MARSHALL DAY Acoustics

CHRISTCHURCH INTERNATIONAL AIRPORT
LAND USE PLANNING

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Project:	**CHRISTCHURCH AIRPORT NOISE CONTOURING**
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1.0 INTRODUCTION

1.1 The Effects of Noise on People

It is a long-established concept that aviation noise can have an adverse effect on people and communities.

World-wide, the lack of appropriate land use planning around airports has historically caused significant numbers of people to be exposed to airport noise and subsequent community action has initiated operational constraints on airports. The fore-fathers in Greater Christchurch however have managed to avoid this situation by farsighted planning of the Christchurch airport location including a 'buffer' protecting the airport.

The noise levels experienced around Christchurch International Airport (CIA) are not sufficiently high to create physiological damage such as hearing loss but there are nevertheless adverse effects caused by noise. These adverse effects include annoyance, speech interference, sleep disturbance and potentially health effects associated with annoyance.

However, at what level of noise do these effects commence? There is no doubt there are adverse effects from aircraft noise at 50 dB L_{dn} [1]. While the adverse effects are less than, for example, they are at 65 dB L_{dn}, they are nevertheless real. If land is available elsewhere in the Christchurch region for new residential development (or intensification), it is proposed that it is not sensible from an acoustics perspective, to allow new noise sensitive activities inside the 50 L_{dn} Air Noise Contour if it can be avoided. It is accepted that noise effects are just one input to the decision making process on land use restrictions.

A number of factors confirm there are adverse effects from aircraft noise inside the 50 L_{dn} Air Noise Contour and that this is not a desirable noise environment in which to locate new residential development and these are discussed in this report.

Recent overseas studies have shown that between 50 dB and 55 dB L_{dn}, 18% to 33% of people were found to be highly annoyed by aircraft noise. If noise sensitive activities such as residential development, hospitals and education facilities are allowed to locate in this area (50 dB to 55 dB L_{dn}), the number of people adversely affected by aircraft noise would increase.

Specifying sound insulation to be fitted to buildings in these noise environments will not eliminate all the adverse effects of noise, due to open windows and an unsatisfactory outdoor noise environment.

Christchurch City and the Christchurch International Airport are geographically extremely well laid out for the avoidance of aircraft noise for two main reasons. Firstly, the main runway was aligned roughly north/south with the city located to the east. As airport noise contours are long and narrow, the city is relatively unaffected by aircraft noise while maintaining close access to the airport. Secondly, the authorities have managed to maintain a 'greenbelt' ensuring that new residential development has been kept away from the airport.

This approach is the basis of New Zealand Standard NZS 6805:1992 "Airport Noise Management and Land Use Planning" and is discussed throughout this report.

1.2 New Zealand Standard NZS6805

In 1992, the Standards Association of New Zealand published New Zealand Standard NZS 6805:1992 "Airport Noise Management and Land Use Planning" with a view to providing a consistent approach to noise around New Zealand airports. The Standard was finalised after several years of preparation and consultation and forms the consensus of opinion in 1991 of many different groups including the

[1] L_{dn} is the Day/Night Sound Level 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.

Ministry of Transport, the Department of Health, Airline representatives, Local Authorities, residents action groups, acoustic consultants and airport companies including CIAL.

The Standard uses the "Noise Boundary" concept as a mechanism for local authorities to:

- "Establish compatible land use planning" around an airport; and
- "Set noise limits for the management of aircraft noise at airports"

The Noise Boundary concept involves fixing an Outer Control Boundary (OCB) and a smaller, much closer Airnoise Boundary (ANB) around the airport. Inside the ANB, new noise sensitive uses (including residential) are prohibited. Between the ANB and the OCB new noise sensitive uses should also ideally be prohibited (and of those that are required, all should be provided with sound insulation). The ANB is also nominated as the location for future noise monitoring of compliance with a 65 dB L_{dn} limit.

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

The location of the ANB is then based upon the projected 65 dB L_{dn} contour, and the location of the OCB is generally based on the projected 55 dB L_{dn} contour. The Standard does however state in paragraph 1.4.3.8 that the local authority may show "the contours in a position further from or closer to the airport, if it considers it more reasonable to do so in the special circumstances of the case". The Canterbury Regional Council, and therefore Christchurch, Waimakariri and Selwyn Councils use the 50 dB L_{dn} contour for the location of the OCB.

The Standard recommends that the ANB and OCB are generally based on noise over a three-month period (or such other period as agreed). Airports in New Zealand mostly use a three-month average with Auckland International Airport using an annual average.

The Standard also recommends planning and management procedures be based on predicted noise contours (L_{dn}) for a future level of airport activity. The Standard (clause 1.4.3.1) recommends that a "minimum of a 10-year period be used as the basis of the projected contours."

It is important for a major international airport to plan for a period significantly longer than 10 years. At Auckland International Airport the original 1995 contours were based on a projection for the year 2030 (35 years ahead at the time). At Wellington International Airport the projections were based on the ultimate runway capacity. At Christchurch International Airport they are based on ultimate runway capacity.

Clause 1.1.5(c) recommends consideration of the noise from individual maximum noise events for night-time operations, and this is normally achieved by plotting the arrival and departure SEL 95 contours from the noisiest frequent night-time aircraft. If the SEL 95 contour extends beyond the 65 dB L_{dn}, then a composite of both contours forms the ANB. For Christchurch Airport the ANB used for land use planning is a composite of the 65 dB L_{dn} contour and the single event 95 dB SEL contour from an individual aircraft event.

Land Use Planning can be an effective way to minimise population exposure to noise around airports. Aircraft technology and flight management, although an important component in abating noise, will not be sufficient alone to eliminate or adequately control aircraft noise. Uncontrolled development of noise sensitive uses around an airport can unnecessarily expose additional people to high levels of noise and can constrain, by public pressure as a response to noise, the operation of the airport.

1.3 What Level of Aircraft Noise is Reasonable

The objective of this report is to discuss at what noise level should planning restrictions commence for Christchurch International Airport. The level of community response to aircraft noise are discussed in detail in section 4.0 of this report. However, community response to noise is clearly a 'grey scale' – annoyance does not start and stop at a specific noise level. However, to implement planning controls, a specific noise level does have to be decided upon.

Marshall Day Acoustics is of the opinion that the existing 50 dB L_{dn} control is the appropriate approach to be used at Christchurch. There are a number of key arguments to support this recommendation;

- 50 dB L_{dn} has historically been used at Christchurch since 1975
- NZS 6805 recommends that existing noise controls should not be downgraded
- World-wide, community annoyance from aircraft noise has increased significantly since these controls were first introduced
- Airports generally experience significant complaints from residents located outside 55 dB L_{dn}
- District Plan noise limits for general noise sources are set around 50 dB L_{dn}
- Providing sound insulation to affected dwellings does not solve all the annoyance issues from aircraft noise

Each of these issues is discussed in this report.

2.0 HISTORICAL LAND USE PLANNING AROUND CHRISTCHURCH AIRPORT

2.1 1975 Waimairi District Plan

Christchurch has been extremely fortunate in the management of aircraft noise for two main reasons. Firstly, the main runway was aligned roughly north/south with the city located to the east. As airport noise contours are long and narrow, the city is relatively unaffected by aircraft noise while maintaining close access to the airport. Secondly, the authorities have managed to maintain a 'greenbelt' ensuring that new residential development does not come too close to the airport.

Christchurch City has been extremely progressive in introducing airport noise planning at an early stage. In 1975 the Waimairi Council introduced Plan Change 10 which included a "calculated noise control line and endeavoured to control possible conflict between airport related activities and residents in the vicinity by making dwelling–houses (including the rebuilding of existing dwelling houses), a conditional use with requirements for noise insulation".

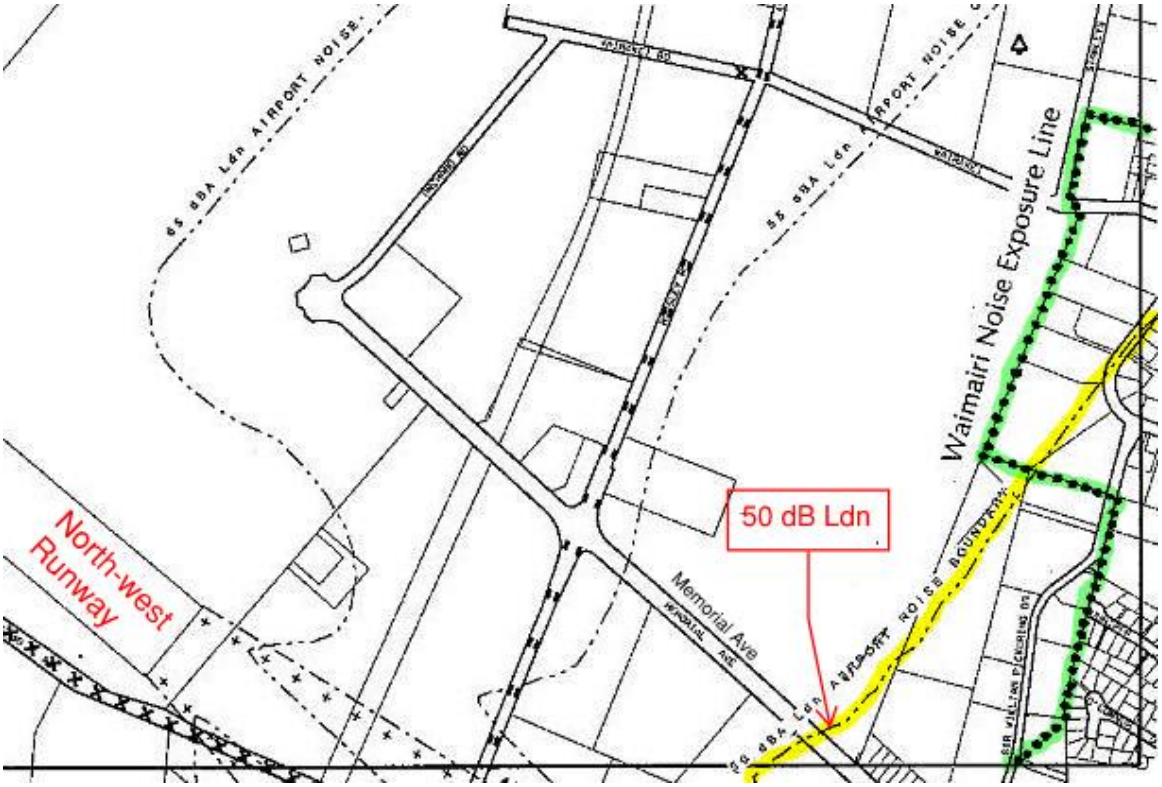
A copy of the Waimairi District Planning Scheme 1989 Section Twelve - Part One: "Christchurch International Airport Noise Exposure Line" (NEL) is attached as Appendix B.

The planning scheme clearly states the objectives of the NEL; *"The controls associated with the noise exposure line are provided both to protect residents living in the vicinity of the airport from airport related noise and also to protect the airport from complaints about noise from residents which if sustained could lead to constraints upon airport operations"*.

The location of the Noise Exposure Line at that time was based on a 50 dB Day-Night Level (L_{dn}) contour produced by the Department of Scientific Research.

Appendix C shows a copy of two City Plan Maps 23B and 24B from the Christchurch City Plan (which was made operative in 1995). These maps (and the excerpt Figure 1 below) show the location of the NEL and the 50 dB L_{dn} Airport Noise Boundary in the City Plan near Memorial Drive. The NEL wanders either side of the 1995 City Plan L_{dn} 50 dB contour but is mostly outside it.

Figure 1 – 1975 Noise Exposure Line versus 50 dB L_{dn} Airport Noise Boundary 1995 CCP



It may appear anomalous that the 50 dB contour in 1975 is in roughly the same place as it is 20 years later. The reason for this is because of the reduction in aircraft noise due technological advances in aircraft design has roughly matched the growth in aircraft movements. This reduction in aircraft noise emissions is discussed further in Section 8.0 of this report. In 1975 there were a smaller number of noisier aircraft. These advances in aircraft technology have enabled airports to grow significantly without noticeably increasing the overall noise exposure for the community.

2.2 1994 Marshall Day Study

Marshall Day Acoustics was engaged in 1992, together with a series of airport planning experts, to develop noise contours for Christchurch Airport. The study involved a dual approach of examining future growth projections and a study of long-term airport capacity. In summary, Christchurch International Airport Limited developed future aircraft operational scenarios for the airport through consultation with their airport planning consultants and users of the airport. These scenarios were developed from the then current, 1993 domestic and international billing details, significant research on anticipated growth rates for the industry and the information on airline fleet replacement preferences.

The 'high' forecast growth, predicted total annual movements of 145,000. CIAL discussions with the airport planning consultants suggested the maximum capacity of the airport, with the technology available at that time, was 140,000 movements per annum. Thus, this slightly lower figure was used in the 1994 noise contour predictions. It was anticipated at the time that this capacity would be reached between the years 2015 and 2020.

Several computer based models have been developed to predict aircraft noise levels in areas surrounding airports. The most widely used of the models (and the model referenced in NZS 6805) is the Federal Aviation Authority (FAA) Integrated Noise Model (INM). The version of the INM program that was current in 1994 was used by Marshall Day Acoustics to predict the future L_{dn} contours around Christchurch International Airport. The resultant contours were an accurate 'best practice'

estimate of the future noise contours for Christchurch and were later included in the various District Plans. The FAA has recently updated the INM by integrating its calculation procedures into a general environmental prediction package called AEDT.

2.3 2007 Marshall Day/Expert Panel Study

In 2007, several parties agreed that the noise contours for Christchurch should be updated to include new operational procedures and updated knowledge of future aircraft types. It is understood this was driven by the upcoming review of the Regional Policy Statement. Marshall Day Acoustics, Airbiz, Yellow Hat Consultants and Airways were engaged to carry out a detailed study to determine future flight tracks, aircraft types and numbers of aircraft movements to provide the input for an updated INM study. The work was carried out in consultation with Mestre Greve Associates from Seattle. Most input parameters were agreed by the consultants however some inputs remained in contention.

Later, in 2007 a panel of noise and aviation experts was formed by the Environment Court to resolve the remaining 'differences'. Seven aviation and noise experts from NZ, Australia and the USA met together in a three day expert conferencing workshop to find an agreed position on input data to be run in the INM.

The people involved in the 'Expert Panel' were; Assoc Professor John-Paul Clarke (engaged by SDC & Chairman), Kevin Bethwaite (Airways), Chris Day & Laurel Smith (MDA, engaged by CIAL), Vince Mestre, Bill Bourke and Barry Malloch (engaged by Foster, the appellant in the then relevant Environment Court proceeding that had initially 'triggered' the expert panel process).

The outcome from the panel was that the modelling approach used by the CIAL experts in the initial 2007 Study was adopted on virtually all issues (flight tracks, fleet mix etc) except for the following issues.

The airport capacity using the dual runway and Simops was originally determined by Airbiz to be 220,000 movements per annum. Associate Professor J-P Clarke was of the view that the capacity was only 175,000 mpa. The airport company reluctantly agreed to a reduction in airport capacity for the modelling exercise from 220,000mpa to 175,000mpa but I understand they do not resile from their position that capacity is greater and the contours are therefore conservative. There were also some minor modifications to the approach profiles and an increased use of the cross-wind runway.

Marshall Day Acoustics subsequently ran these agreed input parameters in the 'then current version' of the INM to produce the updated noise contours. These revised contours are sometimes also referred to as the 'Expert Panel' contours and were subsequently adopted into the Regional Plan and the various District Plans. They are now often referred to as the Operative Noise Contours.

2.4 Planning Hearings Debating 50 dB versus 55 dB L_{dn}

Since 1994 there have been several hearings (Council and Environment Court) that have debated the 50 dB versus 55 dB L_{dn} issue. These cases are discussed in detail by Chapman Tripp however the overall summary is that many overseas and local noise experts presented evidence as to the suitability of 50 dB vs 55 dB and in all cases the use of the 50 dB L_{dn} contour for the Outer Control Boundary was reconfirmed as appropriate for Christchurch.

3.0 NEW ZEALAND STANDARD NZS 6805

A summary of the concepts within NZS 6805 is included as section 1.2 of this report. However, there are some specific clauses in the Standard that support the use of 50 dB L_{dn}.

3.1 Clause 1.1.4 'Do not downgrade existing noise controls'

Clause 1.1.4 of NZS 6805 states that "This Standard shall not be used as a mechanism for downgrading existing or future noise controls…"

If the City Plan adopted the L_{dn} 55 dBA contour now as the commencement of land use controls (i.e. a position closer to the airport than the historical line), this would be a significant 'downgrading of the previously existing controls' (existing from 1975 until now).

3.2 Clause 1.4.3.8 Minimum Standard of Protection

It is understood the NZS 6805 is very much recommending a minimum level of protection with its use of L_{dn} 55 dBA as the Outer Control Boundary. The Standard states in clause 1.4.3.8 that the local authority may show "the contours in a position further from, or closer to the airport, if it considers it more reasonable to do so in the special circumstances of the case".

Christchurch Airport is a unique situation where the Council and the Airport Company have diligently maintained a 'buffer' around the airport through the implementation of appropriate land use planning over a significant period of time. Many other New Zealand airports have not been as fortunate due to severe shortages of residential land. In these situations, the local authorities have tended to implement less stringent land use planning rules during the adoption of NZS 6805 into their district plans as in most cases the Standard arrived too late (1992) to prevent residential encroachment.

Auckland is an example of this less stringent approach due to the current and future shortage of residential land in the Manukau area. However, Queenstown, which also has a shortage of residential land, has adopted a more protective approach with new residential development between the OCB and ANB listed as a prohibited activity in rural zones.

I understand the Christchurch area does not have an overriding need to site residential development in areas affected by airport noise. Such land should be used for non-noise sensitive users or uses which require low population densities thus keeping the number of people impacted by aircraft noise to a minimum. There are many areas away from the airport not affected by aircraft noise that can more appropriately be used for residential development.

The NZ Standard clearly envisages that a better standard of protection than the 'minimum standard' may be implemented somewhere in New Zealand – otherwise it would not have these words in clause 1.4.3.8 of the Standard. It is difficult to imagine a more appropriate location than Christchurch with its national significance in the transportation network and its already well established 'buffer', to implement "contours in a position further from the airport".

4.0 COMMUNITY RESPONSE TO NOISE

4.1 Community Annoyance

A large number of overseas studies have been carried out over time to investigate community response to environmental noise. The general approach of these studies is to question residents (verbally or in writing) as to their level of annoyance to a particular noise source. The noise level at the respondent's location is then determined by either measuring it or by using calculated noise contours. 'Noise levels' are normally measured/calculated as L_{dn} – the Day/Night Level which involves a summation of the noise energy over 24 hours with a 10 dB penalty for noise at night. Analysis of these widely varying results allows a 'dose-response curve' (regression analysis) to be prepared showing the percentage of people highly annoyed versus the level of noise they are exposed to.

In the 1970s, the Schultz curve was developed from a number of studies in general transportation noise (included air, road and rail). Later analysis by Bradley of airport studies indicated that community response is greater than the Schultz curve predicts by a factor of approximately two. The Schultz and Bradley results were used during the preparation of New Zealand Standard NZS 6805.

A comprehensive amalgamation of the various airport noise studies was carried out by Miedema and Oudshoorn in 2001[2] and the dose-response curve from this study has been used internationally and in New Zealand since then.

In 2002, Taylor Baines & Associates and Marshall Day Acoustics conducted a noise annoyance survey in Christchurch. The study was conducted to investigate how the Christchurch community responded to environmental noise when compared to the previous overseas studies (Schultz, Bradley and Miedema).

There have also been a number of international studies that have been undertaken more recently in the 21st century. MDA has recently completed a literature review of 45 of the latest studies. The full report is provided separately and a summary of the 14 most significant studies is included below.

Each study included analysis of a number of different airports. Of the 14 studies:

- 6 reported an increase in noise annoyance over time (FAA, Guski x3, WHO, Janssen and Vos)
- 1 reported a decrease (Vietnam)
- 4 reported no change (Gjestland x 2, Fidell, Gelderblom)
- 3 did not report on a change (NZTA, Brink, Gjestland 2021)

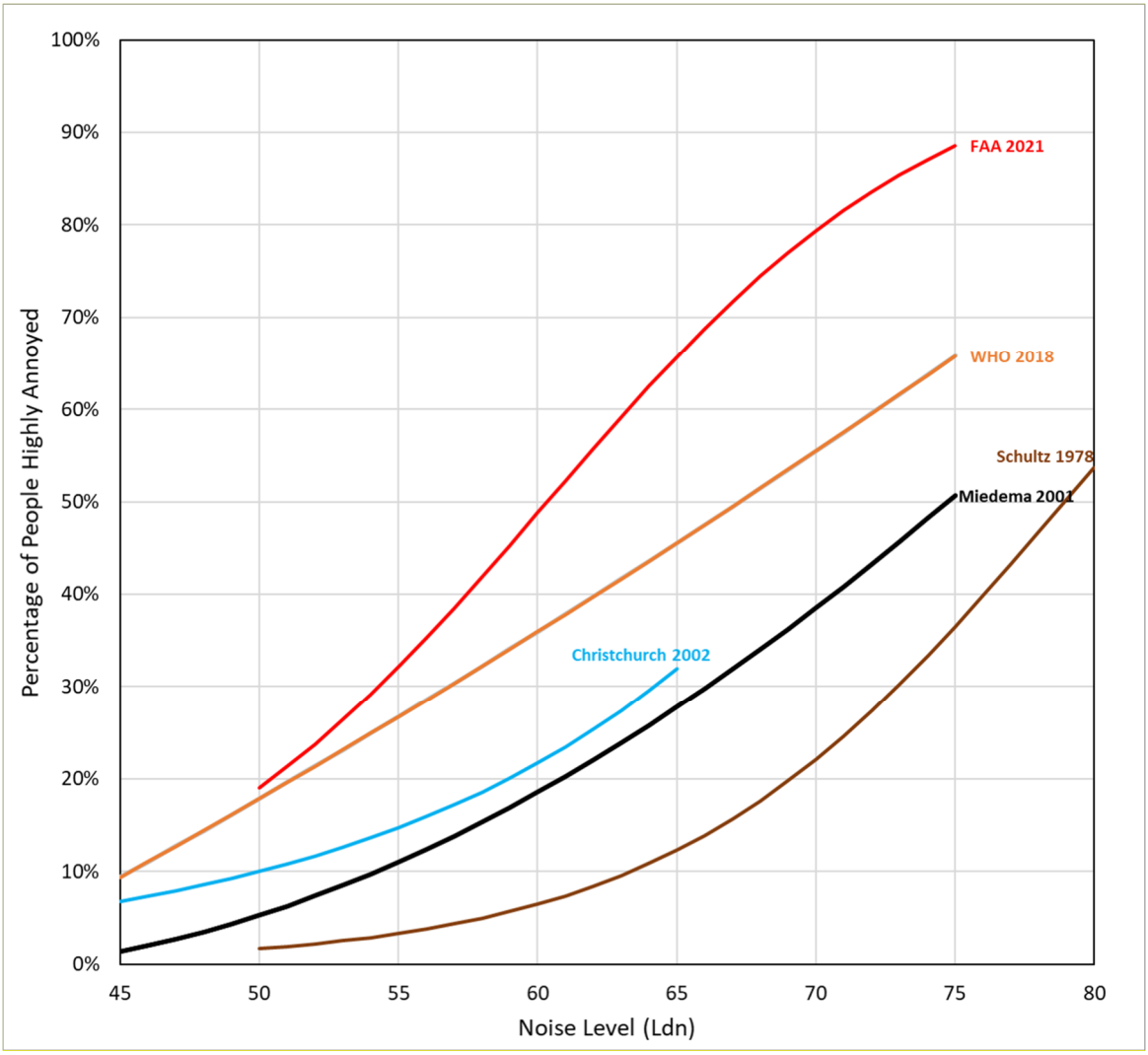
The two largest studies in this set of studies, were the World Health Organisation (WHO) study in 2018 and the Federal Aviation Administration (FAA) study in the US in 2021.

Both of these studies show a significantly higher level of annoyance than the Miedema 2001 dose-response curve. The dose response curves from these studies are shown below in Figure 2 along with the Miedema and 2002 Christchurch study for comparison.

A 'dose-response curve' is the graphed results of the percentage of people highly annoyed versus the noise level (L_{dn}/L_{den}) they experience.

[2] Miedema and Oudshoorn (2001); "Annoyance from Transportation Noise: Relationships with Exposure Metrics DNL and DENL and Their Confidence Intervals"

Figure 2: Comparison of Studies - Community Response to Aircraft Noise



The clear conclusion from these recent studies and Figure 2, is that community annoyance from aircraft noise is significantly higher today than the results 20 to 40 years – which were used to develop the recommendations in NZS 6805 and adopted as the basis for airport controls in previous Christchurch District Plans.

Based on these results it would not be sensible to relax the planning controls to enable residential intensification in closer proximity to the Airport (for example, by setting the OCB to 55 dB L_{dn}) when the level of annoyance is trending the other way.

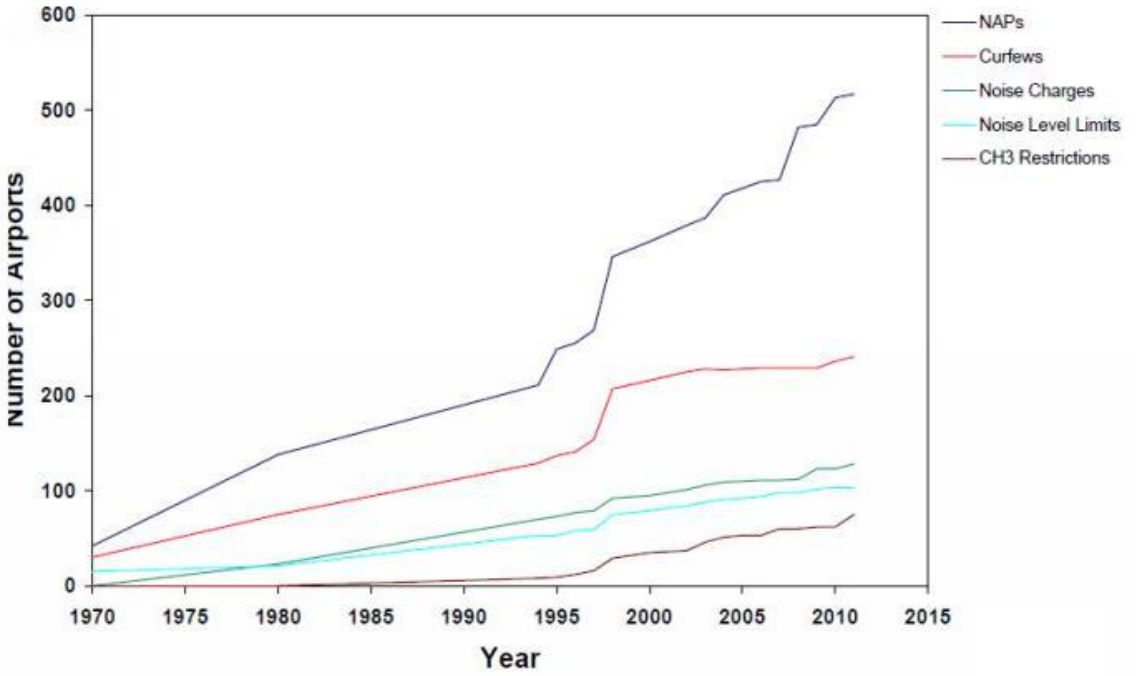
5.0 PLANNING CONTROLS AT OTHER AIRPORTS

In the past debates over the 50 dB vs 55 dB issue, it has often been promoted by potential land developers, that other airports do not use 50 dB for planning controls so why should Christchurch. In my opinion this argument has no weight – the fact that other airports have failed to implement adequate planning controls is no reason to repeat the mistake in Christchurch. Other territorial authorities would be delighted to have the low numbers of people adversely affected by aircraft noise as there are in Christchurch.

Other airport authorities would be delighted to have the lack of operational restrictions that Christchurch enjoys due to the foresight of Christchurch planners. A large number of airports have

operational restrictions due to noise effects. Figure 3 below shows the significant growth in airport noise restrictions over time.

Figure 3: Growth in Airport Noise Restrictions (Boeing [3])



Note: NAP=Noise Abatement Procedures, CH3=Only aircraft with Chapter 3 Noise Certification or quieter can fly

Each airport has individual historic circumstances that give rise to their particular land use planning controls. In many cases 'the horse had already bolted' at the time airport planning regimes were introduced. For example, when NZS 6805 was implemented at Wellington Airport there were existing houses right beside the runway and over 600 houses inside the future 65 dB L_{dn} Airnoise Boundary and many thousands inside 55 dB L_{dn} . This is discussed in more detail below.

Airbiz has recently carried out a review of planning controls and noise restrictions at a number of overseas airports. The next sections of this report, examine the other three 'main' New Zealand airports. Each of the airports, Auckland, Wellington and Queenstown are discussed in detail in Appendices D, E and F respectively and summarised in the next three sections.

5.1 Auckland Airport

The noise contours for Auckland International Airport have been based on the noise levels expected from future growth scenarios in 30 to 40 years time.

Auckland Airport is moderately well laid out geographically for the avoidance of aircraft noise effects, in that half the noise contours (the western end) lie over the Manukau Harbour (see Map 14 Appendix D). However, the other half of the contours lie over significant areas of residential land. The size of these contours is such that a large number of residents are exposed to moderate to high levels of aircraft noise – there are 379 houses in the HANA (inside 65 dB L_{dn}).

There is an Aircraft Noise Notification Area (ANNA) between 55 dB and 60 dB L_{dn} with no planning controls. The land use planning rules at Auckland commence inside 60 dB L_{dn} .

[3] Available online at https://www.boeing.com/resources/boeingdotcom/commercial/noise/restrictions.pdf

Between 60 dB and 65 dB L_{dn} (area known as the MANA[4]) noise sensitive activities are a discretionary activity and there are density controls. Inside the 65 dB L_{dn} (HANA) noise sensitive activities are a prohibited activity.

The reason for these relatively moderate land use controls is that there has been a severe shortage of residential land in Auckland and there are significant areas for new development in these moderate noise areas 55 to 65 dB L_{dn} (the ANNA and MANA).

A community liaison group (the ANCCG) meet on a bi-monthly basis and provides an opportunity for the community to interact with Auckland International Airport Limited and Airways on noise issues. The majority of noise complaints at Auckland come from the relatively low aircraft noise areas – 45 to 55 dB L_{dn}.

In 2015, AIAL was involved in a high profile and very expensive exchange with disgruntled residents following the introduction of a new RNP arrival procedure, designed to reduce fuel burn and air emissions. The residents were exposed to relatively low levels of aircraft noise (45 to 50 dB L_{dn}).

5.2 Wellington International Airport

Wellington International Airport was built in 1959 in the middle of an existing residential area. Since then, it has been compromised in terms of a curfew on airport operations and there are a significant number of people exposed to aircraft noise (660 houses inside the ANB – approximately 1,800 people). See Figure 7 in Appendix E.

NZS 6805 was implemented for Wellington International Airport in the 1990s but with a considerably 'watered down' version of the Standard's land use planning recommendations. The Air Noise Boundary (ANB) is based on the 65 dB L_{dn} noise contour from a projected capacity scenario.

New noise sensitive activities inside the ANB are not 'Prohibited' as recommended by the Standard – they are permitted in residential zones and restricted discretionary in other zones. There is no OCB included in the District Plan and thus no land use controls in the moderate noise areas. The approach taken by the decision makers in Wellington was that 'the horse had already bolted' so what's a few more houses.

Consequently, there have been further increases in the number of people exposed to aircraft noise over the years. Wellington International Airport is an excellent example of how bad land use planning has caused a significant number of people to be exposed to the adverse effects of airport noise and for consequential restrictions on airport operations.

5.3 Queenstown Airport

The geographical layout at Queenstown Airport is well suited to the avoidance of aircraft noise except for a small pocket of historically residential land at the Frankton end of the runway (as shown in Figure 8 in Appendix F). Figure 8 also shows the operative noise boundaries for Queenstown.

The Queenstown noise boundaries are largely consistent with NZS 6805, in that an ANB based on the 65 dB L_{dn} contour, and an OCB based on the 55 dB L_{dn} contour have been adopted based on a future growth scenario. There is also an annual 60 dB L_{dn} contour used for mitigation offers, but this is not shown in the District Plan. There are approximately 50 houses inside the ANB at Queenstown.

New residential activity is prohibited inside both the ANB (65 dB L_{dn}) and OCB (55 dB L_{dn}) for rural and commercial zones around the airport. However, new noise sensitive activities are not prohibited by the District Plan within the residentially zoned land in the ANB, but new and altered noise sensitive activities are required to be acoustically insulated.

[4] MANA = Moderate Aircraft Noise Area, HANA = High Aircraft Noise Area (see Appendix D)

Due to the close proximity of houses to the runway, night operations are not permitted between 10pm and 6am. Noise is further restricted at Queenstown for practical reasons as the runway and surrounding topography cannot accommodate larger wide-bodied aircraft.

The noise contours for Queenstown Airport have been based on 'projected growth' rather than 'ultimate capacity' since initial implementation in 1994. In practice, the actual growth rates have turned out to be much higher than anticipated in the projections and this has resulted in the contours needing to be expanded through district plan changes. Expanded noise contours were notified in PC35 in 2010 and implemented in 2013 after a protracted series of Environment Court hearings.

In 2018 the noise contours at Queenstown Airport were again approaching the noise boundaries in the District Plan. An updated forecast and noise study projected a 5 dB expansion of the contours. This was put to the community in a series of public consultation meetings and met with significant resistance.

Some affected residents were of the view, "enough is enough, we don't want higher levels of airport noise". There was also a political faction that was of the opinion that 'Queenstown should not grow any further' and they saw the airport noise contours as a tool that could be used to restrict growth in the region. There was also a business faction that was in support of the projected growth.

The QAC have not taken the plan change any further.

6.0 GENERAL DISTRICT PLAN NOISE LIMITS

Because other airports have generally not used 50 dB L_{dn} as the onset of land use planning controls, 50 dB L_{dn} may be seen by some as unusual or 'highly conservative'. By way of comparison, however, the operative Christchurch District Plan sets the residential zone noise limits as 50 dB L_{Aeq} daytime and 40 dB L_{Aeq} night-time. Without going into the technical explanation, these controls are effectively the same as 50 dB L_{dn}. Most other district councils including Waimakariri and Selwyn Districts, set similar noise limits. This gives an indication of what local Councils view as a reasonable 'receiving noise level' for the protection for residential amenity in the wider Christchurch context.

On this basis, as it is reasonable that residential uses should be protected to a level of 50 dB L_{dn} from general noise sources, it is therefore equally reasonable that residential uses should not be allowed to establish next to an existing noisy activity (such as an airport) at levels higher than 50 dB L_{dn}.

It is understood that in the Canterbury Regional Policy Statement and in the Christchurch, Waimakariri and Selwyn District Plans the following activities (broadly) have been classified as 'sensitive activities to aircraft noise' - residential activities, education activities including pre-schools, visitors accommodation and health care facilities.

In our opinion, it is reasonable that all these noise sensitive land uses should be protected to a level of 50 dB L_{dn} from general noise sources as they are in the general district plan noise rules. It is therefore equally reasonable that these same uses should not be allowed to establish next to an existing noisy activity at levels higher than 50 dB L_{dn}.

6.1 Complaints

It is common at hearings or in planning processes for questions to arise which seek to either draw conclusions based on the number of complaints received – ("But there aren't many complaints at the moment") or to introduce anecdotal evidence from a particular individual experience ("I live in this area and the planes don't bother me").

There are several reasons for the lack of complaints about aircraft operational noise from Christchurch International Airport. Firstly, the historic land use planning has meant that there are relatively few people exposed to aircraft noise in Christchurch. Secondly, people do not complain if they assume their complaints are likely to have no effect. If the airport is operating in its normal

mode and they are annoyed, they know nothing can be done about the noise. The Taylor Baines study shows that of the relatively few people exposed to current levels of aircraft noise at Christchurch, there are a number who are 'highly annoyed' but are not complaining during normal airport operations.

However, when the airport changes an operation (flight paths or runway length) then significant complaints can arise. The 2017 trial in Auckland of alternative arrival procedures caused the number of complaints to jump from 2 per month to around 500 per month. These complaints came from a relatively low aircraft noise area.

The comments that "I live in this area and the planes don't bother me", overlook the fact that the noise contours (and thus land use planning) are based on future noise levels – not current noise levels. The number of aircraft movements in the operative Air Noise Contours, are over double the current movements.

7.0 SOUND INSULATION

Some advocates for residential development in areas affected by aircraft noise have submitted that sound insulation fitted to proposed dwellings is sufficient on its own to avoid the adverse effect of noise and to protect the interests of the Airport. The argument is understood to be, that sound insulation provides sufficient mitigation, regardless of the population density of the land involved. In our opinion, this assertion, that sound insulation is all that is required to prevent reverse sensitivity effects, is incorrect for several reasons.

Firstly, the level of sound insulation required in the 50 to 60 dB L_{dn} area is provided by a standard house. No additional construction techniques or materials are required in this area. However, 18% to 37% (WHO graph) of the population is still typically highly annoyed by aircraft noise in this environment, even though they have the opportunity to close their windows and achieve 'WHO satisfactory noise levels' inside. This is why sound insulation, on its own, is insufficient and land use controls in the form of density restrictions are the only real form of mitigation available in this case.

Secondly, houses exposed to aircraft noise, are likely to operate with their windows closed to reduce internal noise levels, particularly at night. Three scenarios are then likely:

(i) the windows are kept closed resulting in an unsatisfactory level of fresh air; or

(ii) a ventilation system or air-conditioning system is installed to improve air quality at significant cost; or,

(iii) the windows are left open resulting in an unsatisfactory noise environment.

Each of these scenarios is likely to result in annoyance and possible complaints from the residents. It is interesting to note that residents involved in the Auckland Airport mediation forum were shocked to learn that they would have to shut their windows to achieve an acceptable internal noise environment.

The third difficulty with sound insulation is that it does not deal with the outdoor noise environment. New Zealanders in general, enjoy an 'outdoor' type of lifestyle that includes barbecues and gardening. This is particularly the case in rural and urban fringe areas where people have more outdoor space and an expectation of enjoying it. Again, an unsatisfactory external noise environment is a potential source of residential complaint with demands to reduce noise, affecting airport operations. There has been a history in New Zealand of people moving into lifestyle blocks and complaining about noise from already existing activities within the rural zone e.g. bird scarers in vineyards. Minimising the number of people affected by airport noise by restricting residential development is the most effective form of mitigation available in this case.

As discussed earlier, sound insulation does not solve the problem for hospitals and education facilities as they are heavily reliant on open windows.

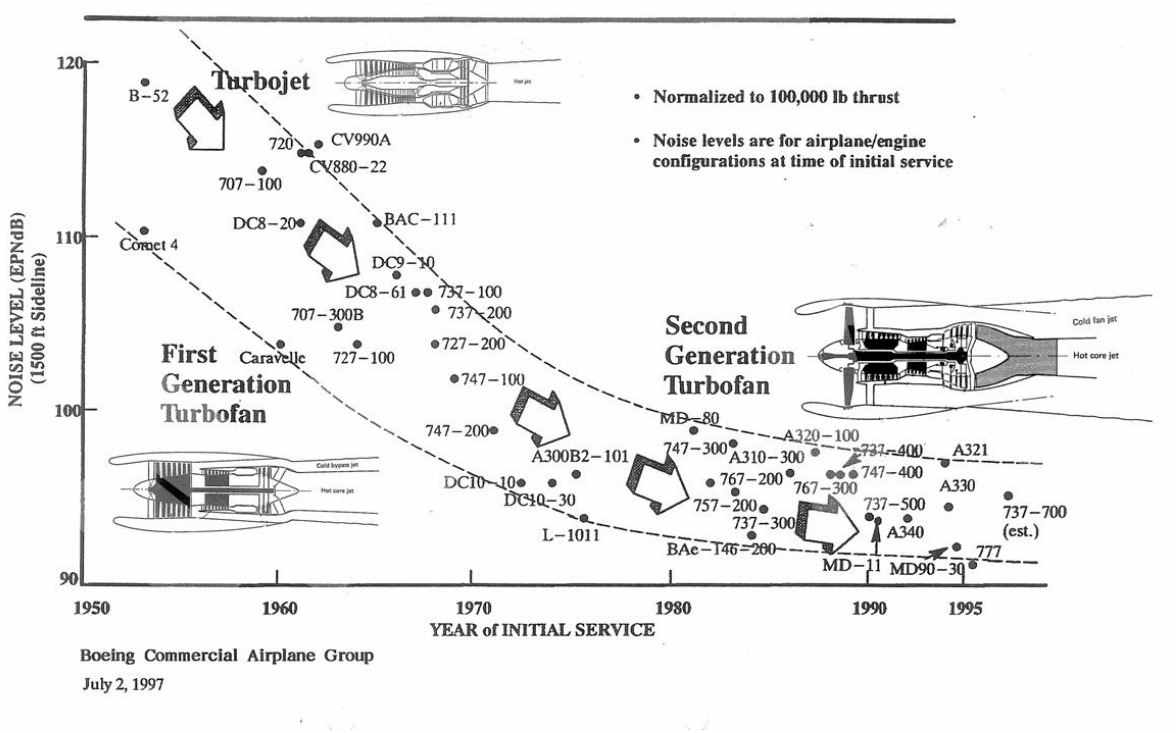
As discussed earlier, the New Zealand Standard refers to sound insulation as a fallback mitigation measure. In my opinion the Standard prefers to 'avoid' the effects of airport noise, ahead of mitigation. Table 2 in the Standard states that new residential inside the OCB "should be prohibited unless a district plan permits such uses, subject to a requirement to incorporate appropriate acoustic insulation."

In my opinion, the issues set out above, highlight why partial mitigation through sound insulation is a much less desirable option to avoiding the effects of airport noise through appropriate land use controls. Section 17 of the Resource Management Act states the duty to "avoid, remedy or mitigate" adverse effects. However, in my opinion, 'avoiding' is the preferable option in this case.

8.0 AIRCRAFT NOISE REDUCTION

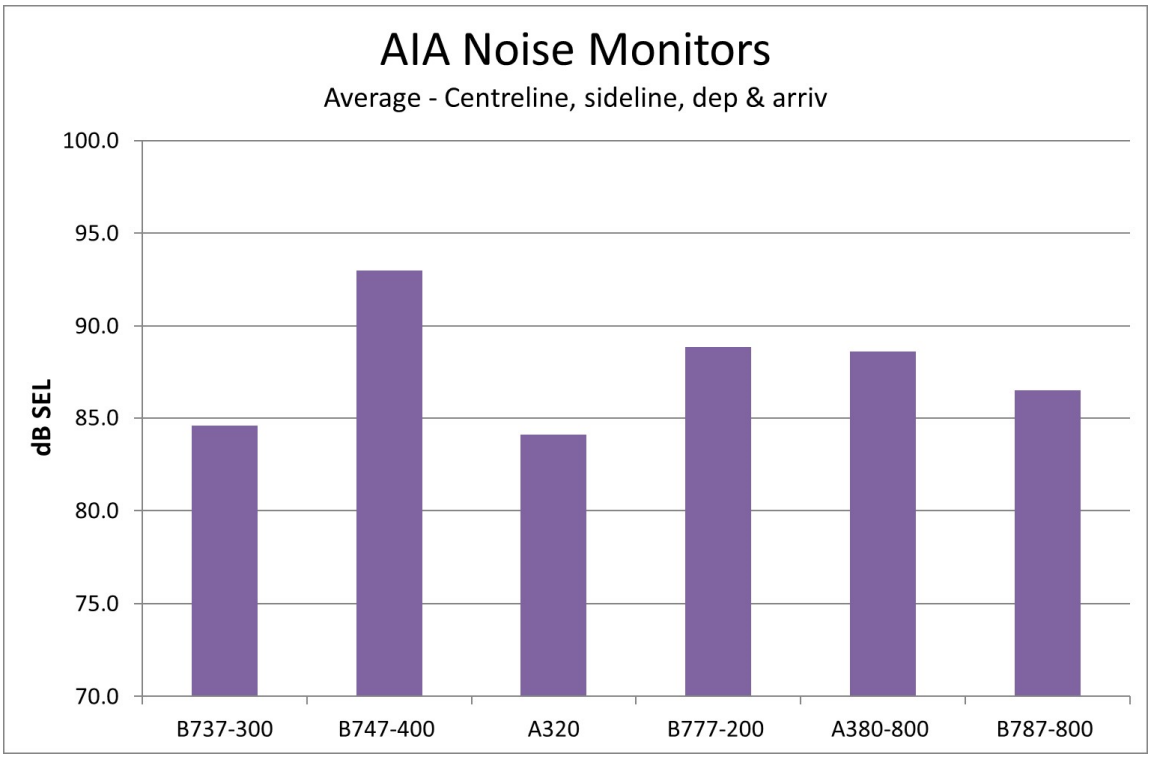
In terms of mitigation, it is worth noting that the airline industry as a whole, has spent billions of dollars mitigating noise from aircraft with the development of 'quiet technology' engines over the last 60 years. Figure 4 below, shows the reduction in noise level for the different aircraft types over time.

Figure 4 – Progress in Aircraft Noise Reduction



The data in Figure 4 'finishes' at 1997 and this prompts the question, "what has happened with aircraft noise reduction since 1997?" Analysis of the ongoing noise monitoring at Auckland International Airport shows that the modern aircraft are not as quiet as had been anticipated. Figure 5 below shows the average Sound Exposure Level (SEL) from the analysis of a large number of aircraft movements at 3 permanent monitoring locations at Auckland International Airport.

Figure 5 – Noise monitoring results from Auckland International Airport



Note: Sound Exposure Level (SEL) is a measure of the 'noise energy' from individual aircraft flyovers

Figure 5 shows the A380 produces approximately the same noise level as a B777 and the B787 Dreamliner is slightly noisier than the much earlier B737 by approximately 2dB – contrary to the general trend.

These newer aircraft do carry more passengers for similar noise output but the Auckland measurements confirm the noise levels from modern aircraft are not much different to 1990s aircraft ie. the 'curve' shown in Figure 4 above has flattened out over the last 30 years.

It is interesting to note that despite this very significant aircraft noise reduction achieved over 60 years, that during this time there has been a significant increase in the noise restrictions placed on airports and flight procedures as shown in Figure 3 above. There is a steeper increase in noise restrictions from 1995 onwards – the period aircraft noise output seems to have flattened and airports have kept growing (apart from 2020 to 2022).

Over this time, the increase in airport noise due to growth in airport operations has generally outstripped or matched the noise reduction achieved on individual aircraft.

APPENDIX A GLOSSARY OF TERMINOLOGY

ANB	Air Noise Boundary. Noise control boundary used to control aircraft noise and land use with a limit of 65 dB L_{dn}
OCB	Outer Control Boundary Noise control boundary used to control aircraft noise and land use with a limit of 55 dB L_{dn}
dB	Decibel The unit of sound level. Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of Pr=20 µPa i.e. dB = 20 x log(P/Pr)
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
$L_{Aeq(t)}$	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level. The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{Amax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
L_{dn}	The A-weighted day night noise level which is calculated from the 24 hour L_{Aeq} with a 10 dB penalty applied to the night-time (2200-0700 hours) L_{Aeq}. L_{dn} is a measure of the cumulative noise exposure over time.
SEL or L_{AE}	Sound Exposure Level The sound level of one second duration which has the same amount of energy as the actual noise event measured. Usually used to measure the sound energy of a particular event, such as a train pass-by or an aircraft flyover.
NZS 6805:1992	New Zealand Standard NZS 6805:1992 *"Airport Noise Management and Land Use Planning"*
NOR	Notice of Requirement
APU	Auxiliary Power Unit – Component of a aircraft used to generate power for essential systems when main engines are not operating
GPU	Ground Power Unit – Land based power supply for aircraft essential systems while parked and not running the APU
Noise dose-response curve	A dose–response relationship is the magnitude of the response (in this case annoyance) of a person to a certain dose of a stimulus or stressor (in this case noise). Dose–response relationships can be described by dose–response curves. Dose-response curves are created by graphing the magnitude of the response (level of annoyance) for each individual against the dose (noise level) and performing a statistical analysis on this data to create a single dose-response curve for the population.

APPENDIX B WAIMAIRI DISTRICT PLAN 1988

SPECIAL PROVISIONS

PART ONE: CHRISTCHURCH INTERNATIONAL AIRPORT NOISE EXPOSURE LINE

INTRODUCTION

The Christchurch International Airport, although in Paparua County is located close to the Waimairi boundary. The airport, as well as being a considerable traffic generator and a local employment source, places restraints on activities in the District because of height and safety requirements and the noise associated with aircraft operations. The height and safety requirements are catered for in the Scheme by designation .

In 1975 the Council introduced Change No. 10 to the previous Scheme. That Change rezoned to Rural A, land within a calculated noise control line, and endeavoured to control possible conflict between Airport related activities and residents in the vicinity by making dwelling-houses including the rebuilding of existing dwellinghouses, a conditional use with requirements for noise insulation. Following a reappraisal of the controls proposed by Change No. 10 in 1980, revised provisions were introduced as part of a major review of rural zoning. (Change No.27)

The noise exposure line provisions in this Scheme are similar to those included in Change No. 27 except that the line has been adjusted in some places and also now includes some properties within the urban area previously excluded (Change No. 27 dealt only with the Rural area.) It is also noted that with extensions being carried out to the main runway there may be changes in aircraft noise patterns. Any necessary further revision of the noise exposure line will be introduced by variation or change to the scheme.

The controls associated with the noise exposure line are provided both to protect residents living in the vicinity of the airport from airport related noise and also to protect the airport from complaints about noise from residents which if sustained could lead to constraints upon airport operations (eg. night time curfews). The importance and economic benefit of Christchurch International Airport, not only to Waimairi District but to the Canterbury Region and beyond, is recognised by the Scheme.

SPECIAL PROVISIONS

Refer to definitions of RESIDENTIAL BUILDING, HABITABLE ROOM - SECTION THREE - DEFINITIONS.

The Airport noise exposure requirements of this Scheme are based on revised noise control lines which relate to actual flight paths and a larger number of recorded noise levels rather than the largely theoretical model on which the previous Rural A boundary had been based. The basic measure now used is the Day-Night Level (LDN). The contour line at which it is considered sound attenuation requirements should be imposed for residential buildings is the 50 LDN line, the location of which was determined by the Department of Scientific and Industrial Research and reported to the Christchurch Airport Authority in "Christchurch International Airport Noise" - July 10, 1978. The "The Christchurch International Airport Noise Exposure Line " is shown on the planning maps and generally follows the D.S.I.R. line with some adjustment for property boundaries and also takes into account the north west (29 - 11) runway, which was not subject to D.S.I.R. measurement. Although this runway is used less frequently than the main runway (20 - 02) (i.e. 5 - 8% of occasions per year) there is nevertheless a significant noise problem of ground testing of engines. This suggests the need for insulation of residential buildings in the vicinity.

It is not intended that the controls within the noise exposure line should be applied in an arbitrary manner. There will be circumstances varying for each site which will greatly affect the extent of external noise levels due to such things as local characteristics, angle of incidence of aircraft and tree planting. The noise exposure line will therefore be used as a basis for determining those sites in the District where it is expected that noise insulation will be required. By taking noise level readings at each proposed site, their amount of attenuation required can be determined and techniques for achieving it (eg. orientation of the building, internal layout, materials to be used, form and standard of construction), recommended. It is intended through these means that the indoor design sound level (i.e. the maximum noise level from an aircraft flyover, heard inside the building) should not exceed 55 dBA for habitable rooms other than kitchens and 65 dBA for other rooms in respect of normal aircraft movements to and from the Christchurch Airport. These levels, which are those recommended by the Standards Association of Australia (AS 2021 - 1977) are considered to be the maximum noise levels which will be judged by the average listener as not excessively intrusive or annoying. Because of the variability of the subjective responses to aircraft noise, however, these figures may not provide sufficiently low interior noise levels for occupants who have a particular sensitivity to aircraft noise.

1. SPECIAL PROVISIONS: AIRPORT NOISE EXPOSURE AREA

1.1 PRE-CONDITION

This ordinance shall apply to every site located between the Christchurch International Airport Noise Exposure Line, as notated on the planning map and the boundary of the District with that of the Paparua and Eyre Counties to the west.

1.2 REQUIREMENTS FOR RESIDENTIAL BUILDINGS

1.2.1 In addition to any requirements of the zone in which the site is located, building design, construction and insulation of residential buildings shall be such that the maximum indoor design sound level due to aircraft noise for habitable rooms other than kitchens shall not exceed 55 dBA and for other rooms 65 dBA. The New Zealand Standard N.Z.S.6801:1977 ("Methods of Measuring Noise") and N.Z.S. 6802 ("Assessment of Noise in the Environment") shall be followed in regard to noise measurement, correction, interpretation and assessment.

1.2.2 Prior to any consent being given to erect the residential building, noise level measurements shall be monitored at the site by the Council to determine the attenuation required. The applicant shall submit calculations and design details prepared by a Registered Engineer with expertise in acoustics as to how the required attenuation is to be achieved, including such of the following matters as are considered necessary by the Registered Engineer in the circumstances.

(a) Orientation of the building.

(b) Internal room layout of the building and location of windows and external doors.

(c) Materials to be used in construction, including their accoustic ratings.

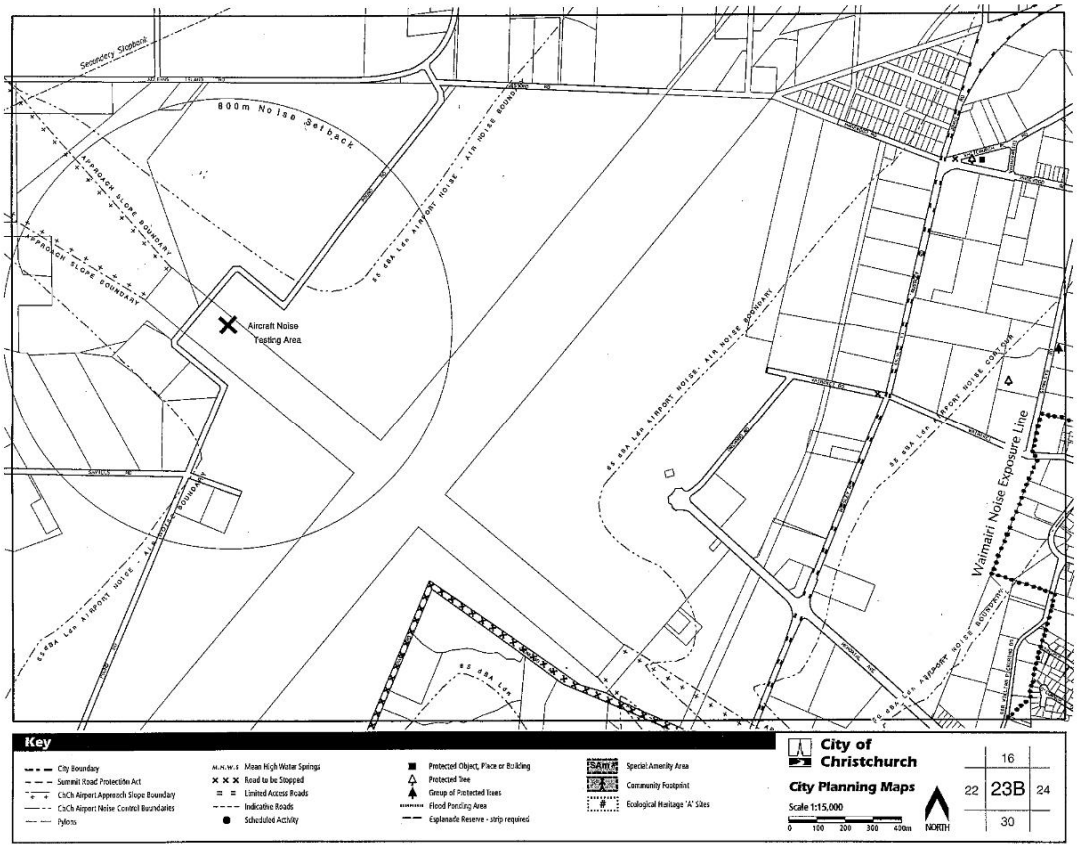
(d) Form of construction.

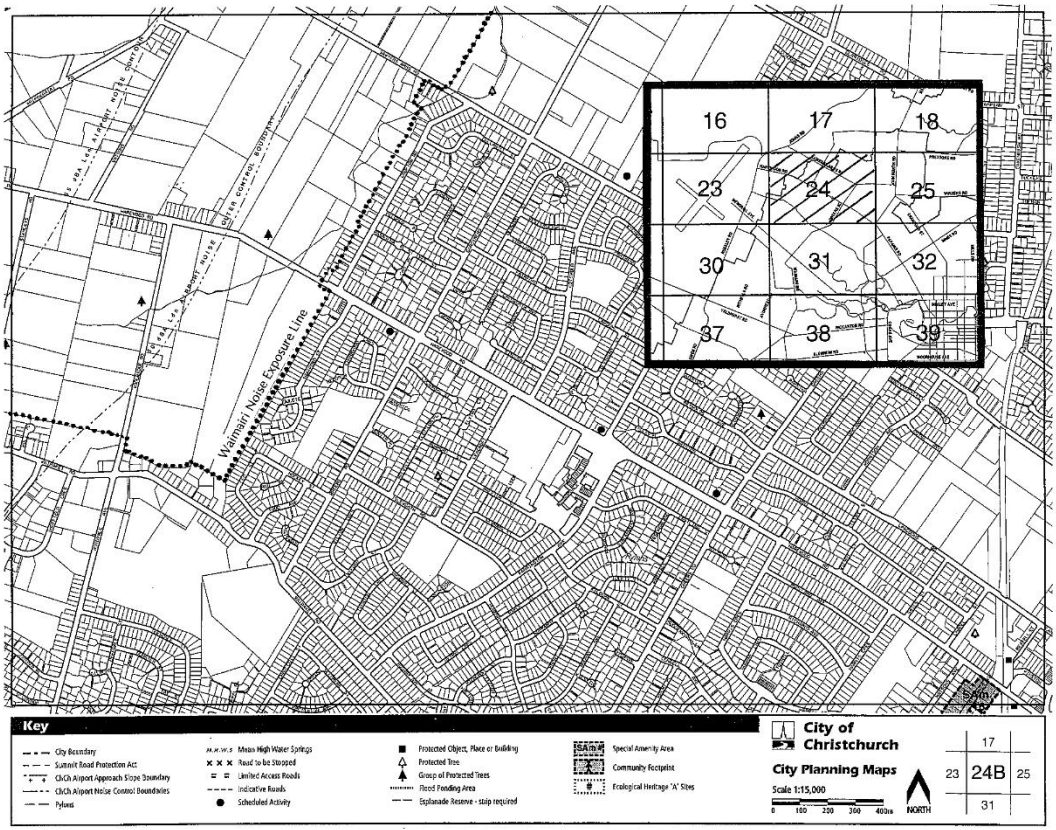
(e) Maximum window area to exterior wall area ratios.

(f) Installation of fixed-closed windows and/or double glazing.

1.2.3 Where the circumstances indicate that close supervision of the erection of the building is required in order to achieve the necessary insulation, a registered Clerk of Works or similar approved person shall supervise the erection and issue of a Certificate of Compliance that the conditions of the Council relating to noise attenuation have been satisfied.

APPENDIX C 1975 NOISE EXPOSURE LINE VS 50 DB L_{DN} OUTER CONTROL BOUNDARY (1995)





APPENDIX D AUCKLAND INTERNATIONAL AIRPORT

Airport Noise Boundaries/Contours

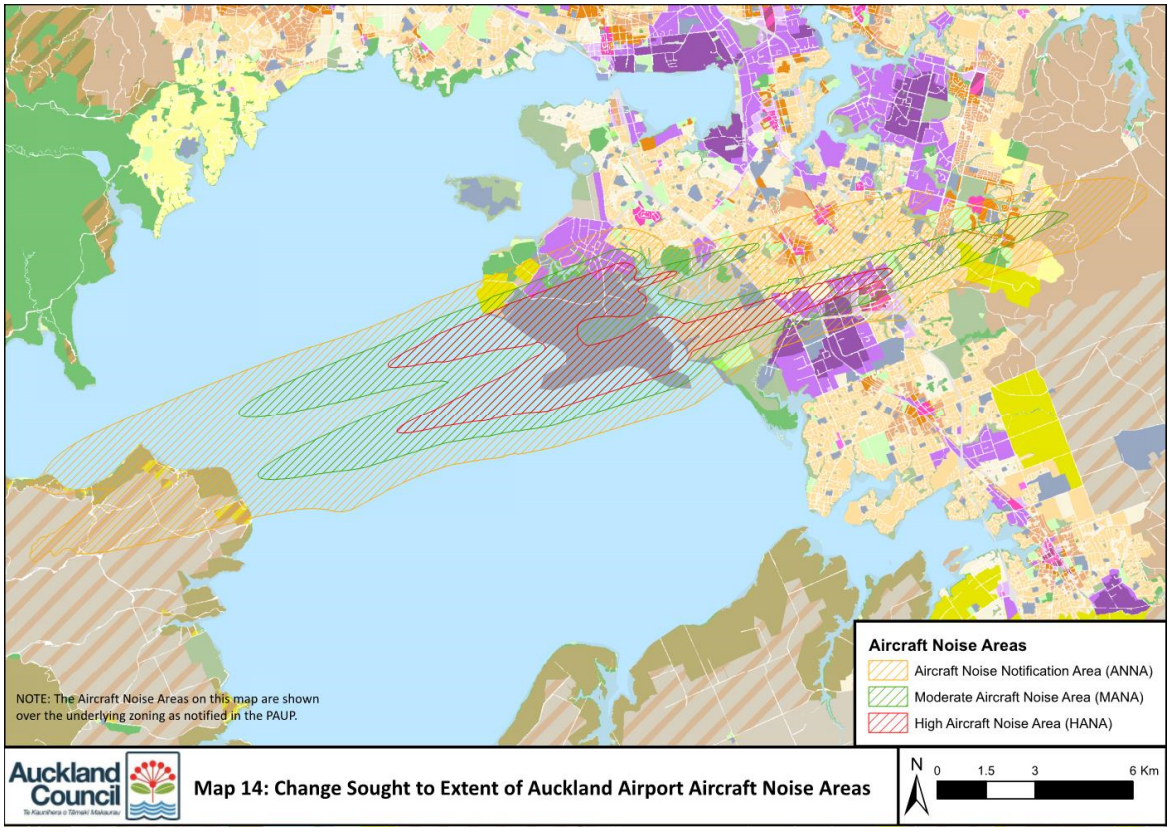
The noise contours for Auckland International Airport (AIA) are different to other airports in that 'Aircraft Noise Areas' are used which are defined by noise contours. AIA has three aircraft noise areas based on future predicted levels of aircraft noise as follows:

- The 'Aircraft Noise Notification Area' (ANNA) – 55 to 60 dB L_{dn}
- The 'Moderate Aircraft Noise Area' (MANA) – 60 to 65 dB L_{dn}
- The 'High Aircraft Noise Area' (HANA) - >65 dB L_{dn}

The operative noise contours represent noise in the year 2044 and include noise from a second parallel runway to the north which was previously envisaged to be built by 2028.

Auckland Airport is moderately well laid out geographically for the avoidance of aircraft noise effects, in that half the noise contours (the western end) lie over the Manukau Harbour (Map 14 below). The other half of the contours lie over significant areas of residential land. The size of these contours is such that a large number of residents are exposed to moderate to high levels of aircraft noise – there are 379 houses in the HANA (inside 65 dB L_{dn}).

Figure 5 – Auckland International Airport – Aircraft Noise Areas (Boundaries)



Land Use Controls

The activity status for Activities Sensitive to Aircraft Noise (ASAN) within the noise contours are contained in Chapter D24 of the Auckland Unitary Plan and are copied below. All new ASAN or additions/alterations to existing ASAN in the MANA and HANA must be designed to meet an internal noise level of 40 dB L_{dn} - see rule D24.6.3.

Development of new dwellings and other ASAN's (schools, hospitals etc) in the HANA is prohibited. For new tertiary education facilities in the HANA the activity status is non-complying.

Additions/alterations to an existing dwelling in the HAHA are restricted discretionary with additions/alterations of other ASAN's (schools, hospitals etc) being non-complying.

In the MANA the controls are more relaxed. New dwellings meeting the minimum density requirements are permitted. If they do not meet these requirements, they are restricted discretionary. New ASAN's (excluding dwellings) are discretionary.

Alterations/additions to an existing dwellings in the MANA are permitted. Alterations/additions to an existing ASAN (excluding dwellings) are restricted discretionary.

There are no land use planning controls in the ANNA – it is a noise advisory area only.

Table 1 – Activity Status within the Aircraft Noise Areas

HANA - High Aircraft Noise Area (>65 dB L_{dn})	
New ASAN's (excludes tertiary ed)	Prohibited
New tertiary education facilities	Non-complying
Additions or alterations to existing dwellings	Restricted discretionary
Additional or alterations to existing ASAN's (excludes dwellings)	Non-complying
MANA - Moderate Aircraft Noise Area (60-65 dB L_{dn})	
New dwellings in a residential zone where: • Density doesn't exceed 400 m^2 • Maximum density control in Flat bush precinct are complied with (range from 150 – 400 m^2)	Permitted
New dwellings in a residential zone where: • Density exceeds 400 m^2 • Maximum density control in Flat bush precinct is not complied with (range from 150 – 400 m^2)	Restricted discretionary
New ASAN's (excludes dwellings)	Discretionary
Additional or alterations to an existing dwelling	Permitted
Additional or alterations to an existing ASAN (excludes dwellings)	Restricted discretionary
ANNA - Aircraft Noise Notification Area	
No controls – noise advisory area only	

Note; "Activities Sensitive to Aircraft Noise" or "ASAN" means any dwellings, boarding houses, tertiary education facilities, marae, integrated residential development, papakainga, retirement village, supported residential care, educational facilities, care centres, hospitals and healthcare facilities with an overnight stay facility.

Noise Control Rules and Abatement Procedures

Auckland Airport Designation 1100

Auckland Airport Designation 1100 sets out noise performance criteria and noise management obligations for the Airport to comply with.

Condition 5(d) of Designation 1100 requires AIAL to undertake the following:

- Monitor noise from aircraft operations near the boundary of the High Aircraft Noise Area (HANA) to demonstrate that the Day/Night level of 65 dB L_{dn} is not exceeded outside the HANA
- Use recognised noise modelling software and noise monitoring data to calculate whether the noise from aircraft operations exceeds 60 dB L_{dn} anywhere outside the Moderate Aircraft Noise Area (MANA)

Noise from aircraft operations is monitored continuously by noise loggers at three locations near the boundary of the HANA (65 dB L_{dn}). Several other noise loggers are located in residential areas further away from the airport.

Approximately 4 years ago, modifications to operations on a particular RNP arrival track was required to ensure the Airport remained in compliance with these two rules.

Condition 4 prevents aircraft from departing to and arriving from the east on the future northern runway between 10pm – 7am. This is colloquially known as "No night flights over Papatoetoe". This is to protect people living under the new flight path in South Auckland from sleep disturbance effects.

Condition 6 puts an interim noise limit on noise from the northern runway to not exceed 58.5 dB at the intersection of the Northern Runway centreline and State Highway 20, and at the southernmost part of Naylors Drive in the first five years of opening. This is to protect residents from large-scale changes in noise levels when then northern runway opens.

Condition 10 requires the Airport to offer acoustic mitigation to houses located inside the 60 and 65 dB L_{dn} Annual Aircraft Noise Contour (AANC). This contour is calculated annually and represents noise levels for the forthcoming year based on growth predicted by the Airport.

The airport must provide mitigation to ensure that noise levels inside the dwelling do not exceed 40 dB L_{dn} and. This includes installation of a mechanical ventilation system to ensure ventilation with windows closed. The airport must pay for 100% of the cost of this mitigation for people living within the HANA and 75% of the cost for people living in the MANA.

The airport must also provide mitigation for preschools and schools within the 65 and 65 dB L_{dn} AANC also and ensure aircraft noise is kept below 40 dB L_{dn} inside.

CAA Part 93 Noise Abatement Procedures

CAA Part 93 outlines a series of general noise abatement procedures for aircraft taking off and landing. The departure procedures are standard 'cut-back' procedures used at most New Zealand airports. The approach procedures are as follows:

93.61 Approach noise abatement procedures

(a) Each pilot-in-command of a turbo-jet or turbo-fan powered aeroplane arriving from north of the extended runway centre line and intending to land on runway 23 shall, unless otherwise instructed by ATC—

(1) when on a visual approach, intercept the extended runway centre line at a height not below 2000 feet QNH; and

(2) between the hours of 2300 and 0600 local time, intercept the extended runway centre line at a distance of not less that 14 nm from the runway threshold and at an altitude of not less than 4000 feet QNH.

(b) Each pilot-in-command of a turbo-jet or turbo-fan powered aeroplane conducting a right hand aerodrome traffic circuit for runway 23 shall not turn onto the final approach path at a distance of less than 4 nm from the runway threshold.

93.63 Noise abatement area

Except when operating in accordance with an instrument approach procedure, or being radar vectored by ATC, or during take-off climb, or during a visual approach to runway 23, a pilot-in-command of a turbo-jet or turbo-fan powered aeroplane shall not operate over the Auckland noise abatement areas specified in Appendix A at an altitude of less than 5000 feet QNH.

Clause 93.65 requires pilots to land and take=off over the harbour when possible:

93.65 Noise abatement procedures: use of runway

Each pilot-in-command of a turbo-jet or turbo-fan powered aeroplane shall, between the hours of 2300 and 0600 local time, use runway 23 for take-off and runway 05 for landing unless—

(1) the tailwind component is more than 5 knots; or

(2) compliance with the aeroplane performance operating limitations requires the use of the other runway direction; or

(3) otherwise instructed by ATC.

Aircraft Noise Community Consultative Group (ANCCG)

The ANCCG meet on a bi-monthly basis and provides an opportunity for the community to interact with the Airport and Airways on noise issues.

A recent issue has involved an alternative navigation point for aircraft arriving at night. This involves residents at low levels of noise exposure, nevertheless concerned about night arrivals.

APPENDIX E WELLINGTON INTERNATIONAL AIRPORT

Wellington Airport is not well laid out geographically for the avoidance of noise effects on residents. The Airport (originally known as Rongotai) was built in 1959 in a residential area with large areas of housing immediately adjacent to the runway as shown in the photograph below.

Figure 6 – The Construction of Rongotai Airport 1959 (photo by Whites Aviation)

As a result of this close proximity (land use conflict) a curfew had to be implemented to reduce the night-time effects of noise on the residents.

Wellington International Airport was the first airport in New Zealand where the New Zealand Standard NZS6805 was implemented. The decision makers at the time decided to modify the recommendations in NZS6805 significantly because there were so many houses already inside the noise contours (660 inside the ANB) – 'the horse had already bolted'.

The main differences that set Wellington Airport's noise management framework apart from airports like Auckland and Christchurch, are:

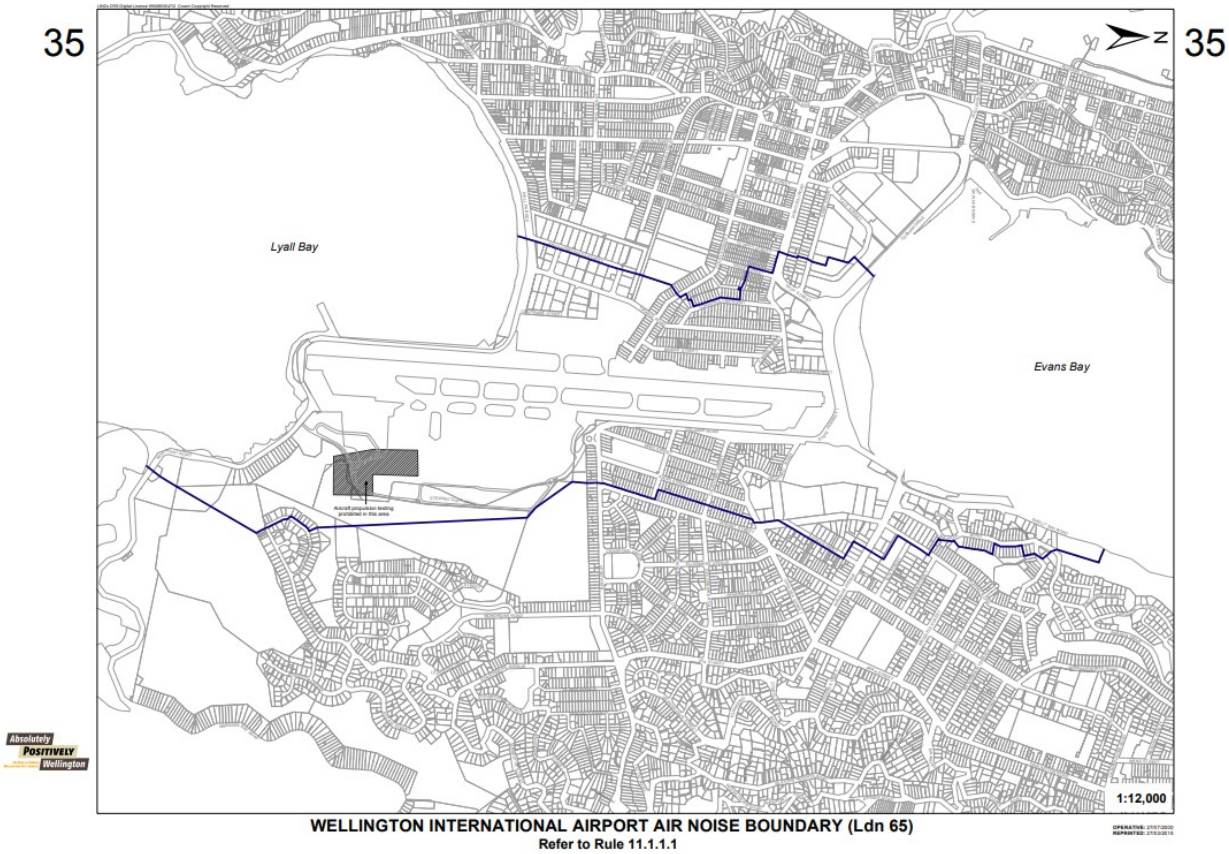
- Wellington operates with a partial night-time curfew, and
- the District Plan only controls land use inside the Air Noise Boundary (ANB) - there is no Outer Control Boundary shown in the District Plan for Wellington Airport.

The Wellington Airport Air Noise Boundary (ANB)is based on a predicted future level of 65 dB L_{dn}.

The ANB was prepared in the late 1990's and represents what was considered at the time to be the long-term future operational capacity of the airport. The ANB has been cadastralised around property boundaries to simplify planning procedures.

Figure 7 below shows the ANB in blue and there are a very large number of houses that are affected by aircraft noise at Wellington.

Figure 7 – Wellington International Airport – Air Noise Boundary
(Map 35 from the Wellington City Council District Plan)



The current planning framework for Wellington Airport sits within the District Plan zone rules. Wellington City Council recently approved a Notice of Requirement for an Airport designation however this is currently under appeal.

Land Use Controls

The decision makers at Wellington decided not to follow the recommendations in NZS6805 and residential activity is not prohibited by the District Plan within the ANB - it is permitted in existing residential zones and restricted discretionary in other zones. New and altered noise sensitive activities are required to be acoustically insulated.

The land use restrictions for activities sensitive to aircraft noise inside the ANB were strengthened through District Plan Changes 72 and 73 following the outcome of the LUMIN Study which found that stronger controls were appropriate to curb residential intensification in this high noise environment. The changes, which became operative in November 2014, include strengthening the acoustic insulation requirements for new and altered noise sensitive activities within the ANB. Nonetheless, new noise sensitive development continues to be permitted inside the ANB in the residential zone.

Noise Controls

Aircraft noise at Wellington Airport is currently controlled by rules in Chapter 11A of the Operative Wellington City District Plan (the District Plan). These rules have been operative since 2000.

The noise controls for Wellington Airport are based on the NZS 6805:1992 approach, although there is just an ANB and no OCB at Wellington. In summary, noise from aircraft operations (arrivals, departures and taxiing) is controlled by a 65 dB L_{dn} noise limit at the ANB which is defined on Map 35

of the planning maps. The ANB also restricts military operations to a maximum of 55 dB L_{dn} at the ANB, however government flights and emergency services are exempt.

In addition to the L_{dn} limit (which includes a night penalty), operations at Wellington Airport are restricted by a partial night-time curfew as follows:

- Domestic operations must not occur during the hours from midnight to 6am.
- International operations must not occur during the hours of midnight to 6am for departures and 1am to 6am for arrivals.

Some exceptions apply that enable the operating hours to be extended in certain situations.

Noise from aircraft operations is measured continuously by noise loggers at three locations near the Air Noise Boundary.

Airport Funded Noise Mitigation

There are no airport funded noise mitigation programme requirements in the District Plan. However, the Environment Court required Wellington Airport to undertake a study to determine whether such mitigation was appropriate. In response the Land Use Management and Insulation for Airport Noise Study ("LUMINS") was carried out by the Wellington Airport Air Noise Management Committee and was completed in 2009. The purpose of LUMINS was to determine the future management of land use and acoustic insulation for the properties within the ANB.

The study involved an in-depth assessment of the effects of aircraft noise on residents. This led to consideration of mitigation options such as acoustic insulation for existing houses and more stringent land use controls for new noise sensitive activities within the ANB. Recommendations from the study have been implemented through changes to the District Plan to restrict intensification of noise sensitive activities inside the ANB. Furthermore, an acoustic mitigation programme "Quieter Homes" has been implemented to retro-fit acoustic insulation and ventilation to existing dwellings inside the ANB.

APPENDIX F QUEENSTOWN AIRPORT

Noise boundaries for Queenstown Airport are contained in the Queenstown Lakes District Plan. These are largely consistent with NZS 6805, in that an ANB based on the 65 dB L_{dn} contour, and an OCB based on the 55 dB L_{dn} contour (future operations) have been adopted. There is also an annual 60 dB L_{dn} contour used for mitigation offers, but this is not shown in the District Plan.

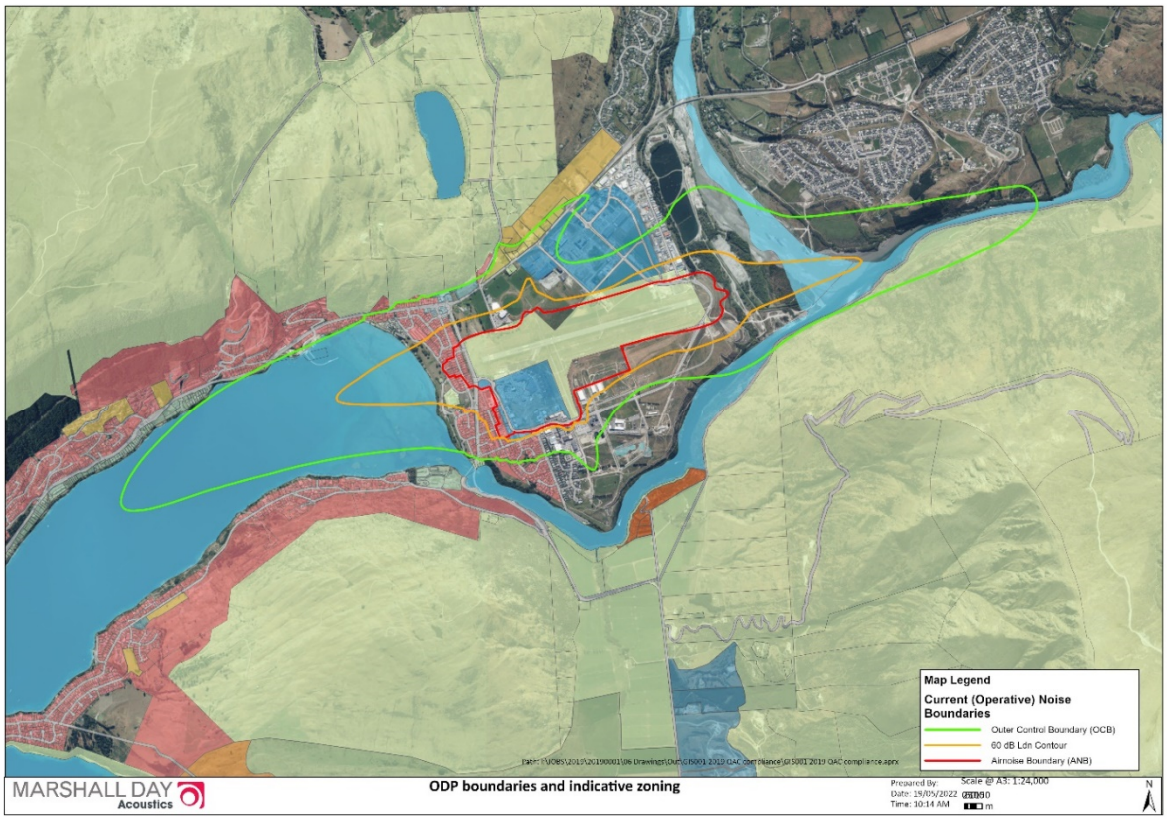
The noise boundaries have all been cadastralised around small lot residential property boundaries, but not large lot boundaries. The ANB also accounts for the possible relocation of general aviation activity to other parts of the airfield.

The ANB was implemented in 2013 and represents what was considered at the time to be a 25 year projection of future activity at the airport.

The geographical layout at Queenstown Airport is well suited to the avoidance of aircraft noise except for a small pocket of historical residential land at the Frankton end of the runway (as shown in Figure 8 below). Figure 8 also shows the operative noise boundaries for Queenstown.

These boundaries are largely consistent with NZS 6805, in that an ANB based on the 65 dB L_{dn} contour, and an OCB based on the 55 dB L_{dn} contour (future operations) have been adopted. There is also an annual 60 dB L_{dn} contour used for mitigation offers, but this is not shown in the District Plan – it is calculated on annual basis.

Figure 8 – Queenstown Air Noise Boundaries - QLDC Operative District Plan



The noise contours for Queenstown Airport have been based on 'projected growth' rather than 'ultimate capacity' since initial implementation in 1994. In practice, the actual growth rates have turned out to be much higher than anticipated in the projections and this has resulted in the contours needing to be expanded through district plan changes. Expanded noise contours were

notified in PC35 in 2010 and implemented in 2013 after a protracted series of Environment Court hearings.

In 2018 the noise contours at Queenstown Airport were again approaching the noise boundaries in the District Plan. An updated forecast and noise study projected a 5 dB expansion of the contours. This was put to the community in a series of public consultation meetings and met with significant resistance.

Some affected residents were of the view, "enough is enough, we don't want higher levels of airport noise". There was also a political faction that was of the opinion that 'Queenstown should not grow any further' and they saw the airport noise contours as a tool that could be used to restrict growth in the region. There was also a business faction that was in support of the projected growth.

The QAC have not taken the plan change any further.

Land Use Controls

There are many houses in close proximity to one runway end and therefore a number of existing houses are inside the noise boundaries. As such, residential activity is not prohibited by the District Plan within the residentially zoned land in the ANB, but new and altered noise sensitive activities are required to be acoustically insulated.

However, new residential activity is prohibited in both the ANB and OCB (55 dB L_{dn}) for rural and commercial zones around the airport.

The adoption of the larger noise boundaries in 2013 included strengthening the associated acoustic insulation requirements for new and altered noise sensitive activities within the ANB.

Aircraft Noise Controls

Aircraft noise is controlled by rules in Designation D1.

The noise controls are based on the NZS 6805:1992 approach. In summary, noise from aircraft operations is controlled by a 65 dB L_{dn} noise limit at the ANB and a 55 dB L_{dn} noise limit at the OCB which is defined on Map 31a of the planning maps. Compliance with these limits needs to be demonstrated every year and is based on annual noise modelling.

Part of the compliance obligations involve adjusting the noise model used to prepare the annual compliance contours to account for on-site measurement results to improve accuracy.

To achieve this, the rules require noise from aircraft operations to be measured every 2 years in several positions, and both in summer and winter. Locations for measurements are agreed with the airport community liaison group. The results are used to adjust the noise model where necessary.

Prior to Covid 19, the 2019 compliance contours were getting close to the District Plan noise limits.

In addition to the L_{dn} limit, night operations are restricted in that aircraft are not permitted to fly between 10pm and 6am. Noise is further restricted at Queenstown for practical reasons as the runway and surrounding topography cannot accommodate the larger wide-bodied aircraft.

Airport Funded Noise Mitigation

An airport funded noise mitigation programme is required in the District Plan. The airport is required to offer full mitigation to houses inside the ANB so that satisfactory internal noise levels can be achieved. Similar to the Auckland procedures, this occurs only when airport noise received at a house is likely to exceed 65 dB L_{dn} in the following year. This is determined each year using the compliance contours, with an annual growth allowance added on. The treatment packages and full design and installation costs are covered by the airport.

The airport is also required to part fund a ventilation system for all properties inside the 60 dB L_{dn} boundary.