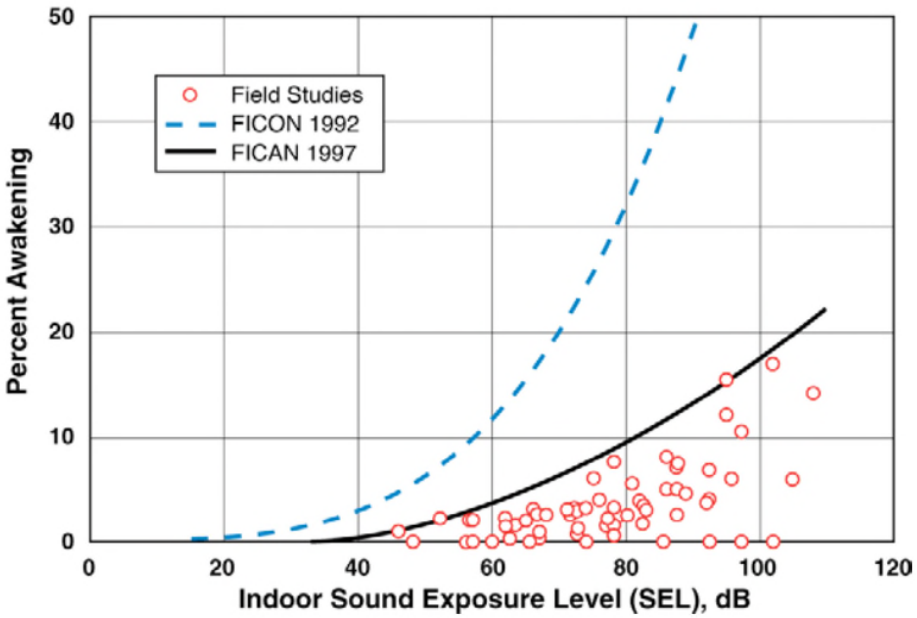

Figure 2: FICAN Sleep Disturbance Dose-Response Relationship

5.13 The FICAN Dose Response Relationship is a curve for predicting the maximum likelihood of behavioural awakening from a *single* aircraft noise event. This relationship predicts a maximum of five percent of the population being awakened by events of 65 dB L_{AE} (indoors) and ten percent awakened by events of 80 dB L_{AE} received in bedrooms.

5.14 With windows ajar for ventilation, 80 dB L_{AE} indoors is approximately equivalent to 95 dB L_{AE} outdoors. With windows closed and with sound insulation installed there would still be a small percentage of awakenings likely to occur.

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4 Federal Inter-agency Committee on Aviation Noise (1997). *"Effects of Aviation Noise on Awakenings from Sleep"*.

5 The study recommends that this relationship applies to adults residing in aircraft noise affected areas.

5.15 Although there would be less likelihood of awakenings occurring with mitigation installed, such mitigation does not fully deal with the sleep disturbance impacts. It remains my opinion that avoiding exposure to high levels of aircraft noise events at night is desirable. I discuss this further in the next section.

5.16 Sleep disturbance effects at this threshold level are likely to vary depending on the number of night time events and the timing of the events. However, noise levels in excess of 95 dB L_{AE} are not, in my opinion, acceptable at night. I have previously presented evidence in Invercargill recommending that new residential activities are prohibited inside the SESEB. I remain of this opinion. Such prohibition rules also exist at New Plymouth and Christchurch, in recognition of this high noise environment.

5.17 In my opinion and based on observations I have made at other airports, such as Queenstown, the high single event noise levels may also give rise to speech intelligibility issues during the day, and these noise levels can also cause startle reactions. The very high noise levels inside the 95 L_{AE} boundary would cause conversations to pause. In educational facilities, for example, these noise levels may cause cognitive impairment, problems with comprehension and disruption to learning. This level of noise is not conducive to high levels of amenity.

Noise mitigation

5.18 In the first instance, I consider it most desirable to avoid development of new sensitive activities in areas that are exposed to high levels of aircraft noise.

5.19 In terms of possible aircraft noise mitigation, airports have some management measures they can adopt to manage their noise effects within their lawful limits. For example, they can apply noise abatement flight procedures, restrict certain types of aircraft, or control the number of movements that occur. For new noise sensitive activities that establish near an airport, these options are not available because residents clearly have no direct control over an airport's operations. Noise barriers are generally not effective for aircraft noise, and therefore the only remaining available options would be not building new sensitive activities in noise contours in the first place, or sound insulation.

5.20 Allowing noise sensitive activities to establish inside the noise contours is inappropriate for a number of reasons including that:

(a) It is contrary to the intent of NZS 6805, particularly for noise exposure levels in excess of 65 dB L_{dn}, where avoidance/prohibition of such noise exposure is recommended.

(b) Reverse sensitivity issues are likely to increase, as more houses would allow more noise sensitive development to occur, thus exposing a larger number of people to higher noise levels. This would give rise to higher numbers of people being annoyed by aircraft noise and likely to complain about airport noise.

5.21 In relation to sound insulation, I consider this to be the option of last resort, primarily because it does nothing for outdoor amenity. People in New Zealand generally have a desire for exposure to the outdoors and an expectation to be able to spend time in the garden, entertain guests outdoors and leave doors and windows open. In these situations, the level of aircraft noise exposure cannot be practicably mitigated. If new residential activity is to be permitted between the OCB and the ANB it can be expected that some residents would be annoyed by aircraft noise outdoors.

5.22 I also consider that internal noise effects are not avoided entirely with the use of sound insulation mitigation. Aircraft noise events would still be audible and could therefore cause some annoyance. It also places a burden and requirement on people to have doors and windows shut at all times to achieve this, which further lessens amenity.

5.23 Further, because of the significant external noise levels allowed inside the SESEB, the internal noise levels would still, in my opinion, cause sleep disturbance effects, because despite mitigation, the internal noise levels would still be noticeable. I therefore do not consider that noise effects are avoided.

5.24 In addition, for other areas of the site just outside the SESEB, night-time noise levels would be 90 – 95 L_{AE}. This is still a high noise level. With windows open, the internal noise levels would be 75 to 80 dB L_{AE} and awakenings would likely occur. This noise exposure level and subsequent effect has not been acknowledged or addressed by Mr Styles.

6. LEVELS OF AIRCRAFT NOISE AT THE SITE

6.1 Mr Styles states at paragraph 41 of his evidence (in relation to the original assessment) that the Site would be exposed to noise levels between 55 and 60 dB L_{dn}. Having reviewed the original noise contours we prepared as the basis of the noise boundaries, I agree with this conclusion. I also note that for those parts of the Site located inside the SESEB, the noise levels would range from 95 – 100 dB $L_{AE.}$

6.2 The Styles Group report suggests in Section 4.3 that "it is not possible to accurately understand the noise level on any given site [from the planning maps]" other than to know that it is in a range of 55 and 65 dB L_{dn}. This is because the air noise boundaries in the District Plan are shown in 10 decibel increments (as is common). This highlights, in my view, the need to ensure the Airport is involved in the design certification process to ensure that any building is designed to the appropriate standard.

6.3 It is also important to emphasise that the *current* noise exposure existing residents (and residents of this proposed subdivision) receive is less than what the Airport can lawfully emit. Based on the annual aircraft movement numbers, and noise contouring work I have previously undertaken for IAL, the Airport is currently operating inside its contours (which are based on a future projection of aircraft noise). With reference to the L_{dn} contours, in decibel terms this is approximately 5 decibels lower than what is permitted.

6.4 It follows that it would be difficult for a prospective resident to easily understand the lawful noise exposure they may receive in the future as part of a due diligence exercise. This may accentuate the reverse sensitivity effects.

6.5 As Mr Finnerty has explained in his evidence, the Airport recently received a complaint from a resident who has moved to an area, inside the OCB, and who is now concerned about the level of aircraft noise they receive.[6] I expect that additional community annoyance is inevitable (with the potential for complaints to arise as a result) should the subdivision be allowed.

6.6 This reverse sensitivity effect is only likely to increase as the airport expands within its permitted levels, if more residential activity as a result of the Application is allowed to occur.

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6 Statement of Evidence of Nigel Russell Finnerty, dated 29 April 2022, at paragraph 6.5.

7. RESPONSE TO APPLICANT'S EVIDENCE

7.1 The Council Officer relies on the acoustic assessment prepared by the Styles Group in the section 42A report, and so my evidence has focussed on responding to that assessment and the evidence of Mr Jon Styles.

7.2 Both the Styles Group report and Mr Styles' evidence are heavily focussed on whether the Application complies with the District Plan. The District Plan requirements are addressed in Ms O'Sullivan's evidence. I comment on the assessment and evidence from a technical noise perspective.

Night noise guidelines

7.3 In his evidence, Mr Styles refers to the WHO 2018 Guidelines where the onset of adverse noise effects arises (which is the same document I discuss in paragraphs 5.1 to 5.10).[7] Despite this, he does not provide any commentary on the annoyance from aircraft noise which is in my opinion an important omission, because annoyance from aircraft noise is often the main adverse effect. Instead, Mr Styles goes on to refer to the WHO night noise guidelines and adjusts the values in this guidance to apply to this context using the L_{night} metric.

7.4 The L_{night} metric is a long-term noise exposure metric that is intended for general use for other types of noise sources. If it is applied, it includes all aircraft noise events at night over the course of one year. The conclusions in the WHO night noise guidelines are also drawn on the basis of large-scale statistical models.

7.5 As I discuss in paragraphs 5.11 to 5.17, sleep disturbance from individual events is most relevant because it is highly likely at such elevated night-time noise levels. It follows in my opinion that there will be a degree of adverse noise effects.

7.6 If consideration of noise metrics other than those enshrined in the SESEB is warranted, as Mr Styles has done by considering L_{night}, it is also worthwhile considering aircraft noise at night in terms of the $L_{Aeq\ 15min}$ metric (as used in noise assessments generally throughout New Zealand).

7.7 One night-time flight in a 15-minute period at 95 to 100 dB L_{AE} is equivalent to 65 – 70 dB LAeq 15 mins. In the context of general noise emissions, the upper limit of acceptability for daytime noise is 55 dB $L_{Aeq\ 15mins}$ and for night-time is

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[7] Statement of Evidence of Jon Styles, dated 21 April 2022, at paragraph 50.

45 dB $L_{Aeq\ 15\ mins}$. Noise levels in this case are significantly above that threshold.

7.8 While I acknowledge such aircraft noise would be infrequent because of the low number of night-time events, it does suggest that this noise environment is adversely impacted to some reasonably significant extent.

7.9 I also note that Mr Styles has on a number of occasions (in other contexts) said that noise levels in excess of 45 dB $L_{Aeq15\ mins}$ at night are unacceptable. The noise levels given in paragraph 7.7 are some 20 dB higher so it is difficult to see how Mr Styles can conclude that the noise levels are acceptable here.

Levels of noise at the Site

7.10 Mr Styles observes that the night-time noise effects are above the Lowest Observable Adverse Effect used in the Night-Time Guidelines but then goes on to conclude that "overall" the noise level expected at the Site is "generally very low". He cites a number of reasons for this which could be construed to mean that there would be no awakenings, no complaints or no highly sleep disturbed people. I disagree that this is likely at the Site for the reasons I have already explained.

7.11 At paragraph 42 of his evidence Mr Styles suggests that noise levels up to 95 dB L_{AE} may be experienced. Whilst it is correct to say that *at* the SESEB, noise levels could be as high as 95 dB L_{AE}, land inside of the boundary (which is subject to this Application) could actually receive noise levels of 95 – 100 dB. This is a significant noise exposure and I do not consider that the conclusion in the Styles Group report that the land will be exposed to "moderate levels of aircraft noise" accurately captures the entire noise environment at the Site.

7.12 Mr Styles also stated in his original report (quoted at paragraph 42 of his evidence):

> The SESEB controls the loudest single aircraft movement and the OCB controls the daily 'average' noise levels from all aircraft, including the loudest of them.

7.13 This is incorrect. The OCB does not control the daily average, but rather the 3-month noise exposure (which is a combination of total movements and averaging). The report then goes on to state, using this assumption that:

> If a single noisy aircraft generated a noise level up to 95dB SEL at the SESEB at night, that would be the only aircraft movement

> permitted in that 24hr period. If any more movements were carried out, the noise limit at the OCB would be exceeded.

7.14 Again, this is incorrect and misleading. The noise limit at the OCB would not be exceeded, because the noise exposure metric utilises the 3 month assessment period included in NZS6805. While this is acknowledged to an extent by way of a footnote, the actual paragraph suggests otherwise and infers compliance would not be possible.

7.15 Mr Styles considers that "it would be ideal to ensure communities are not exposed to noise levels over 55 dB L_{dn}".[8] I take this to mean that purely from a noise effects perspective Mr Styles agrees that noise levels above this are not acceptable.

7.16 He then goes on to state that he understands large separation distances would be required (but these he understands are undesirable for a number of reasons). The broader reasons (which Mr Styles alludes to) as to why separation distances may (or may not) be appropriate is not a relevant factor in the acceptability or otherwise of aircraft noise exposure.

7.17 Mr Brown (the applicant's planner) also states at paragraph 4.7 of his evidence his experience of being at the Site, and draws a conclusion as to the acceptability of the noise environment. This paragraph demonstrates a lack of understanding as to what can potentially occur at the Site in the future (within the parameters of the Airport's air noise boundaries), and also that on any given day aircraft noise can be highly variable. It is simply Mr Brown's own opinion (as the applicant's planner) on the matter formed from one visit, which I do not consider can be given any weight.

Acoustic insulation

7.18 Mr Styles suggests, notwithstanding the aircraft noise levels at the Site, with the use of sound insulation mitigation and no complaint covenants, the impacts on internal noise amenity are controlled to acceptable levels and are therefore reasonable. The evidence does not consider in any detail what the adverse noise effects will be on those living in this location, or the effect that new sensitive receivers will have on the Airport.

7.19 As I noted above, noise attenuation should be the option of last resort because aircraft noise effects inside are not entirely avoided, and cannot be avoided, remedied or mitigated in the external noise environment. However, where

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8 Statement of Evidence of Jon Styles, dated 21 April 2022, at paragraph 67.

acoustic insulation is required, the requirements in the District Plan, allow noise sensitive activities to be constructed to achieve satisfactory internal noise levels. I consider the internal noise level criteria of the District Plan to be at the upper end of acceptability. The reliance on having windows and doors closed at all times to achieve these does, however, place a burden on residents and is not an ideal living environment.

7.20 In Section 4.4, the Styles Group report refers to Waka Kotahi seeking acoustic insulation when noise levels reach 68 dB L_{dn}. I understand Waka Kotahi seeks this at 57 $L_{Aeq\ 24h}$ when new residences apply to establish near existing roading infrastructure.[9] The reference in the Styles Group report refers to what Waka Kotahi will do when *they themselves* alter an existing road and create more noise burden on existing residents. This is not the same situation to this one where new noise sensitive activities are coming to the Airport's existing lawful activities. This means the concluding statement in Section 4.4 of the report is also incorrect.

7.21 In any case, road noise is well known to be of different characteristics, being more continuous in nature with less high noise level events, and also perceived differently. This means road noise is considered less annoying and not directly comparable to aircraft noise.

Outdoor amenity

7.22 The section 42A report does not include any discussion on outdoor noise effects and there is no definitive conclusion in Mr Styles' evidence about effects of aircraft noise on outdoor amenity in this context. Mr Styles discusses outdoor amenity in paragraphs 64 to 68 but concludes that controls typically require acoustic insulation. Internal mitigation of course does not manage effects outdoors (which Mr Styles also accepts).

7.23 Mr Styles also states at paragraph 65 that overflight events are typically short duration. This is not always the case. In my experience, at Queenstown for example, jet aircraft overflights can last approximately 30 seconds at noticeable to very high noise levels, and still be audible to a lesser degree both before and after. Some smaller (slower) aircraft can be audible for longer, but at much lower noise levels.

7.24 He also states in paragraph 66 that noise levels at the SESEB "would be perceived as very loud and disruptive". I agree with this statement. Using a

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9 https://www.nzta.govt.nz/assets/resources/effects-on-noise-sensitive-land/effects-on-noise-sensitive-land-use.pdf

noise level of 95 – 100 dB L_{AE}, there are parts of the Site that could be exposed during the daytime to 10 events at that noise level; each and every day.

7.25 With a slightly quieter aircraft producing noise levels of 90 -95 dB L_{AE}, which is still in my opinion a significant noise exposure giving rise to speech interference, there could be 30 such events.

7.26 Because of the nature of the rolling 3 month average, many days could have a significantly higher number of such events on any given day (albeit with correspondingly fewer events on other days). I disagree therefore with Mr Styles that such instances "would be very infrequent".

7.27 In my opinion, the allowable number of events at such elevated noise levels will have an adverse impact on outdoor amenity. This is further demonstrated by Figure 1, which indicates that 27% of the population could be highly annoyed by aircraft noise at the Site. This is not an insignificant number.

7.28 I consider that the noise environment is not suitable for residential development and even with the proposed mitigation, there are reverse sensitivity effects as well as adverse impacts on amenity which have not been addressed by the applicant.

Stephen Jack Peakall

29 April 2022