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PROJECT: **Whangarei District Airport -**  
**2008 Biannual Noise Compliance**  
**Contours**

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## 1.0 INTRODUCTION

Marshall Day Acoustics has been engaged to undertake aircraft noise predictions for Whangarei District Airport for the purposes of assessing compliance with the Whangarei District Plan noise controls.

Noise predictions have been undertaken based on actual operations that have occurred at Whangarei Airport (period 1 July 2007 – 30 June 2008). This information has been provided by the Whangarei District Airport.

A glossary of terminology is provided in Appendix A.

## 2.0 NOISE PERFORMANCE STANDARDS

The New Zealand Standard NZS 6805:1992 "*Airport Noise Management and Land Use Planning*" provides a recommended approach for territorial authorities dealing with airports and land affected by airport noise. The process aims to manage the adverse effects of airport noise by controlling the use of land around airports, and by ensuring the airport does not exceed the future noise contours used for the planning process.

The Standard recommends two boundaries, the Airnoise Boundary (ANB) and the Outer Control Boundary (OCB). At Whangarei, the provisions of NZS 6805 have been implemented through the District Plan (refer Appendix B). Planning Map 46R indicates the location of the ANB and OCB. Noise rules in the plan specify that noise from aircraft operations shall not exceed 65 dBA  $L_{dn}$  outside the ANB

Further, the Airport Noise Management Plan (ANMP) for Whangarei District Airport (March 2005) sets out the procedure to be followed for compliance monitoring. In summary, the ANMP requires noise contours be produced to assess compliance with the relevant noise rules, and that this be undertaken on a biannual basis.

## 3.0 INTEGRATED NOISE MODEL

Several computer based models have been developed to predict aircraft noise in the vicinity of an airport. The most widely used of the models (and the model recommended in NZS 6805) is the Integrated Noise Model (INM) developed by the US Federal Aviation Authority. The INM calculation procedures use an energy averaging technique to calculate the noise exposure in terms of  $L_{dn}$ .

The INM calculates the noise level at a large number of grid points by summing the 'noise energy' from each aircraft movement during a 'typical' day's operation. The 'noise energy' is calculated using the hourly  $L_{eq}$  value, night-weighted by +10 dBA and then averaged over 24 hours to give the daily  $L_{dn}$  value at each grid point. The grid points with equal noise level are then joined graphically to give a plot of  $L_{dn}$  noise contours. The INM predicts the noise level from aircraft operations in take-off and landing and excludes engine testing and taxi-ing.

The original airport noise contours used to develop the existing airport noise boundaries were generated in 2002 using INM version 6.1. Since this time there have been several updates to the INM program which produces slightly different results.

### 3.1 INM updates

To ensure consistency with the District Plan, the version used for these 2008 compliance contours is the same as that used to develop the original noise contours contained in the District Plan (ie. INM v6.1).

Nevertheless, currently the most up to date version of the INM model is version 7a. As this has improved algorithms for predicting helicopter hovering operations, and fully incorporates the Helicopter Noise Model (HNM), this has been used to calculate the noise levels from this activity.

Therefore the resultant noise contour plots presented here are a combination of noise contours from general airport operations produced in INM v6.1 and noise contours from helicopter hovering operations produced in INM v7a.

It is considered that the INM v7a predicted helicopter hovering noise contours are generally more accurate than helicopter hovering noise contours predicted with INM v6.1.

### 3.2 Terrain

INM v6.1 has the ability to include terrain effects. This is particularly helpful for airports such as Whangarei where there are significant topographical features in close proximity. In summary, the effects of terrain are the change in distance between aircraft noise sources and receivers on the ground.

However, no account of the screening effects of topographical features is included in the calculation algorithms. Therefore the same methodology as used previously (including in the District Plan noise contours) has been implemented to account for this effect.

Terrain data for Whangarei has been derived from NASA topographical data.

### 3.3 Aircraft Activity

Aircraft activity has been noted for 12 months (1 July 2007 – 30 June 2008) by Whangarei District Airport. The current average number of daily movements was determined by averaging the flight statistics over the last 12 month period. For each aircraft movement, including departures, arrivals and training circuits, the following information was provided for input into the model:

- Aircraft type
- Runway usage
- Time of day (day 0700–2200 or night 2200–0700)

- Departure, arrival or training circuit tracks

The effects of helicopter training have also been included in the noise model.

#### 4.0 PREDICTED NOISE CONTOURS

The predicted 55 and 65 dBA  $L_{dn}$  contours are shown in Figure 1, Appendix C. Also shown are the Outer Control Boundary (OCB) and Airnoise Boundary (ANB), as published in the current District Plan.

From Figure 1, it can be seen that the predicted 55 dBA  $L_{dn}$  contour is within the OCB and that the predicted 65 dBA  $L_{dn}$  contour is within the ANB. Therefore, it can be stated that the predicted current noise levels comply with the District Plan noise controls.

It is noted that these 2008 noise contours are smaller in extent than the 2006 noise compliance contours on centreline. This is largely due to a reduction in aircraft activity at the airport.

However, the contours as a result of helicopter hovering activity are larger in extent, due to the more accurate helicopter hovering calculation procedure.

#### 5.0 CONCLUSION

Marshall Day Acoustics has prepared aircraft noise contours for Whangarei District Airport, to assess compliance with the Whangarei District Plan.

Based on actual recorded aircraft activity (provided by Whangarei District Airport), noise contours have been predicted using the Integrated Noise Model. The predicted noise contours demonstrate that noise from aircraft operations (for 1 July 2007 until 30 June 2008) complies with the District Plan noise controls.

APPENDIX A – GLOSSARY OF TERMINOLOGY

$L_{eq}$	The time averaged sound level (on a log/energy basis) over the measurement period (normally A-weighted).
$L_{dn}$	The day-night sound level which is calculated from the 24 hour $L_{eq}$ with a 10 dBA penalty applied to the night-time (2200-0700 hours) $L_{eq}$ (normally A-weighted).
$L_{95}$	The sound level which is equalled or exceeded for 95% of the measurement period. $L_{95}$ is an indicator of the mean minimum noise level and is used in New Zealand as the descriptor for background noise (normally A-weighted).
$L_{10}$	The sound level which is equalled or exceeded for 10% of the measurement period. $L_{10}$ is an indicator of the mean maximum noise level and is used in New Zealand as the descriptor for intrusive noise (normally A-weighted).
$L_{max}$	The maximum sound level recorded during the measurement period (normally A-weighted).
Noise	A sound that is unwanted by, or distracting to, the receiver.
Ambient Noise	Ambient Noise is the all-encompassing noise associated with any given environment and is usually a composite of sounds from many sources near and far.
NZS 6801	New Zealand Standard NZS 6801:1991 " <i>Measurement of Sound</i> "
NZS 6802	New Zealand Standard NZS 6802:1991 " <i>Assessment of Environmental Sound</i> ".
NZS 6805	New Zealand Standard NZS 6805:1992 " <i>Airport Noise Management and Land Use Planning</i> "
NZS 6807	New Zealand Standard NZS 6807:1994 " <i>Noise Management and Land Use Planning for Helicopter Landing Areas</i> "

APPENDIX B – WHANGAREI DISTRICT PLAN NOISE RULES

**62.3 Noise from Aircraft Operations**

- a) Noise from aircraft operations shall be so managed that the rolling 3-month average 24-hour night weighted sound exposure does not exceed 65dBA Ldn at, or at any point outside, the Air Noise Boundary; and
- b) Helicopter hovering (other than hovering included in normal take off landing) is restricted to the area identified as "Helicopter Hovering Area" on Planning Map 46; and
- c) Noise from aircraft operations, measured as the rolling 3-month average 24-hour night weighted sound exposure may exceed the noise limits in Rule 62.3 a) in the event of:
  - i. Aircraft landing in an emergency; and
  - ii. The operation of emergency flights required to rescue persons from life-threatening situations or to transport patients, human vital organs or medical personnel in a medical emergency; and
  - iii. The operation of unscheduled flights required to meet the needs of a national or civil defence emergency declared under the Civil Defence Act 1983; and

(source: Whangarei District Plan Chapter 62)

**2. DW 124 (Whangarei Airport)**

Designation DW124 shall be subject to the following conditions:

1. The activities authorised by Designation DW124 shall be subject to the Airport noise limits imposed by the District Plan of the Whangarei District Council and in particular (but without limiting the application of this condition) Rule 44.3.6 relating to aircraft engine testing and Rule 62.5 relating to noise from aircraft operations.
2. Within 6 months of the date of commencement of these amended conditions of Designation DW 124, the Whangarei Airport Authority shall submit to the Whangarei District Council as consent authority for approval an Airport Noise Management Plan (ANMP). The ANMP shall include:

- a) The manner in which the Airport Authority will comply with the District Plan rules relating to Airport noise. That section of the ANMP shall be prepared by a suitably qualified and experienced acoustical engineer.
- b) Provision for an Airport Noise Management Consultative Committee, the membership of which committee should include representatives of interested parties.
- c) The manner in which the Airport Authority will deal with the following:
  - helicopter flight paths;
  - helicopter hovering activity;
  - engine testing;
  - education of airport users and operators;
  - complaints; and
  - monitoring;
  - any other relevant matters.

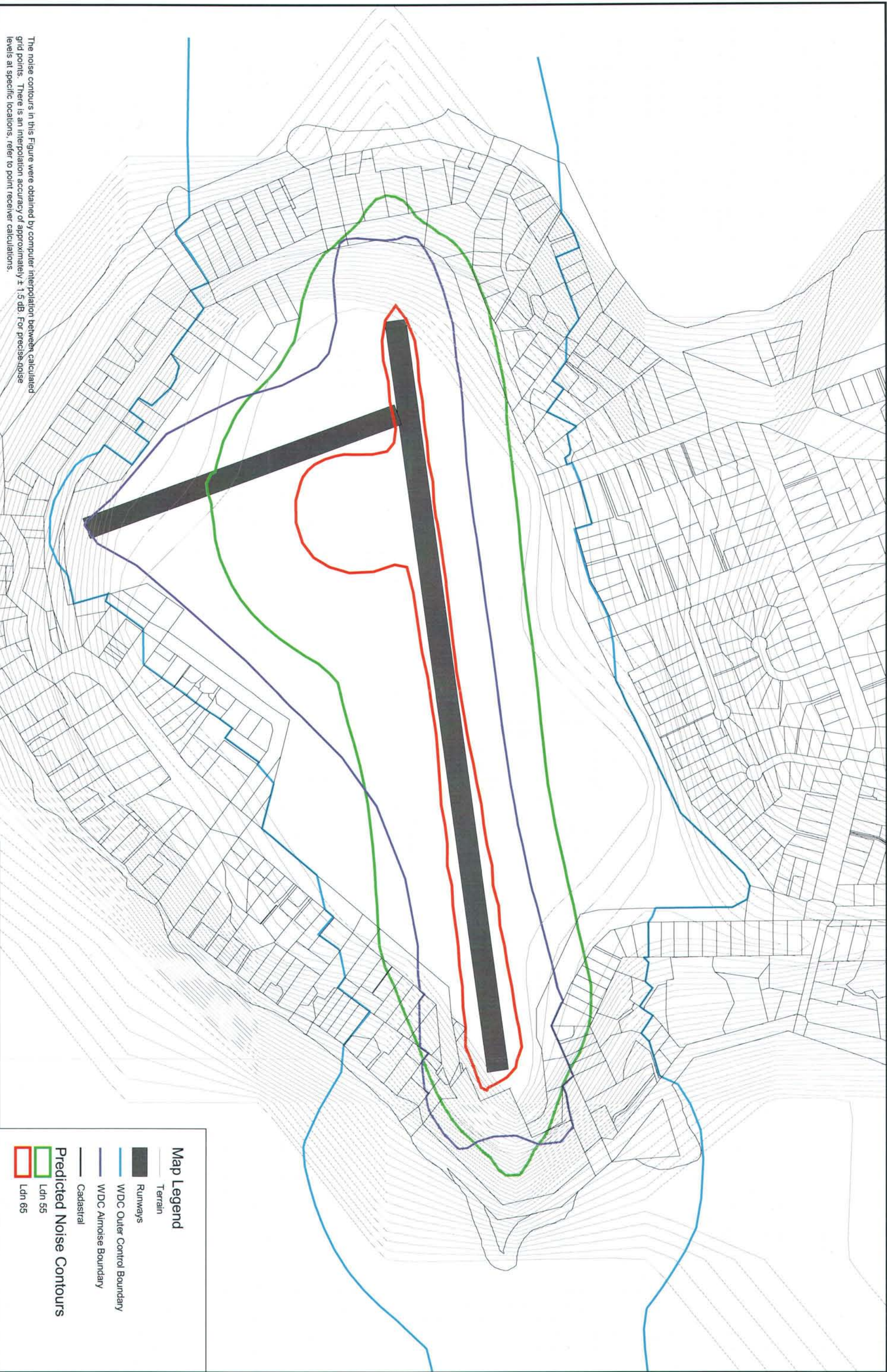
(source: Whangarei District Plan Chapter 85)



APPENDIX C - FIGURES

Figure 1 - 2008 Noise Compliance Contours





The noise contours in this Figure were obtained by computer interpolation between calculated grid points. There is an interpolation accuracy of approximately  $\pm 1.5$  dB. For precise noise levels at specific locations, refer to point receiver calculations.

Figure 1 - 2008 Noise Compliance Contours

Client: Whangarei District Airport  
 Path: J:\OBS\2008\2008545A\CAD Figures  
 Filename: 2008 Figure 1.SGS INM case: 2008 Biannual Contours R00  
 Prepared by: SJP Date: 19/1/108

**Map Legend**

- Terrain
- Runways
- WDC Outer Control Boundary
- WDC Airnoise Boundary
- Cadastral

**Predicted Noise Contours**

- Ldn 65
- Ldn 55
- Ldn 65

Scale 1:5000

0 25 50 100 150 200 m