

**BEFORE THE HEARINGS PANEL
FOR THE QUEENSTOWN LAKES PROPOSED DISTRICT PLAN**

IN THE MATTER of the Resource
Management Act 1991

AND

IN THE MATTER Hearing Stream 05
- District Wide chapters

**STATEMENT OF EVIDENCE OF DR STEPHEN GORDON CHILES
ON BEHALF OF QUEENSTOWN LAKES DISTRICT COUNCIL**

ACOUSTICS ENGINEER

17 August 2016

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1. INTRODUCTION

- 1.1 My name is Dr Stephen Gordon Chiles.
- 1.2 I am an acoustics engineer and independent commissioner, self-employed by my company Chiles Ltd. I am a visiting academic at the University of Canterbury Acoustics Research Group.
- 1.3 I have a Doctorate of Philosophy in Acoustics from the University of Bath, and a Bachelor of Engineering in Electroacoustics from the University of Salford, UK. I am a Chartered Professional Engineer, Fellow of the UK Institute of Acoustics and Member of the Resource Management Law Association.
- 1.4 I have been practising in acoustics since 1996, as a research officer at the University of Bath, as an acoustics specialist at the NZ Transport Agency (**NZTA**), and as a consultant for the international firms Arup, WSP, URS and for the specialist firms Marshall Day Acoustics and Fleming & Barron. I have previously been responsible for acoustics assessments and design for numerous different activities including infrastructure, industrial, commercial, recreational and residential developments. I routinely work for central and local government, companies and individual residents.
- 1.5 I have worked extensively on acoustics issues in the Queenstown Lakes District (**District**) over many years. Recently my role has primarily been as a consultant to the Queenstown Lakes District Council (**Council**) and in the last two years I have provided advice on over 50 resource consent applications. I also advised the Council on technical issues associated with Plan Change 27A (**PC27A**) to the Operative District Plan (**ODP**), which related to noise provisions.
- 1.6 I am convenor of the New Zealand industry reference group for the international standards committee ISO TC43 (acoustics), which is responsible for approximately 200 published "ISO" standards relating to acoustics. I was Chair of the 2012 Standards New Zealand acoustics standards review group; Chair for the 2010 wind farm noise standard revision (NZS 6808); and a member for the 2008 general environmental noise standards revision (NZS 6801 and NZS 6802).

- 1.7** This is the second statement of evidence I have prepared on behalf of the Council for the Stage 1, Proposed District Plan (**PDP**). The first was in the Rural Hearing, related specifically to informal airports, dated 6 April 2016.¹
- 1.8** I have now been engaged by the Council to provide acoustics evidence in relation to Chapter 36, Noise, of the PDP. I provided some comments to the consultant planner engaged by the Council during the drafting of Chapter 36, but I note that I was not engaged to review the completed draft before it was notified.
- 1.9** Following my engagement by the Council in relation to the Noise chapter of the PDP I was also asked to comment on a few discrete noise related issues on Chapter 30, Utilities and Renewable Energy and Chapter 35 Temporary Activities and Relocated Buildings.
- 1.10** With respect to this evidence I declare that:
- (a) I was an independent commissioner for the Council for Plan Change 26 (**PC26**) and Plan Change 35 (**PC35**) to the ODP relating to Wanaka and Queenstown Airports respectively; and
 - (b) I was previously employed by the NZTA and my role included technical aspects of land use controls relating to noise around state highways. However, I had no involvement in NZTA's submission (#719) on the PDP. I now consult for NZTA on various matters, but not with respect to the PDP.
- 1.11** Although this is a Council hearing, I confirm that I have read the Code of Conduct for Expert Witnesses contained in Environment Court Practice Note 2014 and that I agree to comply with it. I confirm that I have considered all the material facts that I am aware of that might alter or detract from the opinions that I express, and that this evidence is within my area of expertise, except where I state that I am relying on the evidence of another person.
- 1.12** The key documents that I have used, or referred to, in forming my view while preparing this brief of evidence are:

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<http://www.qldc.govt.nz/assets/Uploads/Planning/District-Plan/Hearings-Page/Hearing-Stream-2/Section-42-A-Reports/Expert-Evidence/QLDC-02-Rural-Stephen-Chiles-Evidence.pdf>.

- (a) QLDC Operative District Plan, including Plan Changes 26, 27A and 35 to the ODP;
- (b) QLDC Proposed District Plan, in particular Chapter 36 (Noise);
- (c) New Zealand Standard NZS 6801:2008 *Acoustics – Measurement of environmental sound (NZS 6801)*;
- (d) New Zealand Standard NZS 6802:2008 *Acoustics – Environmental noise (NZS 6802)*;
- (e) New Zealand Standard NZS 6803:1999 *Acoustics – Construction noise (NZS 6803)*;
- (f) New Zealand Standard NZS 6805:1992 *Airport noise management and land use planning (NZS 6805)*;
- (g) New Zealand Standard NZS 6806:2010 *Acoustics – Road-traffic noise – new and altered roads (NZS 6806)*;
- (h) New Zealand Standard NZS 6807:1994 *Noise management and land use planning for helicopter landing areas (NZS 6807)*;
- (i) New Zealand Standard NZS 6808:2010 *Acoustics – Wind farm noise (NZS 6808)*;
- (j) International Standard ISO 2922:2000 *Acoustics - Measurement of airborne sound emitted by vessels on inland waterways and harbours (ISO 2922)*; and
- (k) International Standard ISO 14509-1:2008 *Small craft - Airborne sound emitted by powered recreational craft - Part 1: Pass-by measurement procedures (ISO 14509-1)*.

2. EXECUTIVE SUMMARY

2.1 The key findings from my evidence are that:

- (a) The ODP had already been updated through PC27A to use current acoustics parameters and standards, and these have been carried through into the PDP. Moving all the noise limits to a district wide chapter in the PDP provides better clarity that noise limits relate to receiving zones. However, I consider several issues with the drafting of the PDP need to be addressed as discussed by Ms Evans in her Officer's Report.

- (b) Sound from emergency generators is likely to be acceptable at a higher level than other sources, and I consider it would be appropriate for it to be exempted from the noise limits.
- (c) Specific noise measurement and assessment standards are appropriate for motorised craft on rivers and lakes. I consider the noise limits for motorised craft specified in the ODP and PDP as notified to be appropriate. However, I recommend that the test details be addressed through reference to standards, and the requirement for annual testing by QLDC to be impractical.
- (d) Assessment of helicopter sound is complex, and there is not a perfect way to equate noise limits for helicopters with noise limits for other sources. I consider the approach to helicopter noise limits in the ODP to be deficient, and a better approach to be to require compliance with the noise limits set out in NZS 6807.
- (e) In response to submissions, I recommend refinements to the sound insulation and ventilation controls for noise sensitive activities around Queenstown and Wanaka Airports. These are aimed at making the controls more practical to apply, in a way that is consistent with the intent of the submissions.
- (f) Numerous other more minor issues have been raised in submissions with respect to the noise rules in the PDP as notified. I have provided technical evidence in response to those submissions.

3. PARAMETERS

3.1 Several submissions raise issues relating to acoustics parameters and I discuss these in my evidence. To assist with that discussion, the following is a brief summary of the key parameters, with a summary table below:

- (a) the L_{A10} is the tenth centile sound level. Mathematically it is the level exceeded for 10% of a measurement (typically 10 or 15 minutes' duration). In practice, the L_{A10} represents the sound from an activity being measured rather than background sounds. The L_{A10} was the

main parameter used in New Zealand Standards before 1999 and was used for noise limits in most first generation district plans;

- (b) the $L_{Aeq(15 \text{ min})}$ is essentially an average sound level measured over 15 minutes. This also relates to the sound of an activity, but has advantages over the L_{A10} in that it allows for more accurate corrections and adjustments to be made. The L_{Aeq} is the parameter most commonly used internationally, including by bodies such as the World Health Organisation. The $L_{Aeq(15 \text{ min})}$ is specified by current New Zealand Standards and has been used in all second generation district plans that I am aware of;
- (c) the L_{AFmax} represents the highest sound level in one eighth of a second during a measurement (typically 10 or 15 minutes' duration). This relates to peaks of noise from individual events such as a car door slamming or a dog barking. New Zealand Standards only recommend applying an L_{AFmax} limit at night, as an additional control to protect sleep;
- (d) the L_{ASmax} represents the highest sound level in one second during a measurement. This parameter is not commonly used in New Zealand, but is included in international standards for measuring sound from motorised craft (e.g. boat) pass-bys; and
- (e) the L_{dn} is the day/night sound level. It is essentially an average level (L_{Aeq}) over 24 hours, with any sound occurring at night penalised by +10 dB before being included in the average. This parameter is used in New Zealand Standards and most district plans for sound from airports, helicopter landing areas and ports. For fixed wing aircraft, the L_{dn} is further averaged over three months and for helicopters the L_{dn} is further averaged over seven days.

Summary of acoustics parameters

| Parameter | Comments |
|---------------------------|---|
| L_{A10} | The main parameter used for activity noise limits in old versions of New Zealand Standards and old district plans |
| $L_{Aeq(15 \text{ min})}$ | The main parameter currently used for activity noise limits in New Zealand Standards and updated district plans |
| L_{AFmax} | A supplementary parameter used for peaks of sound from individual events at night |
| L_{ASmax} | This parameter is used in international standards for sound from boats, but is not commonly used in New Zealand |
| L_{dn} | This parameter is used in New Zealand Standards for airports, helicopter landing areas and ports |

4. PLAN CHANGE 27A

- 4.1** Before PC27A, the ODP used the L_{A10} parameter and did not include specific rules for helicopter landing areas. The use of the L_{A10} parameter had caused practical issues for situations such as measurement and assessment of sound from bars in the Queenstown Town Centre. PC27A sought to update the acoustics standards and parameters in the ODP and to introduce specific measures for helicopters (and airports and wind farms) in accordance with New Zealand Standards.
- 4.2** PC27A did not seek to change the structure of noise limits in the ODP or to change the general standard of amenity achieved by the noise limits. I understood this was because the Council considered these changes would be better addressed at a later stage through notification of the PDP (Stage 1).
- 4.3** As a result of PC27A the ODP uses current New Zealand Standards and the $L_{Aeq(15 \text{ min})}$ parameter. These aspects have been carried forward into the PDP.
- 4.4** PC27A was appealed to the Environment Court, primarily in relation to noise limits for helicopter landing areas. My understanding is that the Council reached a compromised position in a mediated agreement that was subject to a consent order.

- 4.5** The mediated agreement on PC27A removed the proposed requirement for helicopter landing areas to be assessed in accordance with the recommended noise limits in the relevant standard (NZS 6807), and instead required them to be assessed under the general zone noise limits. While the intent of this agreement was clear, in my opinion the resulting wording has created a contradiction in the ODP as the general noise limits are required to be assessed in accordance with NZS 6802, which explicitly excludes helicopters from its scope. The rules are further complicated by NZS 6807 being specified in the ODP as part of the assessment matters for helicopter sound, although with reference to the general district plan noise limits.
- 4.6** I foreshadow these issues now, as they are relevant to specific issues and submissions that I discuss later in my evidence with respect to helicopter landing areas.

5. FORMATTING

- 5.1** I have identified a number of issues with the notified version of the PDP, where the formatting of the noise rules might result in inefficiencies, inconsistencies and ambiguities. Some of these matters have been raised in submissions and I will discuss them later in my evidence. However, there are some other matters that I will now discuss, and I understand are not covered by a specific submission point.
- 5.2** The noise chapter has been structured to set general noise limits for receiving zones rather than setting noise limits specifically for sites containing activities generating sound. The ODP sets noise limits in the same way, but interpretation of the ODP noise limits is complicated by them being distributed between different chapters in the ODP. In the PDP the drafting needs amendment to give effect to the approach of noise limits applying to receiving zones, as set out by Ms Evans in her Officer's Report.
- 5.3** The noise limits in Rule (notified 36.5.7; redrafted 36.5.6) are erroneous. For the same zones this rule includes duplicate and conflicting noise limits for overlapping time periods using different parameters. As a consequence, I consider that the rule as notified is unusable. To correct these issues, I recommend the following:

- (a) the Kingston Village Special Zone (Activity Area 2) should be subject to noise limits as set out in Rule (notified 36.5.6; redrafted 36.5.5); and
- (b) Industrial Zones should be subject to a noise limit of 65 dB $L_{Aeq(15 \text{ min})}$ at all times. However, I understand that the Council propose that this matter be addressed in Stage 2 of the PDP.

5.4 The structure of notified Rule 36.5.17 does not fit with the format of the table, making the requirements ambiguous. However, I understand the Council propose that this matter could be addressed in another chapter of the PDP.

6. EMERGENCY AND BACKUP GENERATORS

- 6.1** Aurora Energy Limited (#635) submitted that emergency and temporary generators should be exempt from noise limits, through amendments to notified Rule 36.3.2.7 and a new Rule 36.4.8 to be added. A similar submission was made by Aurora Energy Limited on notified Rule 30.4.6 of the Utilities and Renewable Energy Chapter, and my recommendations apply to both provisions and submission points.
- 6.2** In my opinion the amendment sought to notified Rule 36.3.2.7 would not be required to give effect to the submission, as notified Rule 36.3.2.5 already exempts all permitted activities in notified Rule 36.4 from the noise limits.
- 6.3** Temporary sound from an emergency generator is likely to be tolerated by most people at higher levels than other permanent sound sources. This is both due to the temporary nature of the source and also due to its essential function. As such, in general I consider the exemption sought to be appropriate in terms of noise effects. The submission refers to "emergency and backup" generators, but in terms of this likely acceptance of the sound, a key feature is that the generator is running for emergency purposes.
- 6.4** Emergency generators are often permanently installed and subject to routine testing. If there were to be an exemption from the noise limits, in my view the timing and duration of generator operation for testing and maintenance should

be restricted. I consider an appropriate allowance for testing would be less than 60 minutes each month during a weekday between 0900h and 1700h.

- 6.5** I consider that notified Rule 36.3.2.7 should not be altered, but in terms of noise effects it would be appropriate to add a new rule permitting noise from emergency generators as set out by Ms Evans in her Officer's Report.
- 6.6** With respect to Rule 30.4.6 the submitter seeks to also exempt generators more generally, and cites examples of backup generators on remote sites and a temporary generator at the hospital. As set out above, I consider it is appropriate to provide an exemption from the noise limits for emergency generators. However, it is not clear why the other examples given should be exempt.
- 6.7** Generators on remote sites should be able to comply with the noise limits at their nearest neighbours without any particular constraints. This is because sound will reduce as it travels over large distances. I am not aware of a justification for exempting this sound from the noise limits.
- 6.8** With respect to generators at the hospital, if it were needed for an emergency then it would be covered by the proposed exemption. However, other generators, such as a temporary generator that might be used for a prolonged period during construction works, should be subject to the noise limits.
- 6.9** For the reasons set out above I consider that the reference to the noise chapter in Rule 30.4.6 should be retained.

7. MOTORISED CRAFT ON THE SURFACE OF RIVERS AND LAKES

- 7.1** The ODP includes a specific rule controlling the sound of all motorised craft on the surface of rivers and lakes. That rule has been carried forward into the PDP essentially without amendment. However, the rule in the PDP only applies to commercial craft rather than all craft as in the ODP. In terms of noise effects, I consider the same controls should apply to all motorised craft, although I understand there may be no scope to make this change to the PDP.
- 7.2** I highlight two issues with the motorised craft rule in the ODP:

- (a) the rule requires all motorised craft to have sound levels measured by QLDC every 12 months at a test day. This requirement is not practical, and despite being in the ODP I have not found any record of it occurring, at least in recent years; and
- (b) the rule replicates requirements for testing that are contained in the referenced standards. This complicates the ODP (and now the PDP) and gives rise to potential inconsistencies. I consider it would be better to reference the standards rather than paraphrase them.

7.3 Neither of these issues were addressed in the notified version of the PDP. However, submissions on this issue range from submissions seeking a complete exemption of sound from motorised craft in the rules (#607/#621) and more lenient noise limits for certain activities (#758), through to more stringent noise limits (#243).

7.4 Te Anau Developments Limited (#607) and Real Journeys Limited (#621) submitted that vessels (motorised craft) should be completely exempt from the noise rules by adding them to notified Rule 36.4. Sound from motorised craft has previously been identified as a particular issue in the district, resulting in the specific noise limits being included in the ODP and now the PDP. While the annual testing required under those provisions has not occurred in practice, the noise limits have served as appropriate criteria for resource consents for various activities involving motorised craft.

7.5 From my experience in the district, I consider that sound from motorised craft has the potential to cause significant adverse noise effects in terms of degradation of amenity and disturbance. I note that unlike sound propagating over land, sound from motorised craft generally travels further across a lake as it is unimpeded and above an acoustically reflective surface. I consider that it is appropriate for a noise limit for motorised craft to be retained in the PDP. However, as noted above, I do not consider the existing annual test requirements to be practical or necessary.

7.6 For the reasons discussed above, while I do not consider a full exemption of motorised craft from the noise limits to be appropriate, I consider removing the testing requirements would partly address the concerns raised in the submissions.

- 7.7** Submitters #607 and #621 also seek more specifically for notified Rule 36.8.1 to be amended to exclude vessels operating low or medium speed passenger transport services. If the testing requirement is removed as I have discussed, Rule 36.8 would be deleted in its entirety.
- 7.8** Jet Boating New Zealand (#758) submit that a more lenient noise limit should be applied to motorised craft competing in jet boat races between 0800h and 1800h. The submission proposes a noise limit of 92 dB L_{ASmax} , compared to the current requirement of 77 dB L_{ASmax} . This increase would be clearly noticeable and could have significant adverse noise impacts. I consider that a more appropriate way to address sound from jet boat races would be for their noise effects to be considered on a case-by-case basis, such as through a resource consent process, with specific regard to the particular location and scale of each jet boat race event. In my opinion it is not practical to make this assessment on a district wide basis for unspecified events.
- 7.9** Christine Byrch (#243) submitted that noise limits for motorised craft should be reduced and should include commentary from onboard sound systems. The noise limits have been in place in the ODP for many years and I am not aware of widespread disturbance occurring or significant complaints. Reducing the noise limits would be likely to prevent some motorised craft operating in the district. I consider the noise limits notified in the PDP represent an appropriate balance between enabling activities with motorised craft, and controlling adverse noise effects.
- 7.10** Sound from on-board sound systems cannot practically be controlled under the test standards specified for motorised craft. This is because the motorised craft noise limit relates to one second of sound as the craft passes a measurement location; but for a sound system a longer measurement is needed as the sound levels are constantly changing. I consider sound from on-board systems could be more effectively controlled by the standard district plan noise limits for general sound sources.
- 7.11** Ms Evans has set out amendments to the PDP that would address the issues I have raised above in her Officer's Report.

8. QUEENSTOWN AIRPORT MIXED USE ZONE

- 8.1** Queenstown Airport Corporation (#433) submitted that notified Rule 36.5.2 should be deleted as it is a duplication of notified Rule 17.5.6.1 in the Queenstown Airport Mixed Use Zone Chapter. The rules are duplicates and I consider that one of them should be deleted. For the reasons set out below, in my opinion notified Rule 17.5.6.1 should be deleted and notified Rule 36.5.2 should be retained.
- 8.2** A significant advantage of the structure of the noise rules in the PDP compared to the ODP is that they are now in a district wide chapter. This is beneficial as for most zones, noise limits are set for sites *receiving* sound rather than sites containing activity generating sound. I therefore consider that notified Rule 36.5.2 should be retained, to keep it in the District Wide Chapter, and notified Rule 17.5.6.1 should be deleted.
- 8.3** As an aside to this submission, I note the noise limits in notified Rule 17.5.6.1 for the Queenstown Airport Mixed Use zone are inconsistent with all other zones. This is in terms of the limits applying to the location of the specific activity rather than relating to the receiving environment; and also the limits being more lenient and having a longer daytime period. There is no obvious reason for these inconsistencies and they undermine the level of amenity provided in surrounding locations by district wide noise limits.

9. JACKS POINT

- 9.1** RCL Queenstown Pty Ltd, RCL Henley Downs Ltd, RCL Jacks Point Ltd (#632) submitted that the noise limits in notified Rule 36.5.3 should also apply to the Village Activity Area in the Jacks Point Resort zone. While this change would provide a good standard of amenity in the Village Activity Area, the noise limits in notified Rule 36.5.3 are stringent for commercial activities and would not allow for some activities such as cafés with patrons sitting outside. For commercial activities, I consider that more lenient noise limits such as those in Rule (notified 36.5.6; redrafted 36.5.5) would be more appropriate.

10. COMMERCIAL OVERLAY

- 10.1** Lake Hayes Cellar Limited (#767) submitted that noise limits for emissions from the Amisfield site should be made more lenient through the creation of a commercial overlay with a daytime period for noise limits extending to 2200h rather than 2000h.
- 10.2** The Amisfield site contains established commercial activities authorised by resource consents. There were detailed noise assessments made as part of those resource consents. There are several residential properties opposite the entrance to the Amisfield site and specific noise effects have previously been assessed at those locations as well as other nearby residential properties.

11. ASSESSMENT LOCATIONS

- 11.1** Sean and Jane McLeod (#391) submitted that noise limits should apply at site boundaries rather than at any point within any site. While it could be assumed that sound levels will be highest at the boundary of a site nearest to a neighbouring site containing a sound source, this is not always the case. Often topography or a boundary fence will mean sound levels will be higher at some other point within a site. Therefore, specifying that noise limits apply at any point within any site (including at the boundary) is more stringent than specifying application just at the site boundary.
- 11.2** As a guide to good practice, I also note that Clause 8.4.3 of NZS 6802 is explicit that noise limits should apply at any point within a site and should not apply at a boundary.

12. FROST FANS

- 12.1** The Southern District Health Board (#649) submitted that the noise limit for frost fans in the PDP should be changed from 85 dB L_{AFmax} to 55 dB $L_{Aeq(15 min)}$. I am not aware of the origins of the 85 dB L_{AFmax} noise limit in the ODP, but L_{AFmax} is not an appropriate parameter for frost fans and 85 dB L_{AFmax} is a level that would not adequately control noise effects. In my opinion a noise limit of 55 dB $L_{Aeq(15 min)}$ as proposed in the submission would be appropriate to control adverse noise effects from frost fans. Such a noise limit is likely to restrict use of frost fans within approximately 200 metres of neighbouring properties,

although the exact distance will depend on the specific frost fan type and local topography.

- 12.2** The proposed frost fan noise limit of 55 dB $L_{Aeq(15 \text{ min})}$ is significantly more lenient than the general night-time noise limit of 40 dB $L_{Aeq(15 \text{ min})}$. While this may be acceptable for a temporary seasonal sound source, I note that some other district plans include additional controls to ensure frost fans are only used when essential. I understand there may be no scope to address such issues in the PDP.

13. HELICOPTERS

- 13.1** Five submitters (#607, #621, #660, #662 and #713) propose that the L_{dn} control for helicopters should be replaced by a control specified in terms of the L_{AFmax} parameter. The adverse noise effects of helicopters are related to both the sound level of individual helicopter movements, and also the frequency of movements. While there are some limitations to an L_{dn} noise limit it does control both these factors, whereas specifying an L_{AFmax} would only control the sound level but not the number of movements. I do not consider an L_{AFmax} control to be appropriate as it would allow an unlimited number of helicopter movements and therefore would not adequately manage the adverse noise effects.
- 13.2** A separate issue with L_{AFmax} noise limits, is that they relate to one eighth of a second of sound, which can be highly variable for helicopter movements. This results in poor repeatability between measurements and difficulty obtaining reliable assessments.
- 13.3** Skyline Enterprises Limited (#574) submitted that the noise limits recommended for commercial areas by NZS 6807 should be applied in the PDP, in addition to the noise limits at residential properties. In general, I agree with this submission as I consider the noise limits in NZS 6807 for all types of zones to be appropriate. However, the submission relates to a specific location for which the Environment Court has considered an application for resource consent and recently determined the commercial area noise limit from NZS 6807 is not appropriate². The Court found a helicopter noise limit of

²

[2015] NZEnvC 205, para 91.

60 dB L_{dn} in conjunction with a limit of four helicopter flights a day to be appropriate.³ I am not aware of any justification for inserting specific helicopter noise limits for this location in the PDP, particularly with different noise limits to those found to be appropriate by the Court.

- 13.4** Christine Byrch (#243) and the Arthurs Point Protection Society (#475) submitted that the general zone noise limits in the PDP should apply to helicopter landing areas, rather than the specific noise limits in NZS 6807. The submissions are correct that the noise limits recommended by NZS 6807 are more permissive.
- 13.5** The appropriate method to address helicopter sound has been a long-running issue in the district. Compared to other districts there are a large number of helicopter operations and some of these occur near to residential properties. All current helicopter operations that I am aware of in the district (other than potentially search and rescue/emergency flights) only occur during Civil Aviation daytime hours, and therefore, unlike many other sound sources, sleep disturbance is not a significant issue. The key concerns are daytime disturbance or annoyance and degradation of amenity.
- 13.6** In the past, many complaints about helicopter sound in the District have related to noise effects from helicopters in flight, and it is likely that ongoing sensitivities to helicopter sound are largely related to this aspect. Constraining the localised noise effects around helicopter landing areas could restrict the number of flights occurring in an area, and thereby indirectly reduce noise effects from helicopters in flight. However, in my evidence I have not had any regard to noise effects from helicopters in flight (generally from 500 metres above the ground) and I have only considered the localised noise effects on residential properties in the immediate vicinity of helicopter landing areas.
- 13.7** When considering noise effects around a helicopter landing area the key issue related to submissions #243 and #475 is how to appropriately allow for the infrequent nature of helicopter movements compared to other sound sources. To illustrate this issue an extreme example could be to compare the sound from the outside unit of a heat pump operating continuously over 24 hours and a single helicopter movement lasting less than one minute. In my experience

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[2015] NZEnvC 205, para 197.

most people would find the helicopter movement much less disturbing even if it were significantly louder than the heat pump.

- 13.8** There is not an exact method to equate the adverse effects of sound sources with different characteristics, as in the example above. Given the variations and complexities in subjective responses to different sound sources, a broad judgement is required to determine equivalent standards. Even moving on from the example with different sound sources, and just comparing two helicopter landing areas with different numbers of flights, there is not an exact method to quantify the relative effects. However, in my opinion, New Zealand Standards provide helpful guidance on these matters.
- 13.9** The issue discussed above is not unique to helicopter sound. For general sounds, NZS 6802 includes a duration adjustment to account for different temporal characteristics of sound sources. With this adjustment a heat pump that only operates for one hour a day would be deemed less disturbing than a heat pump that operates continuously. In my opinion, while this regime in NZS 6802 is appropriate for general sound sources, it is inappropriate for helicopter movements as they are of particularly short duration, generally less than one minute.
- 13.10** To address these issues, NZS 6807 specifies that helicopter sound should be averaged over seven days. This means that a single helicopter event that might be relatively loud, would be assessed as being relatively quiet when that sound is averaged over seven days. To an extent this makes a fair allowance for the relative annoyance that might be caused by less than one minute of sound compared to other more continuous sound sources. However, this method only provides an approximate balance between the sound levels and frequency of helicopter movements.
- 13.11** In my opinion, constraining helicopter sound on the basis of 15 minute periods as proposed by submitters #243 and #475 would be unduly stringent and would not adequately account for the lesser noise effects caused by an infrequent sound source, as is the case for most helicopter landing areas.
- 13.12** There are limitations with the L_{dn} criteria recommended in NZS 6807, and in my opinion when there are very few helicopter movements the noise effects might be understated. For this reason, I consider that additional controls on

movement numbers in the rural zone are appropriate, as contained in notified and redrafted Rules 21.5.25 and 21.5.26 of the PDP. However for residential zones, such controls are not required as the smaller section sizes means that the L_{dn} control is effectively more stringent anyway.

13.13 On balance, I consider that the L_{dn} control for helicopter noise in notified Rule 36.5.13, coupled with the additional controls on movement numbers in the rural zone, sets an appropriate noise limit to manage adverse noise effects. I consider that a more stringent control based around $L_{Aeq(15\text{ min})}$ criteria would not adequately account for the lesser noise effects of an infrequent sound source.

13.14 Regardless of my opinions set out above, if it is decided to apply $L_{Aeq(15\text{ min})}$ criteria to helicopters then I consider the drafting of the PDP would need to be amended to avoid the potential contradictions in the ODP.

14. AIRPORT SOUND INSULATION

14.1 I repeat my declaration in paragraph 1.10 that I have previously been involved as an independent commissioner for PC26 and PC35 to the ODP, including rules relating to sound insulation of houses around Wanaka and Queenstown Airports.

14.2 The Council in its corporate capacity (#383) has submitted that the "Minimum Constructions" in notified Rule 36.6.2 are outdated and a mechanism should be included to allow modern building solutions.

14.3 I note that for most sites around Queenstown Airport that fall between the Outer Control Boundary and Air Noise Boundary, and for all sites around Wanaka Airport, notified Rules 7.5.3, 21.5.12, 21.5.13.b and 36.6.1 only require provision of ventilation and do not require sound insulating constructions in accordance with notified Rule 36.6.2 or equivalents.

14.4 In the areas nearest to Queenstown Airport, notified Rules 7.5.4 and 21.5.13.a do require sound insulation if necessary to comply with an internal noise limit. However, use of the constructions in notified Rule 36.6.2 is not mandatory. The sound insulation requirements are defined with a performance standard of 40 dB L_{dn} . Use of the constructions in notified Rule 36.6.2 is a method that

can be used to demonstrate compliance. Another method is to obtain certification from an acoustics specialist of the adequacy of the particular building system.

- 14.5** The main issue that I am aware of with the table of constructions in Rule 36.6.2 is that glazing configurations specified do not correspond to those in common use. I understand from two local glazing suppliers that the most common glazing configuration for new houses in the district is double-glazing with two 4mm thick panes separated by a cavity typically 12 mm wide, but sometimes wider. The sound insulation performance of this typical system is similar to the specified configuration of 4 mm single glazing in Rule 36.6.2, although there is one frequency where the performance of the double-glazing is slightly worse due to the resonance of the system. However, given that the overall performance of the double-glazing is marginally better than the single glazing, I consider this should be an acceptable substitution.
- 14.6** On the basis of the performance of double-glazing with 4 mm panes discussed above, I consider that it would be appropriate for Rule 36.6.2 to be updated so the existing glazing requirements are removed and replaced with double-glazing with 4 mm thick panes separated by a cavity at least 12 mm wide. This would allow greater use of the constructions table to avoid the cost of individual acoustics assessments for new houses.
- 14.7** The ceiling construction in Rule 36.6.2 in the PDP as notified has a typographical error. The specification for “1 mm gypsum or plasterboard” should read “9 mm plasterboard”. (I note that “gypsum board” and “plasterboard” refer to the same material).
- 14.8** Queenstown Airport Corporation (#433) and David Jerram (#80) both submit that the ventilation requirements in notified Rules 36.6.3 and 36.7 should be adjusted. Queenstown Airport Corporation propose amended requirements but the submission does not include a detailed explanation of the reasons behind the changes proposed.
- 14.9** The ventilation requirements in notified Rules 36.6.3 and 36.7 originated from a study done by Beca consulting engineers for Auckland Airport in 2000. However, there appears to be a typographical error in the rules in the ODP and PDP in that the original requirement in Auckland for 0.5 air changes per

hour has been incorrectly transcribed as 1-2 air changes an hour, presumably in error for 1/2 air changes per hour.

14.10 The ventilation requirements from Auckland Airport have also been used extensively by NZTA for ventilation of houses near state highways. Through my previous work for NZTA, I became aware of various issues with these ventilation requirements and also wide variations in other ventilation requirements used in district plans for the same purpose. From this experience, I agree with both submitters that some adjustment to the ventilation requirements in the PDP is appropriate.

14.11 The aim of the ventilation system rules is to provide sufficient thermal comfort for occupants, so they have a free choice to leave windows closed if required to reduce sound from aircraft. Given the issues identified with the Auckland Airport criteria, on behalf of the Transport Agency I commissioned Beca to review appropriate ventilation requirements in 2014. Their review report⁴ recommended an amended specification to the original Auckland Airport provisions. I consider this amended specification is also appropriate to replace the requirements of notified Rules 36.6.3 and 36.7.

14.12 This specification would give effect to submission #80, but only adopts the specification put forward in submission #433 in part. Based on the 2014 Beca report I do not consider the lower air flow rates proposed in submission #433 to be adequate. Furthermore, contrary to the specification proposed in submission #433, in my opinion the sound levels allowed from a ventilation system itself should not be allowed to increase over the levels specified in the ODP and PDP; but should be maintained at a lower level than aircraft sound to avoid cumulative noise effects and to prevent the system itself causing noise disturbance.

15. TEMPORARY ACTIVITIES CHAPTER

15.1 Various submitters have requested notified Policy 35.2.1.7 be amended to refer to *residential activities in residential zones* rather than *residential amenity*.

⁴

Beca, Ventilation systems installed for road-traffic noise mitigation, 20 June 2014, <http://nzta.govt.nz/assets/Highways-Information-Portal/Technical-disciplines/Noise-and-vibration/Research-and-information/Other-research/Ventilation-systems-installed-for-road-traffic-noise-mitigation.pdf>.

15.2 In my opinion notified Policy 35.2.1.7 appears to be generally given effect to by:

- (a) time limits in notified Rules (notified 35.4.8; redrafted 35.4.6) and (notified 35.4.9; redrafted 35.4.7), which correspond to the residential night-time period; and
- (b) time limits in notified Rule (notified 35.4.7; redrafted 35.4.5) relating to the "relevant zones".

15.3 With respect to the time limits specified in notified Rules 35.4.7, 35.4.8 and 35.4.9, these do not just apply to residential zones so it would be inconsistent to limit notified Policy 35.2.1.7 to residential zones. For example, the rules are also protecting residential amenity in rural zones and resort zones between 2000h and 0800h.

15.4 In the Town Centre zones (which have a later start to the night at 2200h) the night-time noise limits are still set for residential amenity. It is a lesser standard of residential amenity than in residential, resort or rural zones, but it is still related to residential amenity.

15.5 I therefore consider that the wording of notified Policy 35.2.1.7 is appropriate and should not be restricted by the specification of "residential zones" as this would be too narrow a focus, inconsistent with the rules.



Dr Stephen Gordon Chiles

17 August 2016