

# ANCCG Meeting

Monitoring Period  
August 2022 – October 2022

Meeting: 19 December 2022

MARSHALL DAY   
Acoustics

NB: Glossary of terminology given in Appendix A



# Aircraft Operations

Figure 1: Number of Aircraft Operations per Month

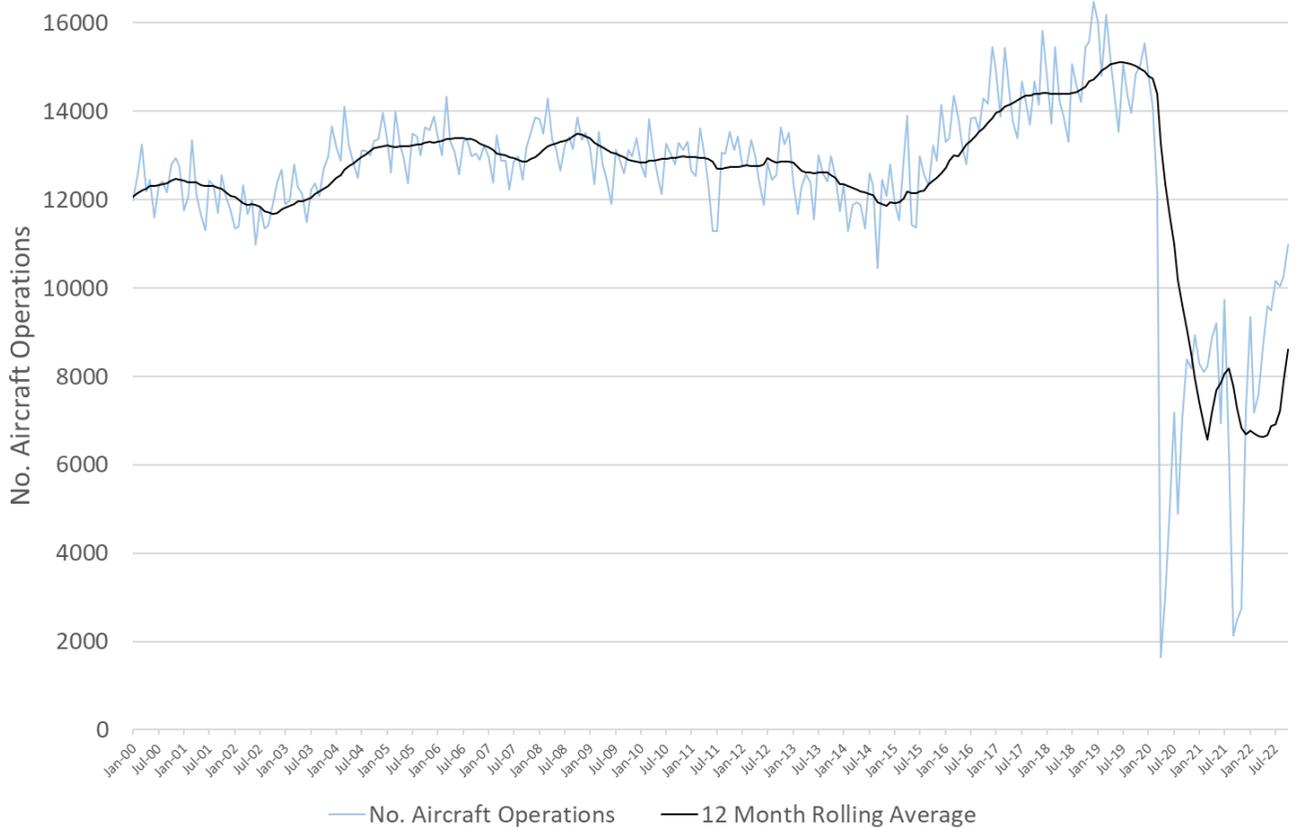


Figure 1 shows the number of aircraft operations per month since the year 2000 (blue line) and the 12-month rolling average (black line).

Aircraft operations have fluctuated over the years with dips in 2002, 2014 and more recently in 2020-2022 due to the COVID-19 pandemic.

Between 2015 and 2020 aircraft operations increased steadily. However, the effect of the COVID-19 pandemic has greatly impacted the aircraft operations in the last two years.

The number of aircraft operations in the three-month period August 2022 to October 2022 has increased by 187% when compared to the same period last year, due to the New Zealand international border fully reopening on the 1<sup>st</sup> August. Aircraft operations for this period in 2022 are down 27% from operations in the same period in 2019 (pre-pandemic). Coincidentally both the 2022 daytime and night-time operations are also each down 27% when compared to the same period in 2019.

And when compared to the same (pandemic affected) period last year, daytime operations have increased by 198% and night-time operations have increased by 126%.

Table 1: Summary of Aircraft Operations

| Operation    | Total         | Day           | Night        |
|--------------|---------------|---------------|--------------|
| Arrivals     | 16,715        | 14,391        | 2,324        |
| Departures   | 14,562        | 13,297        | 1,265        |
| Circuit      | 32            | 23            | 9            |
| <b>Total</b> | <b>31,309</b> | <b>27,711</b> | <b>3,598</b> |

Table 2: Average Daily Aircraft Operations

| Total | Day | Night |
|-------|-----|-------|
| 340   | 301 | 39    |

Table 1 shows a breakdown of aircraft operations in the three-month period August 2022 to October 2022.

Table 2 shows that there were on average 340 aircraft operations that occurred per day (24-hour period), 39 of these were at night-time.

The average daily aircraft operations generally ranged between 450 – 550 movements per day prior to the COVID-19 pandemic, with around 50 – 60 of those at night-time.

Figure 2: Aircraft Operations by Time

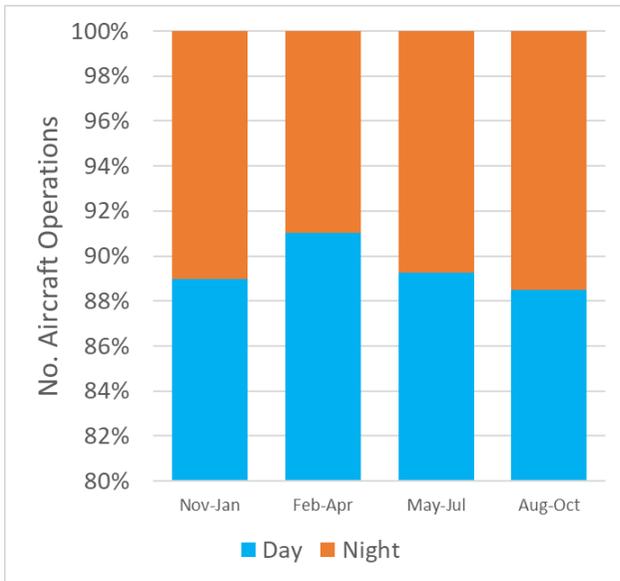


Figure 3: Aircraft Operations by Aircraft Type

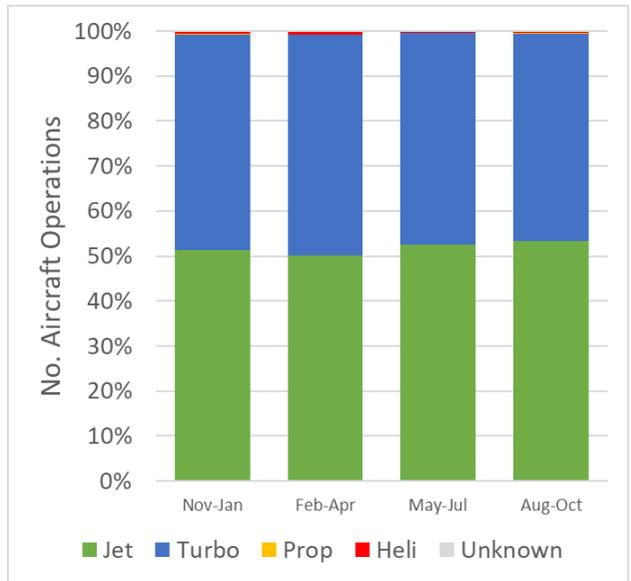


Figure 2 shows the breakdown of aircraft operations by time of day for this three-month period August 2022 to October 2022 and the three quarters preceding.

For this period 89% of aircraft operations occurred in the daytime between 7am and 10pm and 11% occurred at night-time.

This was similar to previous quarters.

Figure 3 shows the breakdown of aircraft operations by aircraft type in this three-month period and the three quarters preceding.

For this period 53% of aircraft operations were jets with 46% being turboprops.

Propeller and helicopter aircraft together made up less than 1% of the total aircraft operations during this period.

Figure 4: Aircraft Operations by Runway

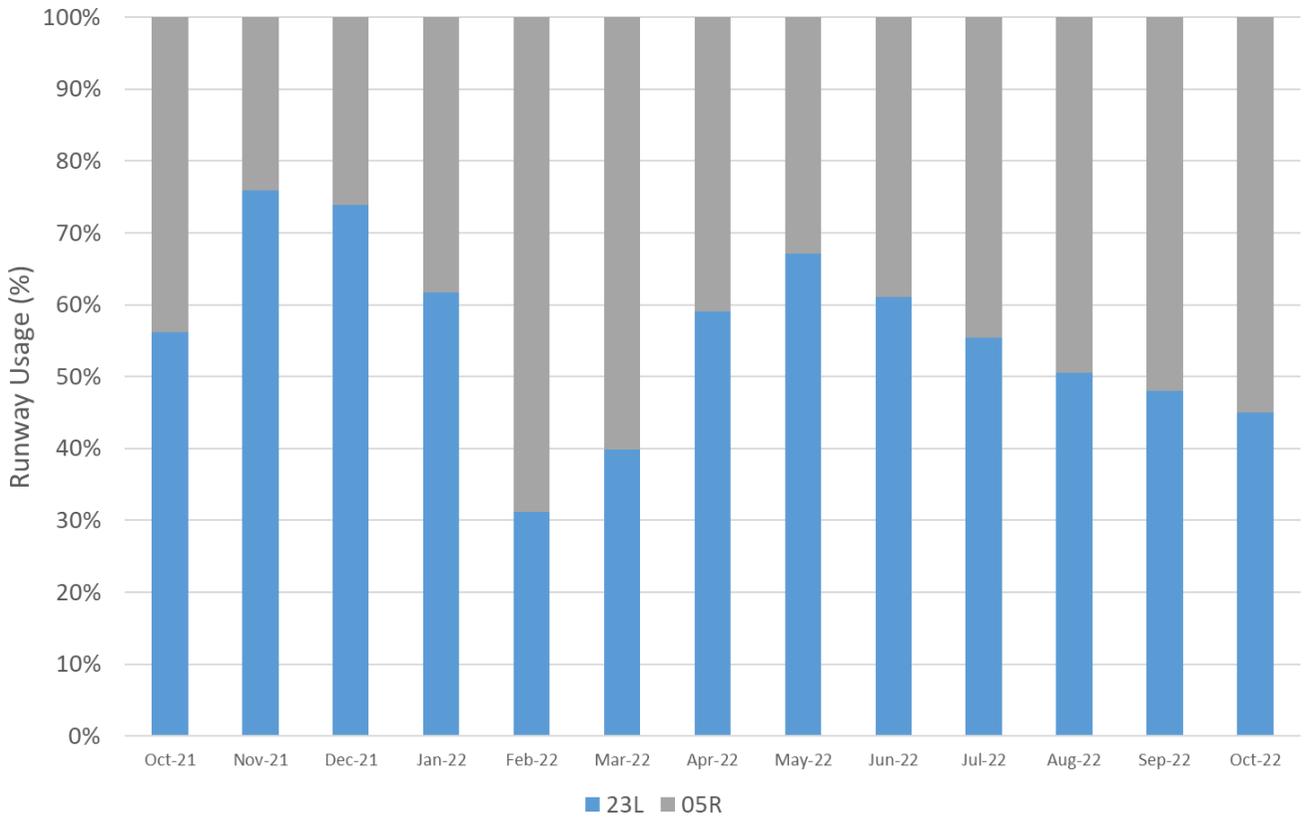


Figure 4 shows the percentage of aircraft operations that used each runway (23L and 05R) over the past 13 months.

Runway 23L is used when westerly winds prevail and Runway 05R is used when easterly winds prevail (refer glossary for explanation)

The historical average runway usage is approximately RW23L 70%/RW05R 30%

The runway usage in the three-month period August 2022 to October 2022 was RW23L 48%/RW05R 52%.

The runway use in the same quarter last year was RW23L 74%/RW05R 26%

Figure 5: Number of SMART Approaches per week

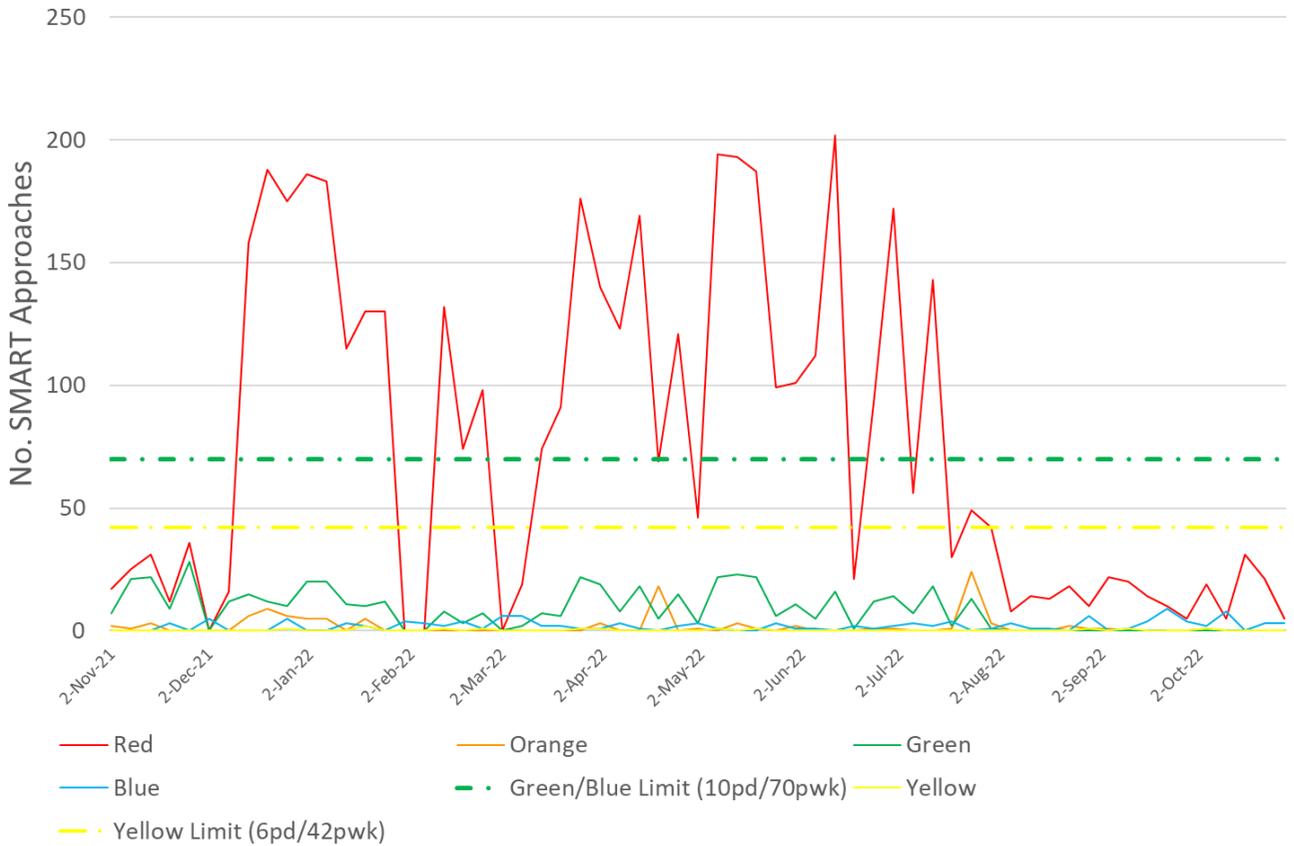


Figure 5 shows the number of SMART flights flown per week in the past 12 months. The SMART Approaches are named as follows:

- Blue X05A – International arrivals from the north on Runway 05R overflying Lynfield
- Green X23A - International arrivals from the north on Runway 23L overflying Highbrook
- Yellow U23 - International arrivals from the north on Runway 23L overflying Whitford
- Red – Domestic arrivals from the south on Runway 23L overflying Wattle Downs
- Orange S23 – Domestic arrivals from the south on Runway 23L overflying Clevedon

There is a limit of:

- 10 SMART approaches per day on the Green and Blue SMART approaches
- 6 per day on the Yellow SMART approach

These limits have been complied with over the past 12 months.

Figure 6: Location of SMART Approaches

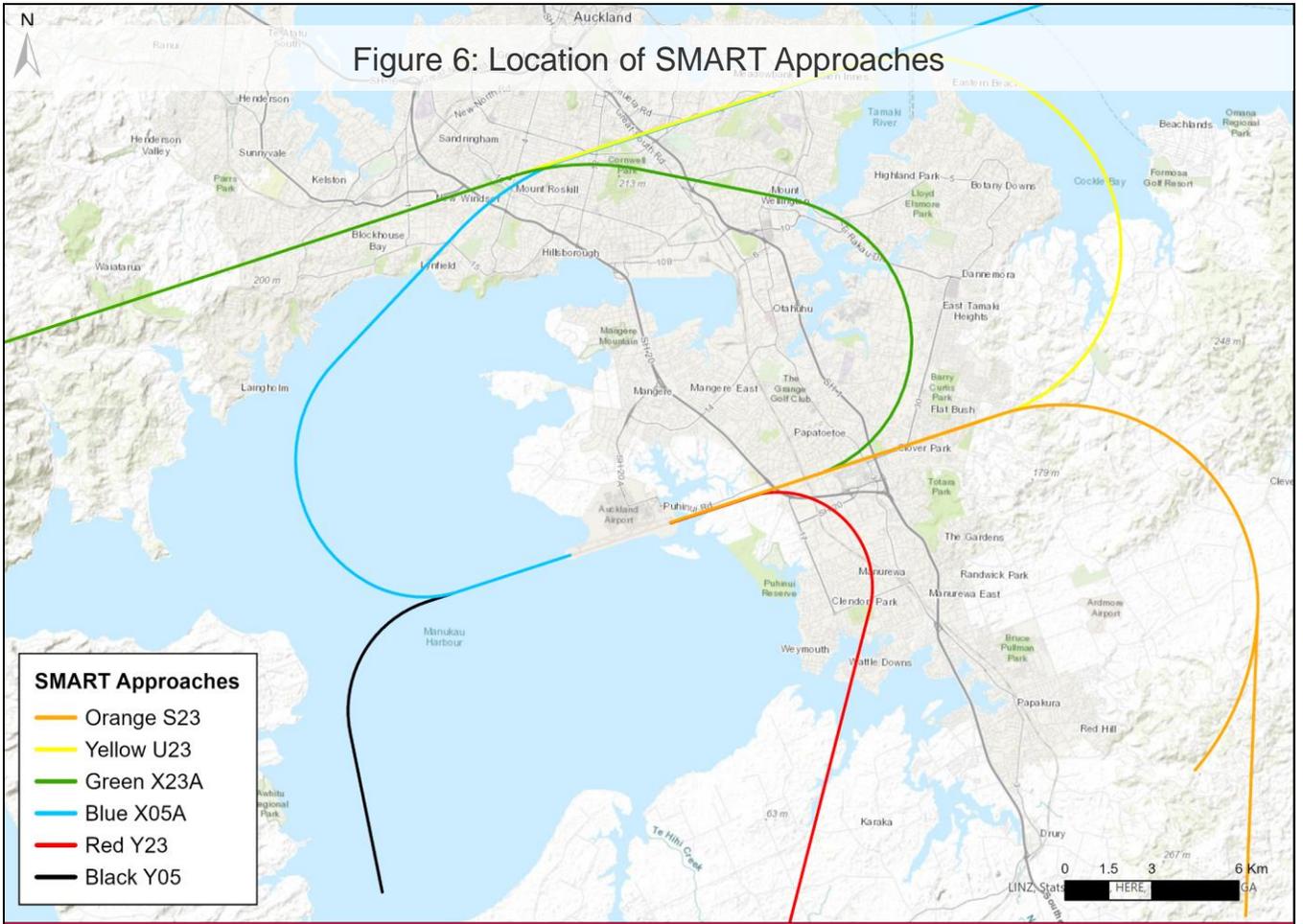


Figure 6 shows the location of the SMART approach flight paths.



# Flight Path Diagrams



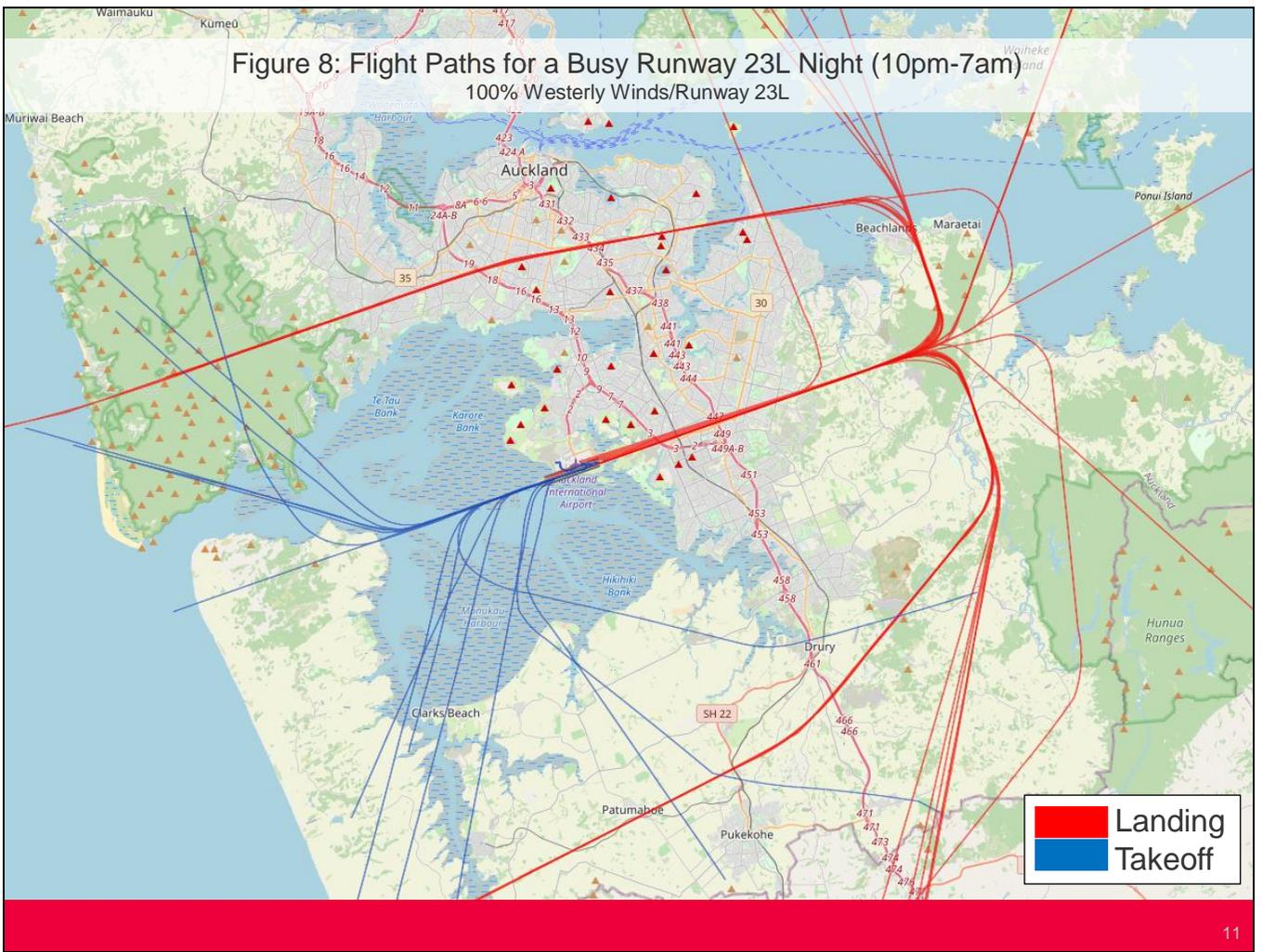


Figure 8 shows the night-time (10pm-7am) flight paths for Thursday 6 October 2022, the busiest day in the three-month period August 2022 to October 2022 when Runway 23L was primarily in use.

The red lines indicate arrivals and the blue lines indicate departures.

The runway usage in this 24-hour period was Runway 23L (westerly) 100%.

There were 48 night-time Runway 23L flights on this night.

Figure 9: Flight Paths for a Busy Runway 05R Day (7am-10pm)  
100% Easterly Winds/Runway 05R

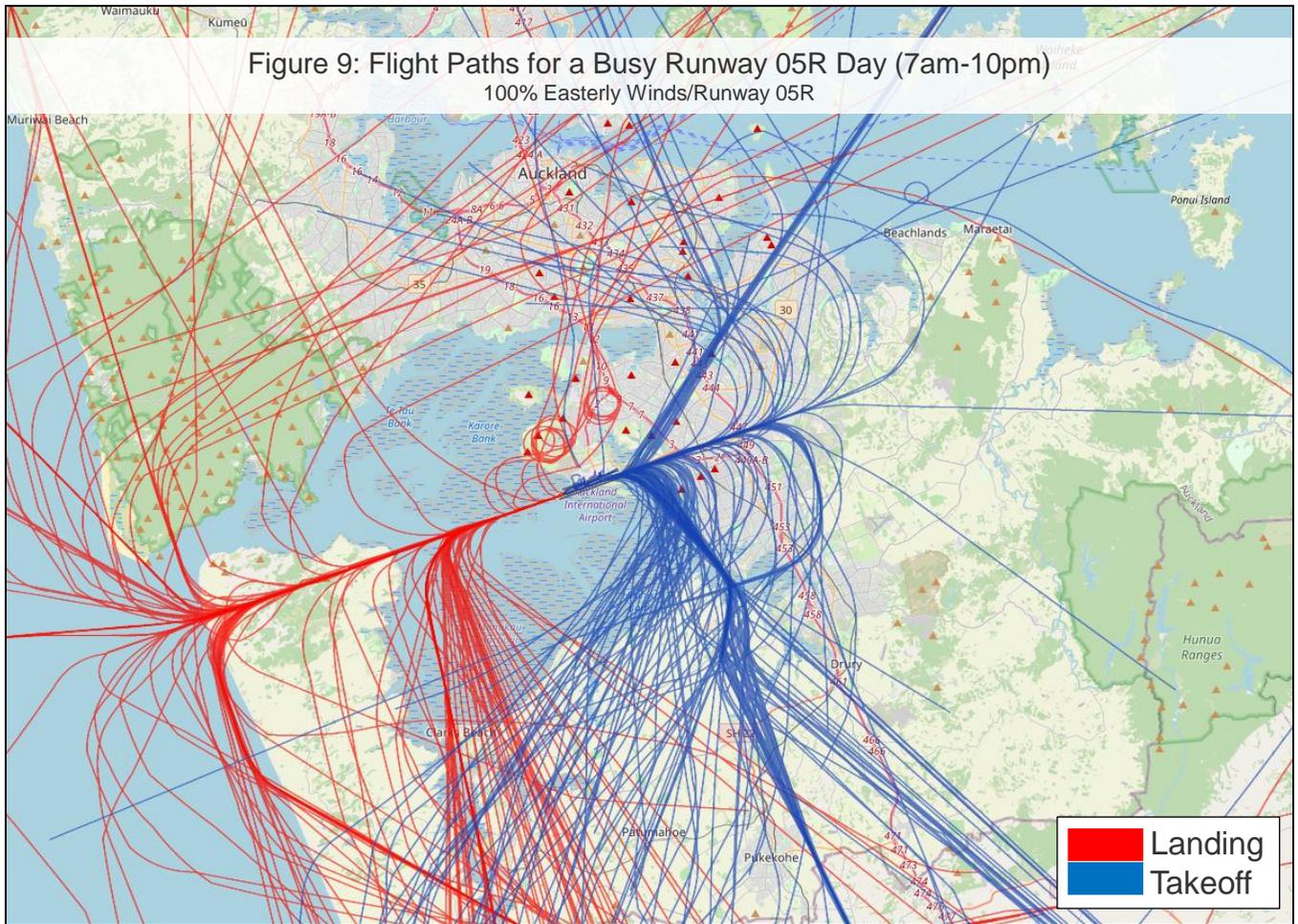


Figure 9 shows the daytime (7am-10pm) flight paths for Friday 14 October 2022, the busiest day in the three-month period August 2022 to October 2022 when Runway 05R was primarily in use.

The red lines indicate arrivals and the blue lines indicate departures.

The runway usage in this 24 hour period was Runway 05R (easterly) 100%.

There were 349 daytime Runway 05R flights on this day.

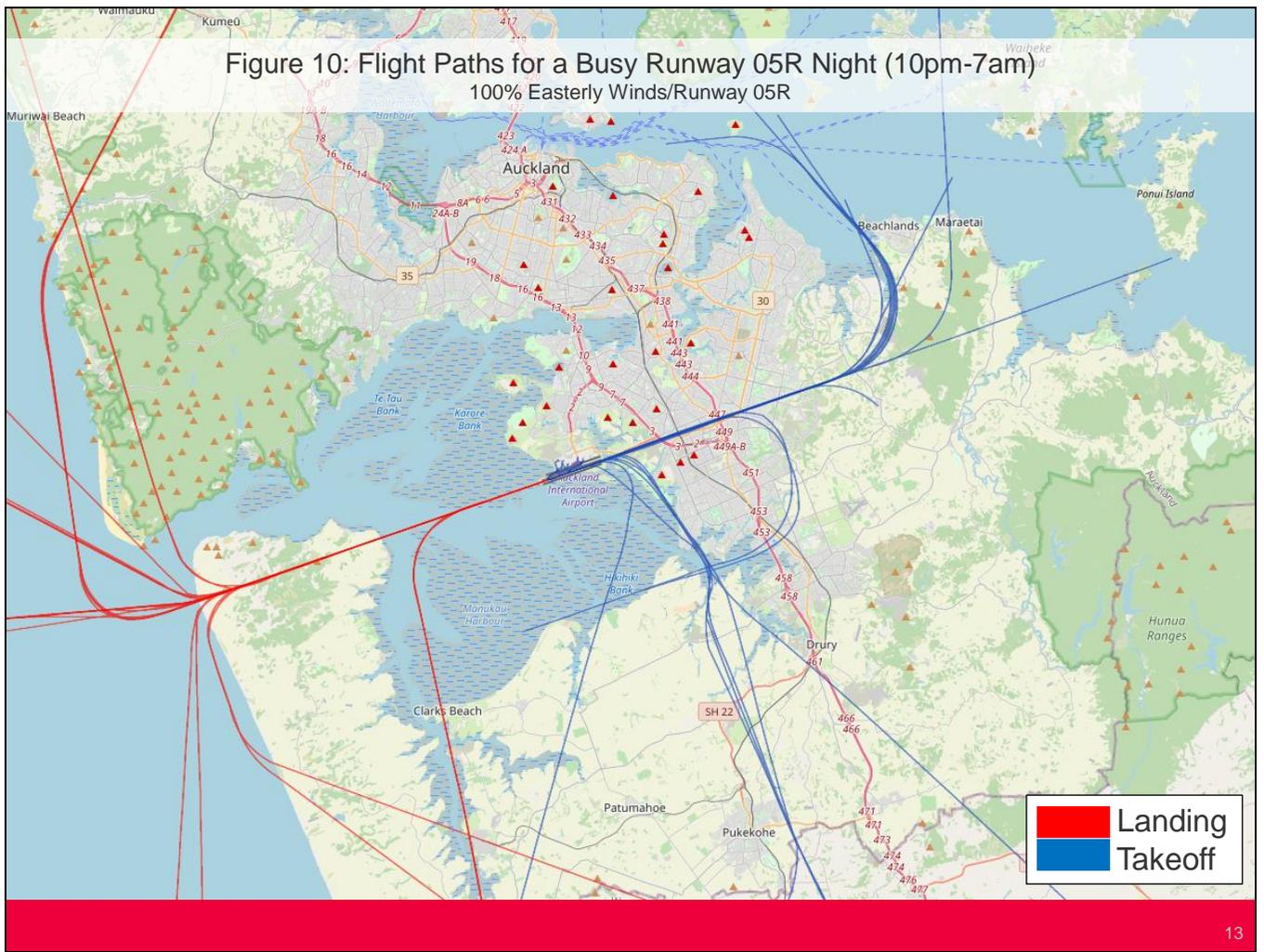


Figure 10 shows the night-time (10pm-7am) flight paths for Friday 14 October 2022, the busiest day in the three-month period August 2022 to October 2022 when Runway 05R was primarily in use.

The red lines indicate arrivals and the blue lines indicate departures.

The runway usage in this 24-hour period was Runway 05R (easterly) 100%.

There were 47 night-time Runway 05R flights on this night.

# Noise Complaints



Figure 11: Number of Aircraft Noise Complaints per Month

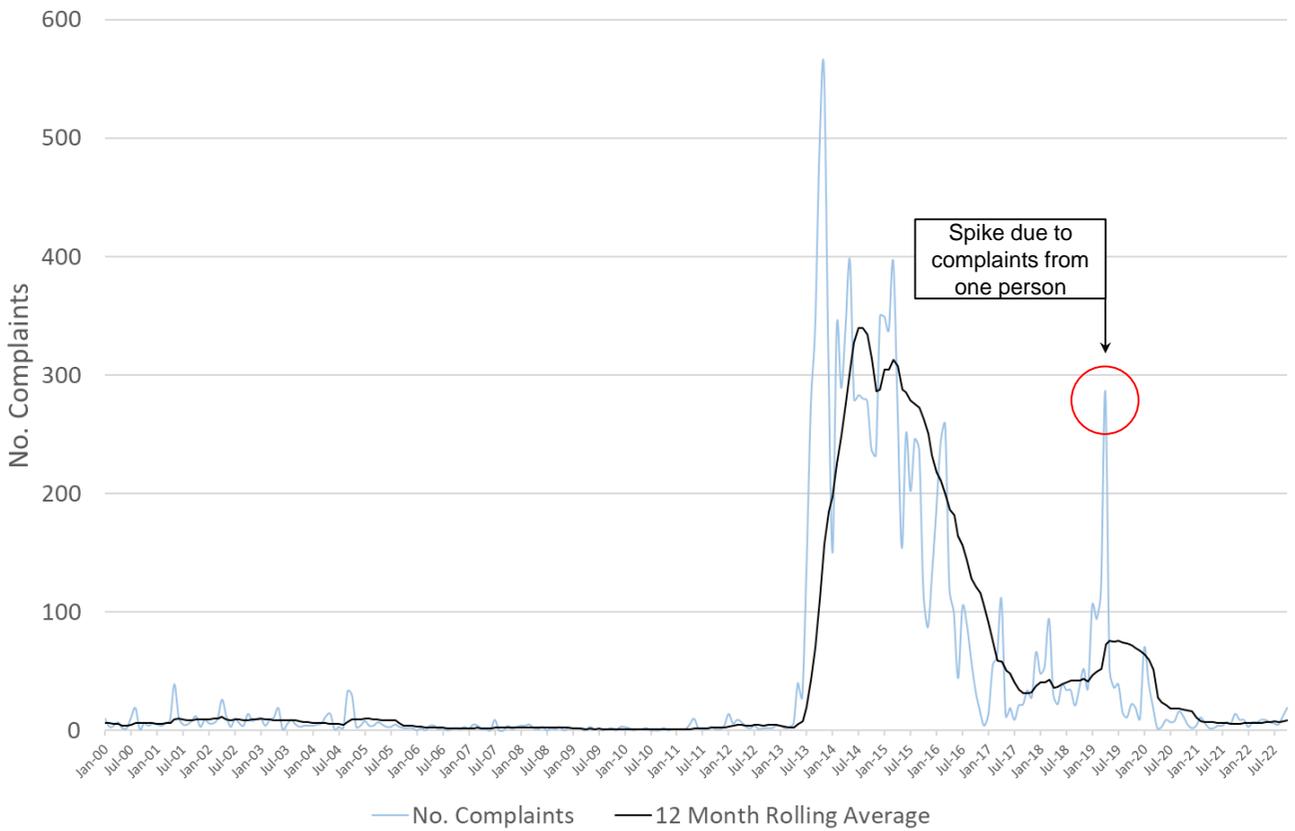


Figure 11 shows the total number of aircraft noise complaints made per month since the year 2000 (blue line) and the 12-month rolling average (black line).

Aircraft noise complaints were low up until 2013 when the number of complaints increased from about 2 per month to a peak of 560 in Aug 2013 and have decreased steadily since then.

This increase in complaints coincided with the 2012/13 SMART trials where community awareness to noise was heightened.

The number of noise complaints in the three-month period August 2022 to October 2022 has increased from 27 to 36 when compared to the same period last year.

Table 3: Summary of Noise Complaints

|                              | Aug | Sep | Oct | Aug-Oct | May-Jul | Feb-Apr | Nov-Jan |
|------------------------------|-----|-----|-----|---------|---------|---------|---------|
| Number of Complaints         | 5   | 12  | 19  | 36      | 22      | 23      | 21      |
| <i>Specific</i>              | 4   | 8   | 11  | 23      | 18      | 14      | 17      |
| <i>Generic</i>               | 1   | 3   | 6   | 10      | 2       | 5       | 3       |
| <i>Question</i>              | 0   | 1   | 2   | 3       | 2       | 4       | 1       |
| Number of People Complaining | 4   | 6   | 7   | 15      | 5       | 8       | 8       |

Table 3 shows a breakdown of the noise complaints in the three-month period August 2022 to October 2022 with the previous three quarters shown for reference.

A particular person may have made several complaints over time. These individual complaints could have been regarding one specific aircraft operation or a more general complaint which does not reference a specific aircraft operation.

There are two types of general complaints: ‘generic’ and ‘question’. The first relates to people lodging a general complaint about aircraft noise rather than a specific event, the second relates to people enquiring to ask for information about aircraft noise or management of noise. We therefore refer to:

- The number of ‘complainants’ (no. of people who complain),
- The number of ‘generic’ noise complaints (e.g. “there was more aircraft noise last night”)
- The number of ‘question’ noise enquiries (e.g. “can you tell me more about how noise is managed at the airport”)
- The number of ‘specific’ event complaints (e.g. “the 6:25pm flight was noisy”)

There were a total of 36 complaints in this three-month period, 64% related to specific aircraft events, 28% were generic complaints and 8% were question enquiries.

One person from Remuera made 53% (19) of the complaints for the three-month period.

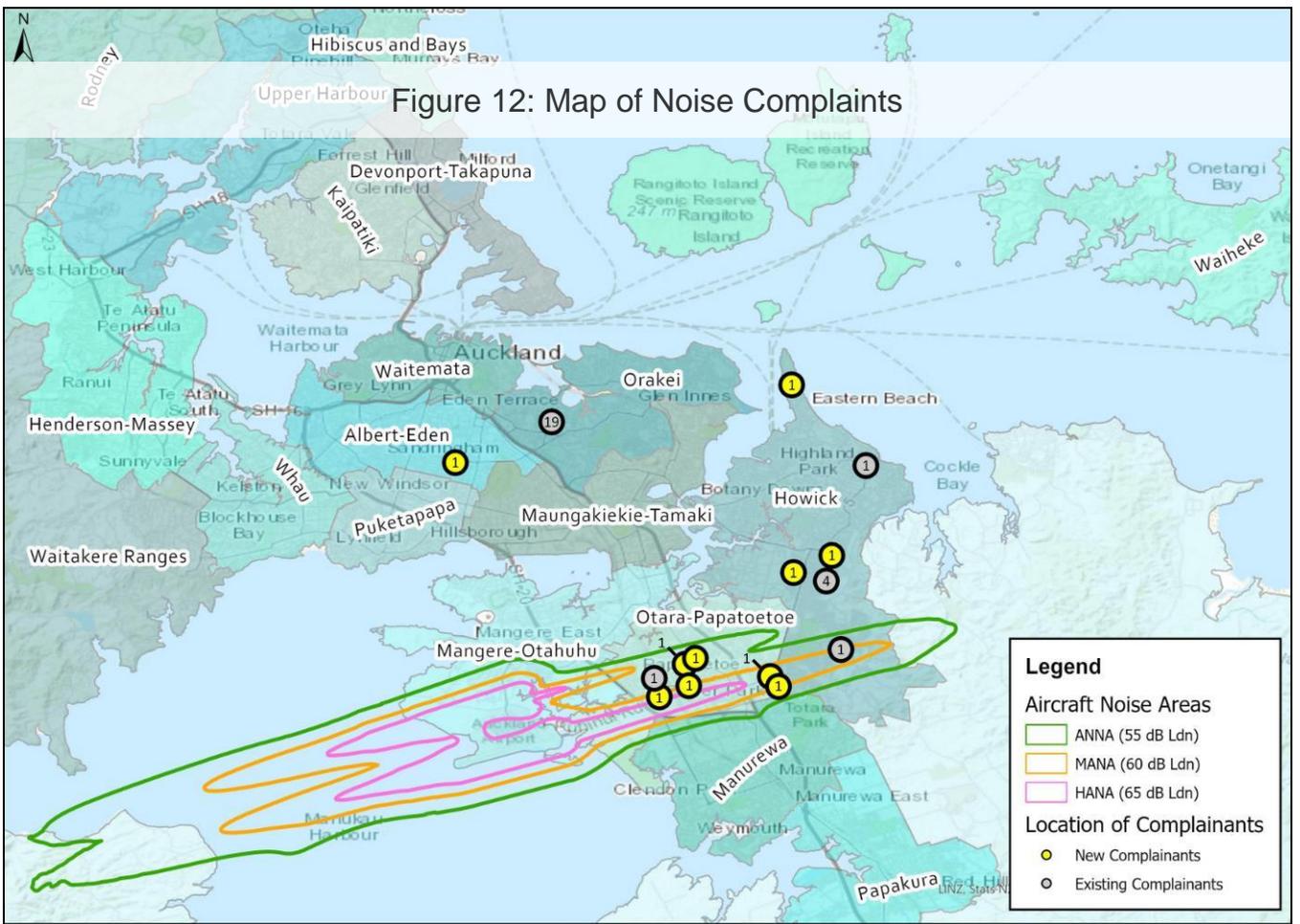


Figure 12 shows a map with the location of each complainant.

Each point represents the location of a person who complained in the three-month period August 2022 to October 2022.

The colour of the point represents whether it was an existing complainant (grey - someone who has complained before) or a new complainant (yellow - someone who hasn't complained before).

The numbers on top of each point give the number of complaints made by each person in the three-month period.

Figure 13: Number of Noise Complaints by Area

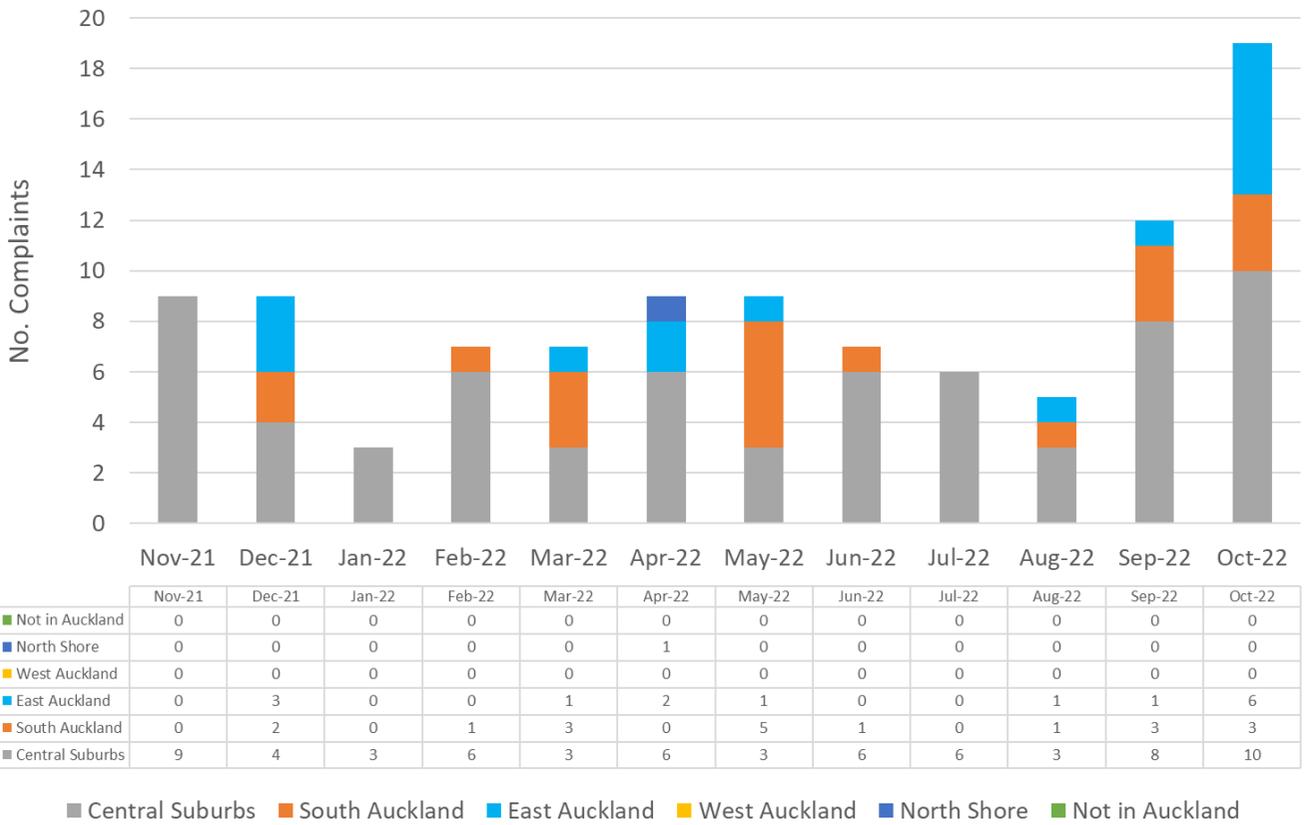


Figure 13 shows the number of complaints made by people residing in different areas of Auckland over the past 12 months.

Central had the most complaints at 21 in the three-month period August 2022 to October 2022.

A list of which suburbs fall into each area is provided in Appendix C.

Figure 14: Noise Complaints by Time

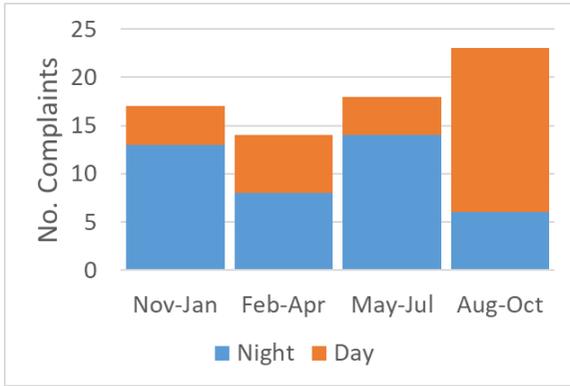


Figure 15: Noise Complaints by Runway

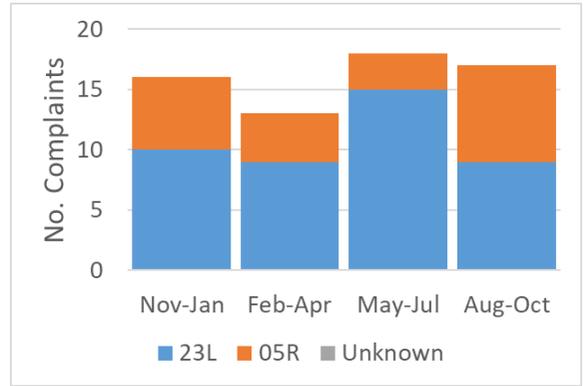


Figure 16: Noise Complaints by Aircraft

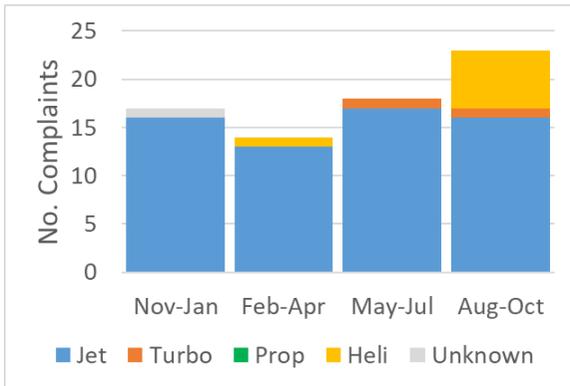
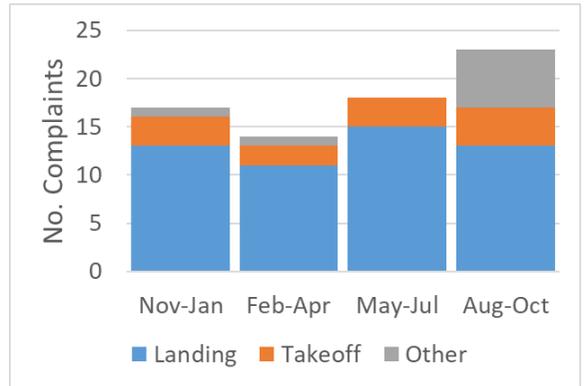


Figure 17: Noise Complaints by Operation



Figures 14-17 show a breakdown of the ‘specific’ aircraft noise complaints made in the three-month period August 2022 to October 2022 and the three quarters preceding.

The increase of complaints in this quarter compared to the previous quarters may be due to the change of change in flight volume. Residents may have become accustomed to the lower number of flights during the COVID-19 travel restrictions, so are more sensitive to the increased flight volume as the number of flights continue to return to pre-pandemic levels. Another reason may be the slightly increased use of Runway 05R compared to Runway 23L as seen in Figure 4 or later in Figure 19.

Figure 18: Specific Noise Complaints by Destination

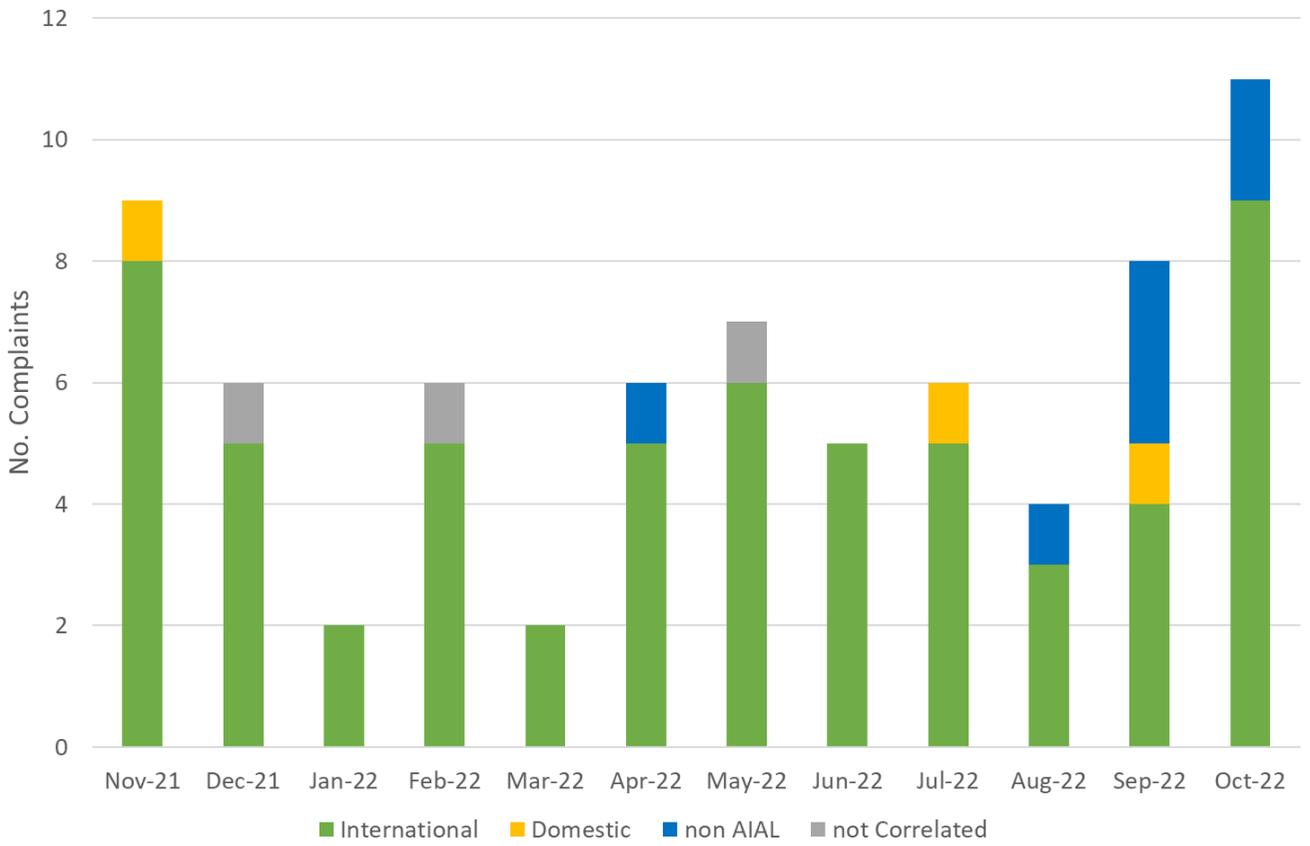


Figure 18 shows the number of specific aircraft complaints made about international and domestic flights over the past 12 months.

Figure 19: Specific Noise Complaints vs Usage of Runway 05R

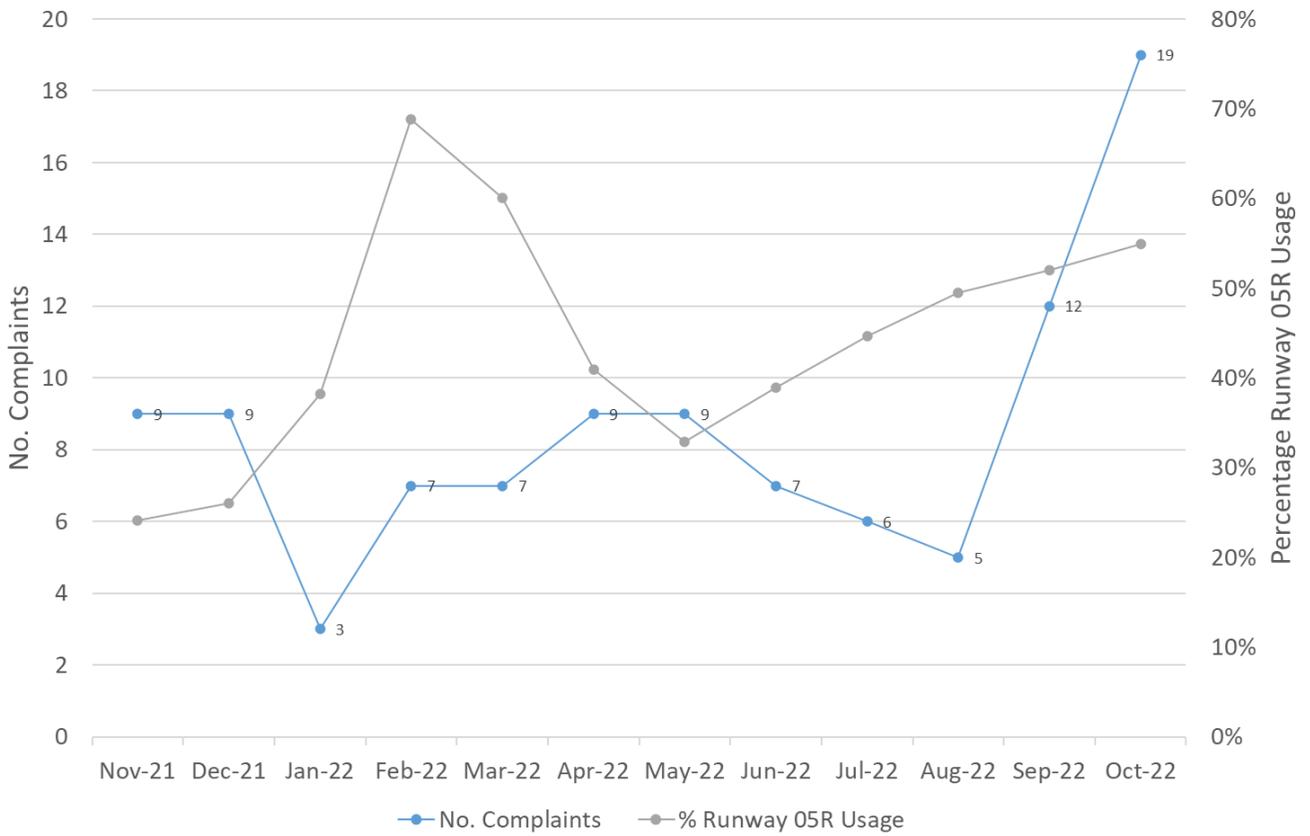


Figure 19 shows the number of specific noise complaints per month received in the past 12 months compared to the usage of Runway 05R.

Usage of Runway 05R is associated with easterly winds which cause departing aircraft to depart to the east over-populated areas instead of over the Manukau Harbour (as occurs in the predominant westerly winds).

Departing aircraft are generally louder than arriving aircraft.

There is generally a low correlation between runway usage and the number of complaints.

Figure 20: Specific Complaints by Hour vs Aircraft Operations by Hour

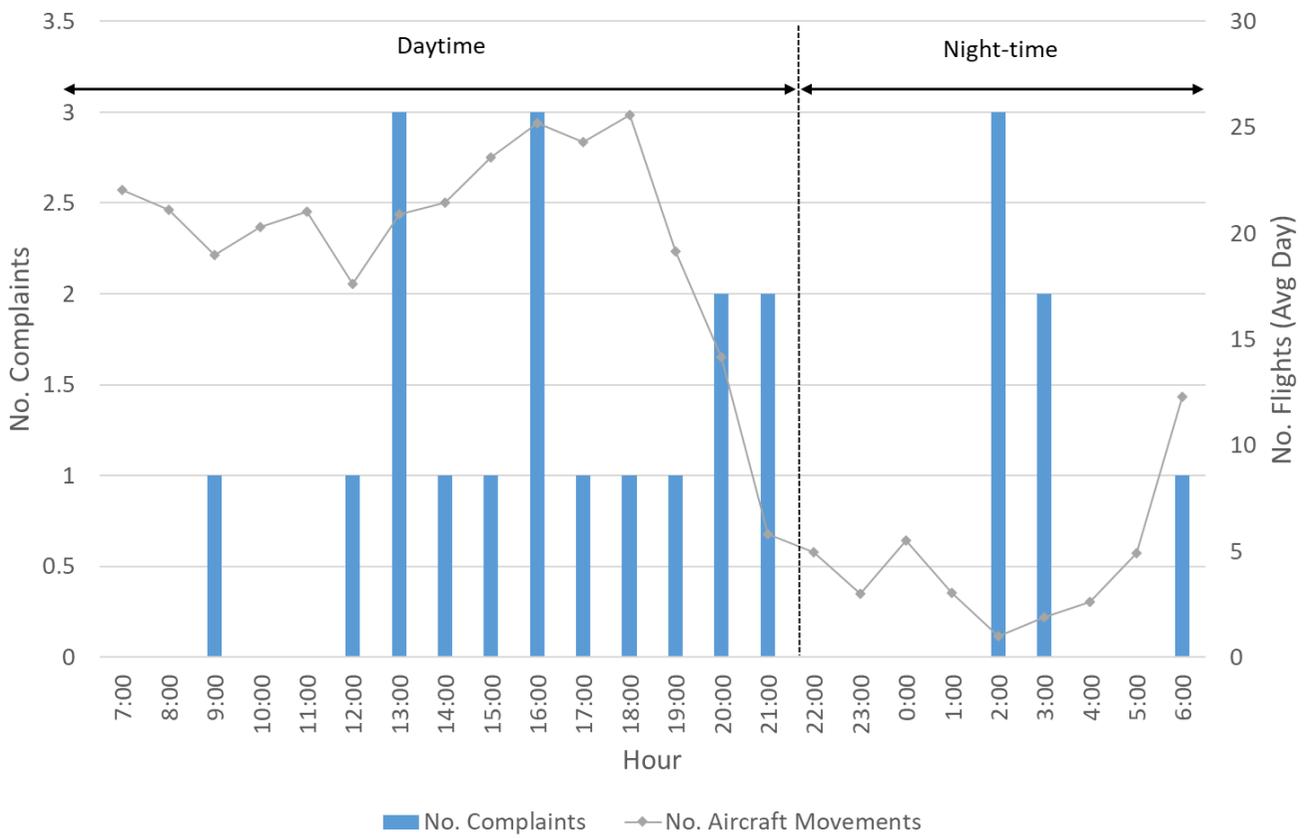


Figure 20 shows the number of specific aircraft noise complaints and the number of aircraft operations per hour.

The blue bars show the number of complaints that related to an aircraft operation in each hour of the day in the three-month period August 2022 to October 2022.

The gray line shows the average daily aircraft operations that occurred in each hour of the day during this period.

Figure 21: Noise Complaints by Type

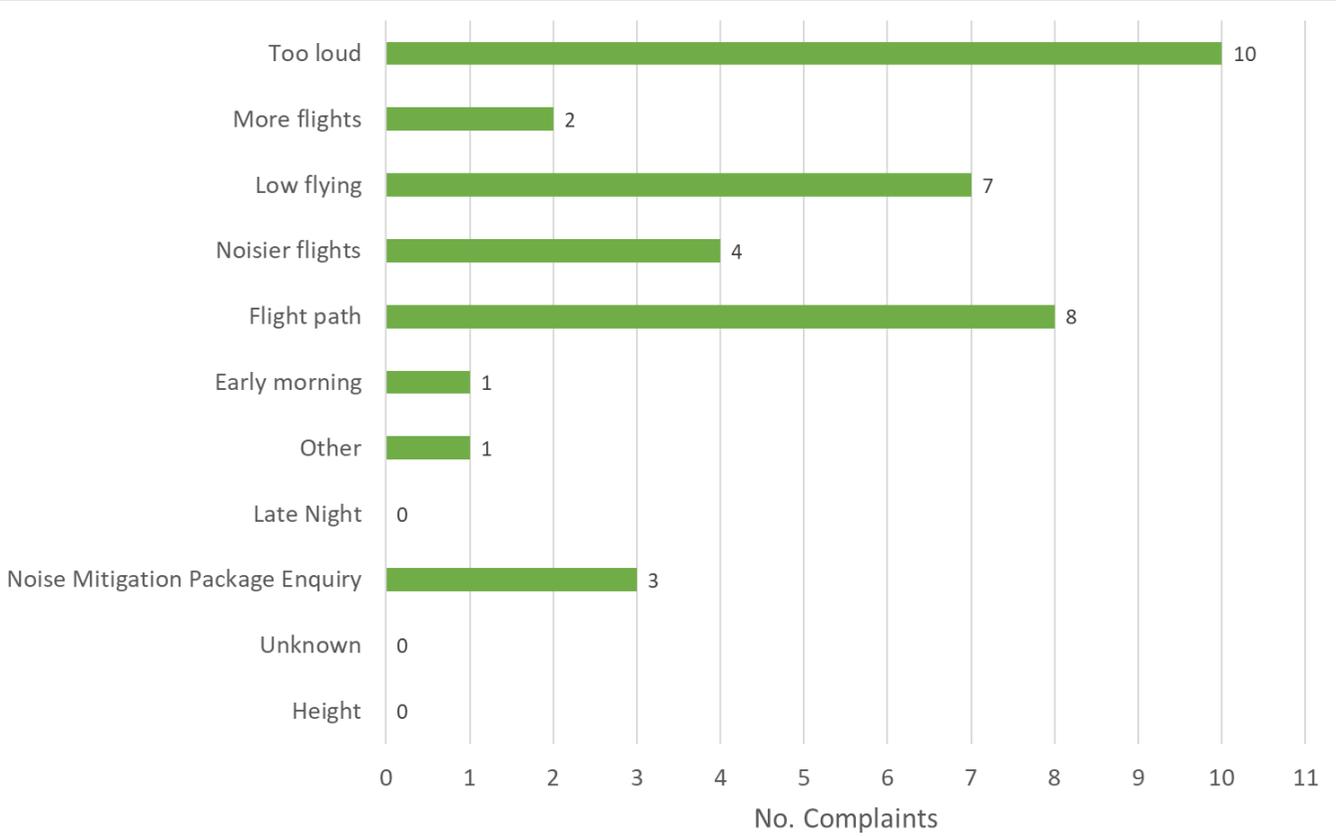


Figure 21 shows the reason for each noise complaint in the three-month period August 2022 to October 2022. This includes all complaints (generic, question and specific).

A full description of each cause is given in Appendix B.

Figure 22: Specific Aircraft Identified in Noise Complaints

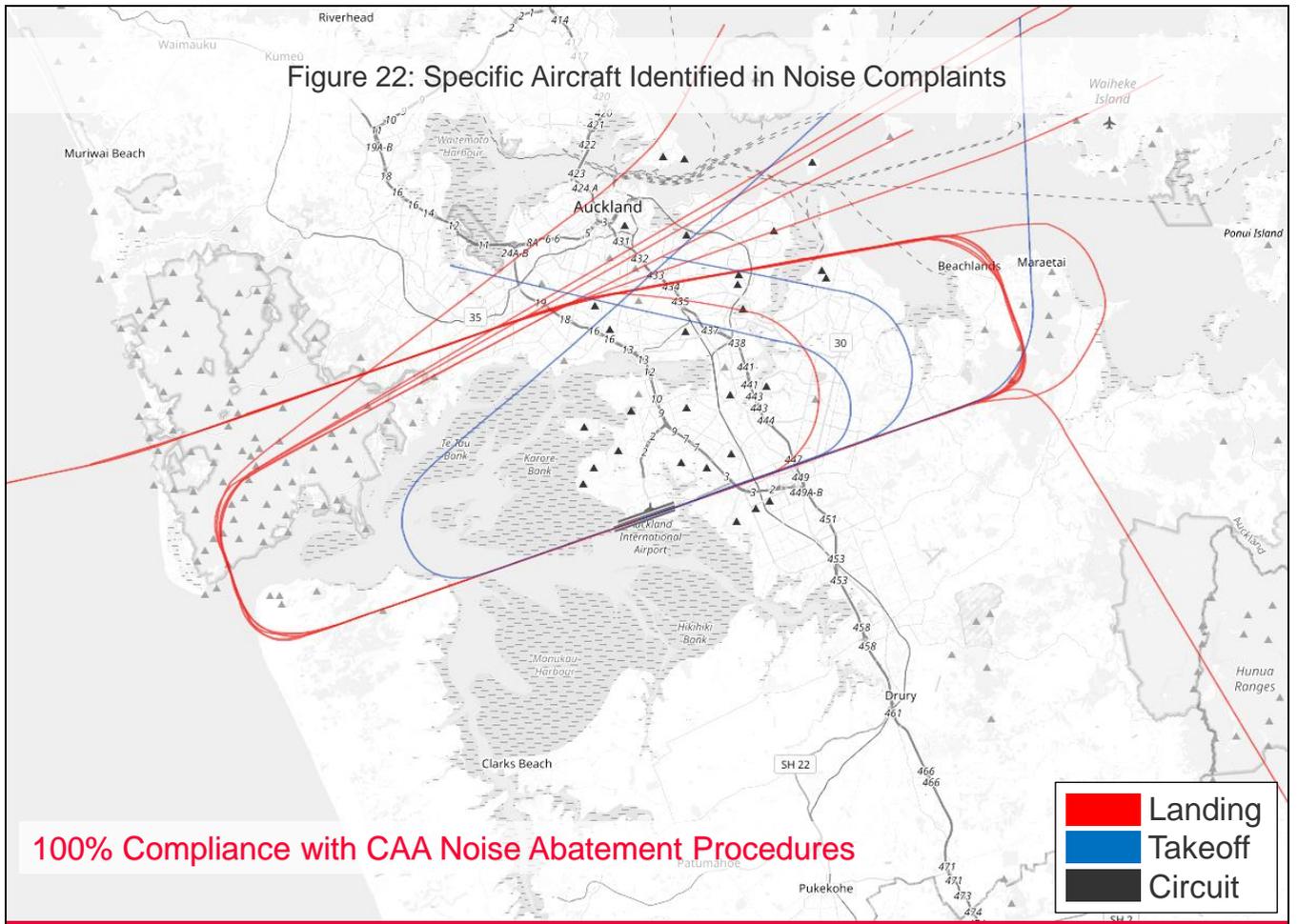


Figure 22 shows the flight paths for specific aircraft from Auckland Airport identified in noise complaints for the three-month period August 2022 to October 2022.

The red lines indicate arrivals, the blue lines indicate departures.

These Auckland Airport aircraft events have been reviewed by the Airport and all of them complied with the Civil Aviation Authority Noise Abatement Procedures.

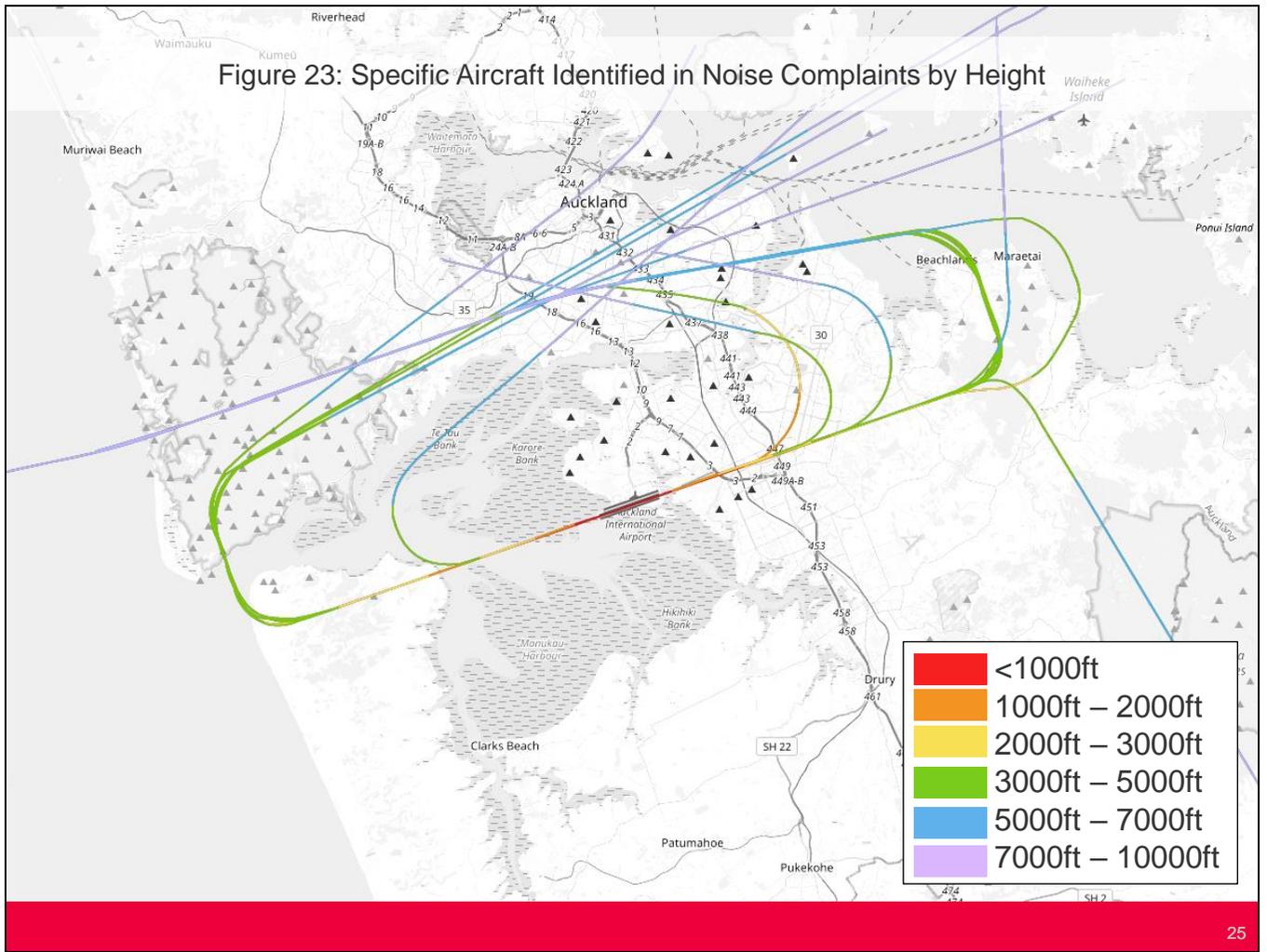
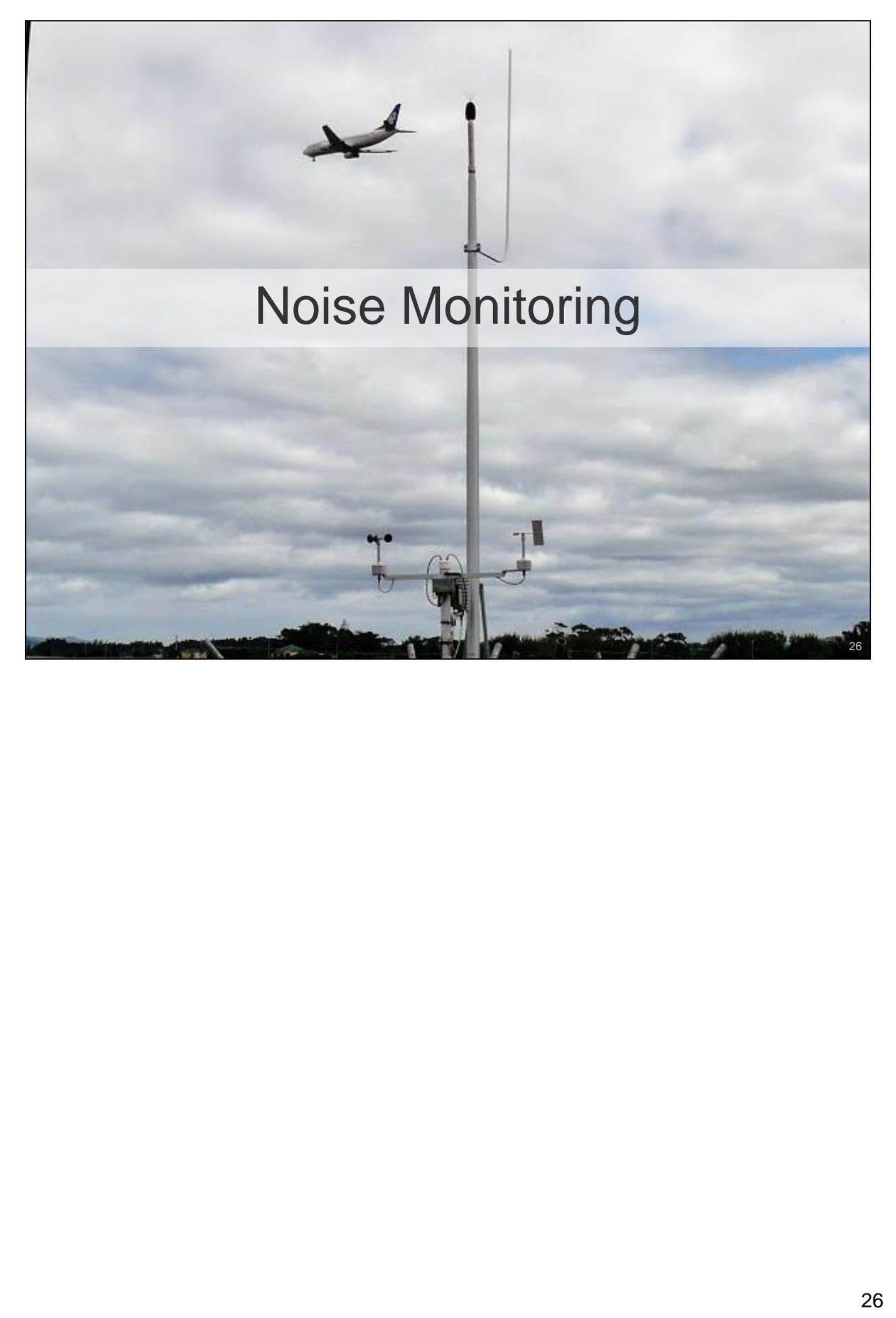


Figure 23 shows the flight paths for specific aircraft from Auckland Airport identified in noise complaints for the three-month period August 2022 to October 2022.

The flight paths are shown in terms of altitude.

A photograph of a noise monitoring station. A tall, white, cylindrical pole stands in the center. At the top of the pole is a small, dark, cylindrical sensor. A thin, white cable runs vertically down the side of the pole. Below the main pole, there is a horizontal arm with several smaller sensors and equipment. The background shows a cloudy sky with an airplane flying in the upper left quadrant. The text "Noise Monitoring" is overlaid in the center of the image.

# Noise Monitoring

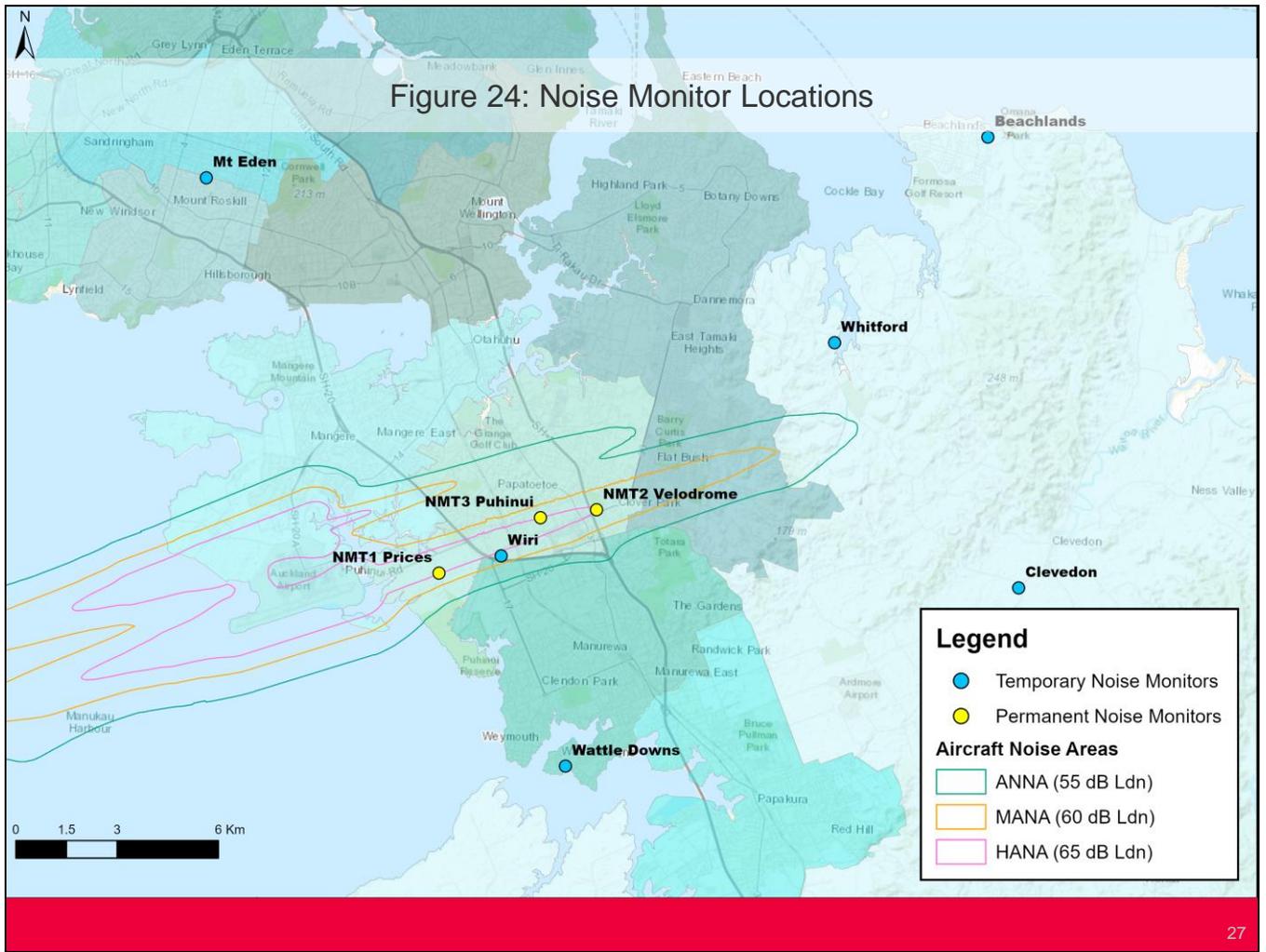


Figure 24 shows the location of Auckland Airport’s three permanent and five temporary noise monitors.

The map includes the site of the new Beachlands monitor (installed in November), which was relocated from Whitford.

In the next quarter, the Clevedon monitor is to be relocated to Flat Bush on the MANA contour (location to be confirmed).

All of the permanent noise monitors are located on the outer boundary of the HANA which is set at 65 dB L<sub>dn</sub> for future aircraft operations.

Table 4: Noise Monitor Maintenance Work

|              |                          |   |
|--------------|--------------------------|---|
| Prices Rd    | 26/10/2022               | – Calibration check                                     |
| Clevedon     | 22/10/2022 to 26/10/2022 | – Power issue for reasons indeterminable                |
| Wattle Downs | 05/08/2022               | – Replace SD card, update firmware and check system log |
|              | 26/08/2022               | – Replace SD card                                       |
| Whitford     | 18/10/2022               | – Dismantled and sent for calibration                   |

Table 4 summarises any replacement, repair, or maintenance work undertaken on the noise monitors for the three-month period August 2022 to October 2022. The three permanent noise monitors and the two temporary monitors at Wiri and Clevedon are owned by Casper, who administer any works on these monitors as required. Marshall Day Acoustics carries out work on our three temporary monitors at Mt Eden, Whitford, and Wattle Downs.

The permanent Casper monitors at Velodrome and Puhinui school and the temporary Casper monitor at Wiri required no maintenance work this quarter.

The MDA monitor at Wattle Downs went offline on 27 July which was rectified on 5 August through a firmware update, and again on 22 August which was solved by an SD card replacement.

The MDA Whitford monitor was dismantled and sent for calibration 18 October to be relocated to the new Beachlands monitor location (4 November).

There was no active maintenance work required for the Mt Eden MDA monitor during this three-month period.

Figure 25: Measured 365 Day Rolling Noise Exposure ( $L_{dn}$ ) – Permanent Monitors

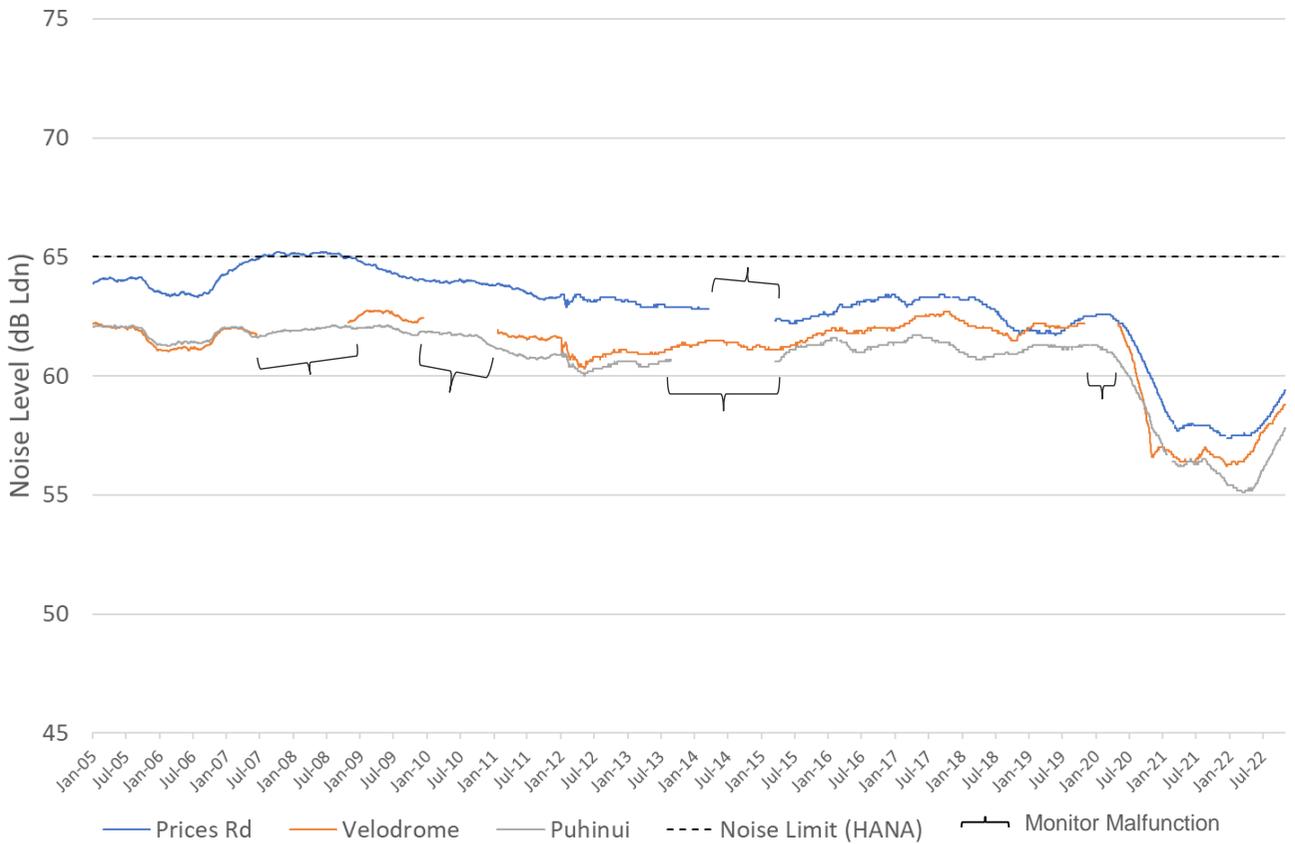


Figure 25 shows the rolling 365-day Noise Exposure ( $L_{dn}$ ) at the permanent noise monitors since January 2005.

The noise limit in the District Plan is 65 dB  $L_{dn}$  (rolling 365 day) at the boundary of the HANA.

The rolling 365-day  $L_{dn}$  is the average  $L_{dn}$  noise level over 365 days calculated each day, and is the overall average  $L_{dn}$  for the 365 days preceding and including the day of the calculation.

For example the point for 31 December 2005 represents the average  $L_{dn}$  noise level from 1 January 2005 to 31 December 2005.

The rolling 365-day  $L_{dn}$  was below the 65 dB  $L_{dn}$  noise limit in the three-month period August 2022 to October 2022.

The noise levels in the three-month period have increased by 1.5 dB at Prices Rd, 1.8 dB at Velodrome and 1.3 dB at Puhinui when compared to the same quarter last year.

A change in noise level of 1 to 2 dB is generally imperceptible to the human ear, while a change of 3 to 4 dB is just perceptible to discernible, and a change of 5 to 8 dB is noticeable to appreciable.

Table 5: Measured Noise Exposure ( $L_{dn}$ ) for each Financial Year – Permanent Monitors

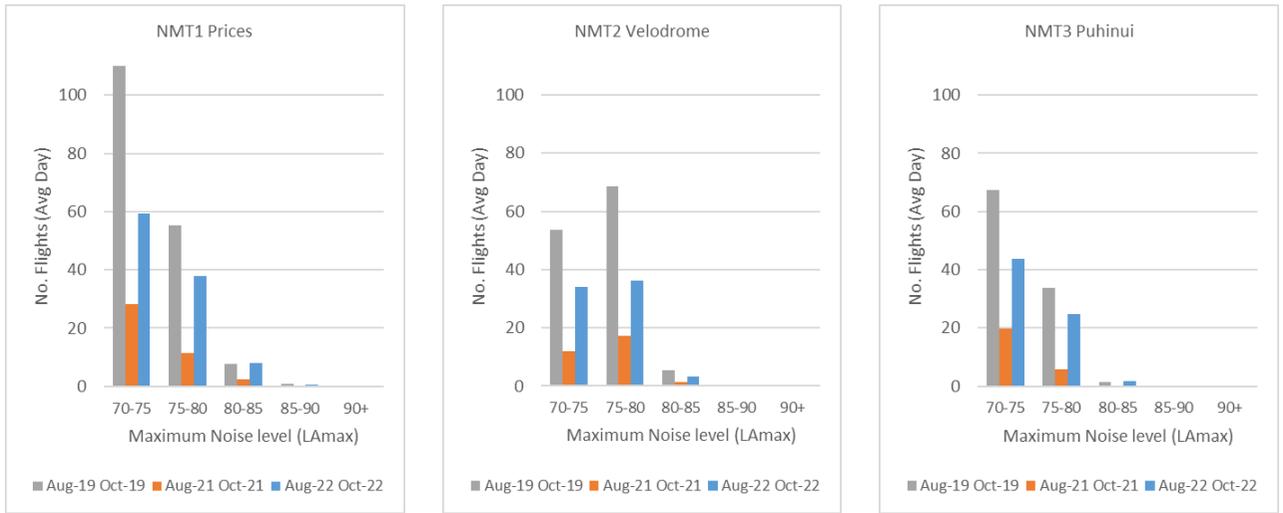
| Financial Year          | Prices Rd | Velodrome | Puhinui |
|-------------------------|-----------|-----------|---------|
| FY09 (Jul-08 to Jun-09) | 64.3      | 62.6      | 62.0    |
| FY10 (Jul-09 to Jun-10) | 64.0      | 62.4      | 61.8    |
| FY11 (Jul-10 to Jun-11) | 63.5      | 61.6      | 60.7    |
| FY12 (Jul-11 to Jun-12) | 63.1      | 60.8      | 60.3    |
| FY13 (Jul-12 to Jun-13) | 63.0      | 61.0      | 60.6    |
| FY14 (Jul-13 to Jun-14) | 63.6      | 61.4      | 60.3    |
| FY15 (Jul-14 to Jun-15) | 62.2      | 61.3      | 61.1    |
| FY16 (Jul-15 to Jun-16) | 63.1      | 61.9      | 61.0    |
| FY17 (Jul-16 to Jun-17) | 63.3      | 62.5      | 61.6    |
| FY18 (Jul-17 to Jun-18) | 62.8      | 61.9      | 60.9    |
| FY19 (Jul-18 to Jun-19) | 61.9      | 62.0      | 61.2    |
| FY20 (Jul-19 to Jun-20) | 61.8      | 61.2      | 60.0    |
| FY21 (Jul-20 to Jun-21) | 57.9      | 56.5      | 56.4    |
| FY22 (Jul-21 to Jun-22) | 58.0      | 57.7      | 56.0    |

Table 5 shows the Noise Exposure ( $L_{dn}$ ) at the permanent noise monitors for each financial year (1 Jul – 30 June) since 2008

The noise limit in the District Plan is 65 dB  $L_{dn}$  (rolling 365 day) at the boundary of the HANA.

There was a decrease of 0.4 decibels at Puhinui and an increase of 0.1 and 1.2 decibels at Prices Rd and Velodrome respectively from FY21 to FY22.

Figure 26: Number of Aircraft Noise Events in Each Noise Band  
Permanent Monitors ( $L_{Amax}$  – Maximum Noise Level)



NB: Aircraft noise events over 70-75  $L_{Amax}$  start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.



Figure 26 shows the average daily number of aircraft that overflowed each permanent noise monitor in each noise band in the three-month period August 2022 to October 2022 (blue bars), the same quarter last year (orange bars), and the same quarter from 2019 pre-pandemic (grey bars).

$L_{Amax}$  is the maximum noise level experienced as an aircraft overflies a monitor.

The permanent noise monitors received 70-106 events above 70  $L_{Amax}$  during this three-month period. The same quarter last year saw 26-42 events, and the same quarter in 2019 (pre-COVID) saw 103-178 events.

Table 6: Correlation of Aircraft Operations with Captured Noise Events  
Permanent Monitors

|  | NMT1 Prices | NMT2 Velodrome | NMT3 Puhinui |
|--|-------------|----------------|--------------|
| Total Aircraft Operations                    | 13,485      | 7,864          | 8,562        |
| No. Aircraft Operations Captured by Monitors | 11,614      | 7,108          | 8,499        |
| Correlation                                  | 86%         | 90%            | 99%          |

NB: Generally a correlation of >80% is considered reasonable. The aircraft that are missed are generally lower noise level events and will not have any effect on the overall noise level.

All monitors show a correlation above 80% this quarter.

Table 6 shows the number of aircraft that flew in the vicinity of each permanent noise monitor and the number of aircraft noise events that were correlated with an aircraft flyover in the three-month period August 2022 to October 2022.

Generally a noise monitor is unable to pick up every noise event due to ambient noise, inclement weather or other factors.

This table shows how well each noise monitor is performing in correlating aircraft noise events.

Last quarter the Velodrome monitor had a correlation rate of 73%, giving an improvement of 17% this quarter. This improvement may be due to the outcome of the Casper Velodrome monitor investigation where parameter changes were implemented (slightly decreasing the Lmax parameter for this monitor, starting 1 August).

Table 7: Temporary Noise Monitor Summary of Measured Aircraft Events Since Deployment

|                 | Date Deployed | Days Deployed | Measured $L_{dn}$ | Average $L_{Amax}$ |
|-----------------|---------------|---------------|-------------------|--------------------|
| Mt Eden         | 1-Apr-15      | 2771          | 38                | 62                 |
| Wiri            | 4-Aug-17      | 2009          | 58                | 74                 |
| Wattle Downs    | 23-Dec-17     | 1774          | 46                | 67                 |
| Clevedon        | 10-Mar-18     | 1698          | 31                | 58                 |
| Whitford (Trig) | 1-Dec-19      | 1136          | 42                | 60                 |

Table 7 gives a summary of the measured noise levels at each temporary noise monitor since deployment (up until 31 October 2022).

The measured  $L_{dn}$  for aircraft noise ranges from 31-46 dB  $L_{dn}$  across all the temporary monitor locations, except for the noise monitor in Wiri where noise levels were 58 dB  $L_{dn}$ .

New Zealand Standard NZS 6805 states that areas exposed to noise levels below 55 dB  $L_{dn}$  are suitable for residential development. The noise levels measured at the temporary noise monitors are 9-24 dB below the 55 dB  $L_{dn}$  New Zealand Standard, except for the noise monitor in Wiri.

The noise levels measured at the Wiri noise monitor are 3 dB above the NZS 6805 guideline which is why this location is within the Moderate Aircraft Noise Area.

The average  $L_{Amax}$  ranges from 58-67 dB  $L_{Amax}$  across the various monitors except for the noise monitor in Wiri where the average is 75 dB  $L_{Amax}$ .

The average  $L_{Amax}$  is calculated by averaging the maximum noise level from all of the individual aircraft noise events during the full monitoring period (i.e. since the monitor has been deployed).

The  $L_{Amax}$  differs for each aircraft operation depending on the aircraft type, type of operation etc.

Aircraft noise events over 70-75  $L_{Amax}$  start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

There was less than one flyover above 70 dB  $L_{Amax}$  per day recorded at the temporary monitors, except Wiri and Wattle Downs which recorded 42 and 12 respectively.

Figure 27: Measured Monthly Noise Exposure ( $L_{dn}$ ) – Central Suburbs Temporary Monitors

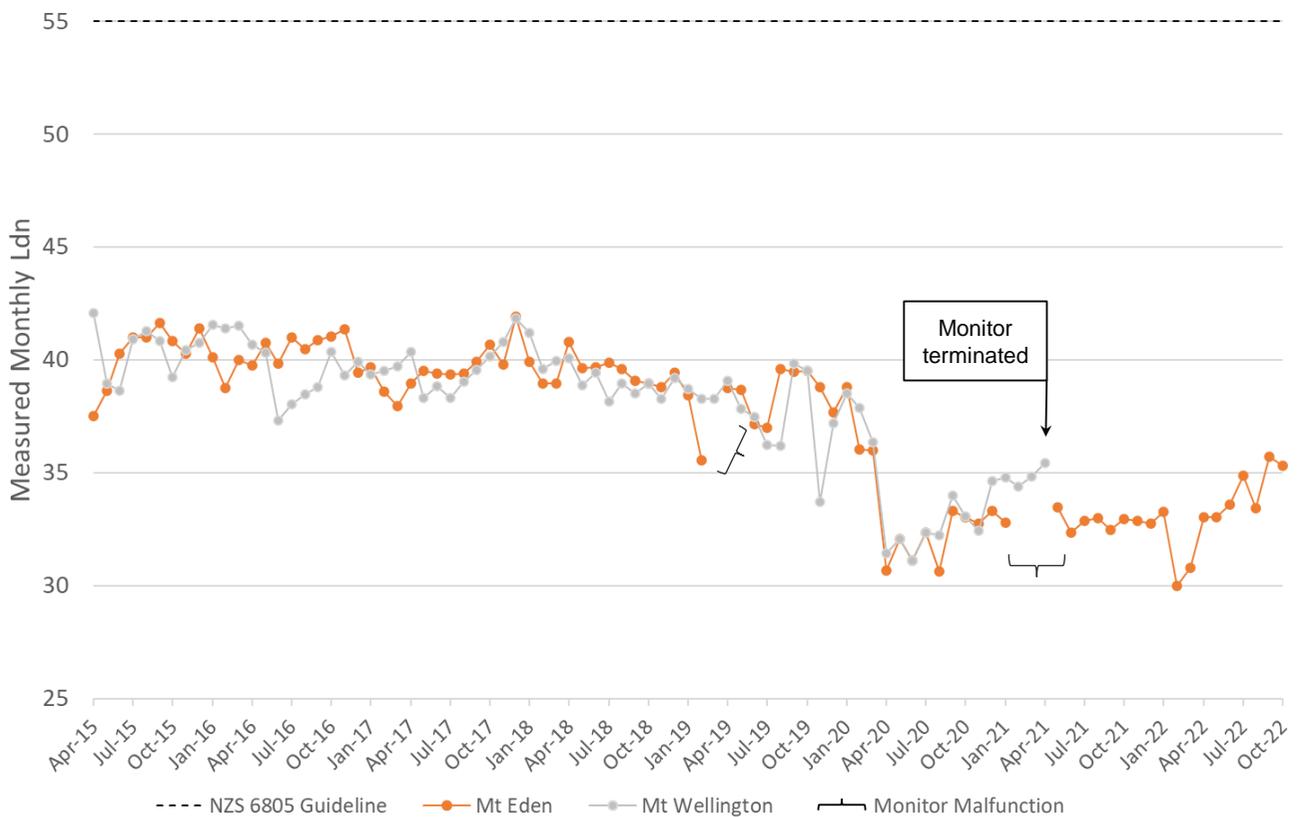


Figure 27 shows the monthly Noise Exposure ( $L_{dn}$ ) trends for aircraft noise at the temporary noise monitor in the Central Suburbs since its deployment.

The  $L_{dn}$  fluctuates month on month by 5 dB at the Mt Eden noise monitor depending on aircraft operations, wind direction and other factors. This 5dB variation is consistent prior and during the COVID-19 pandemic.

There are no notable trends in the data, besides a recent increase in  $L_{dn}$  after the COVID-19 restrictions were relaxed.

The measured  $L_{dn}$  for aircraft noise ranges from 30-42 dB  $L_{dn}$  per month at the Mt Eden monitor.

New Zealand Standard NZS 6805 states that areas exposed to noise levels below 55 dB  $L_{dn}$  are suitable for residential development.

The noise levels measured at this monitor in the Central Suburbs is 13-25 dB below this level.

The quarterly  $L_{dn}$  at this logger has increased by 1 dB when compared to the same quarter last year.

We note that the Mt Wellington monitor is no longer deployed, but the data captured is included for reference.

Figure 28: Measured Monthly Noise Exposure ( $L_{dn}$ ) – Eastern Suburbs Temporary Monitors

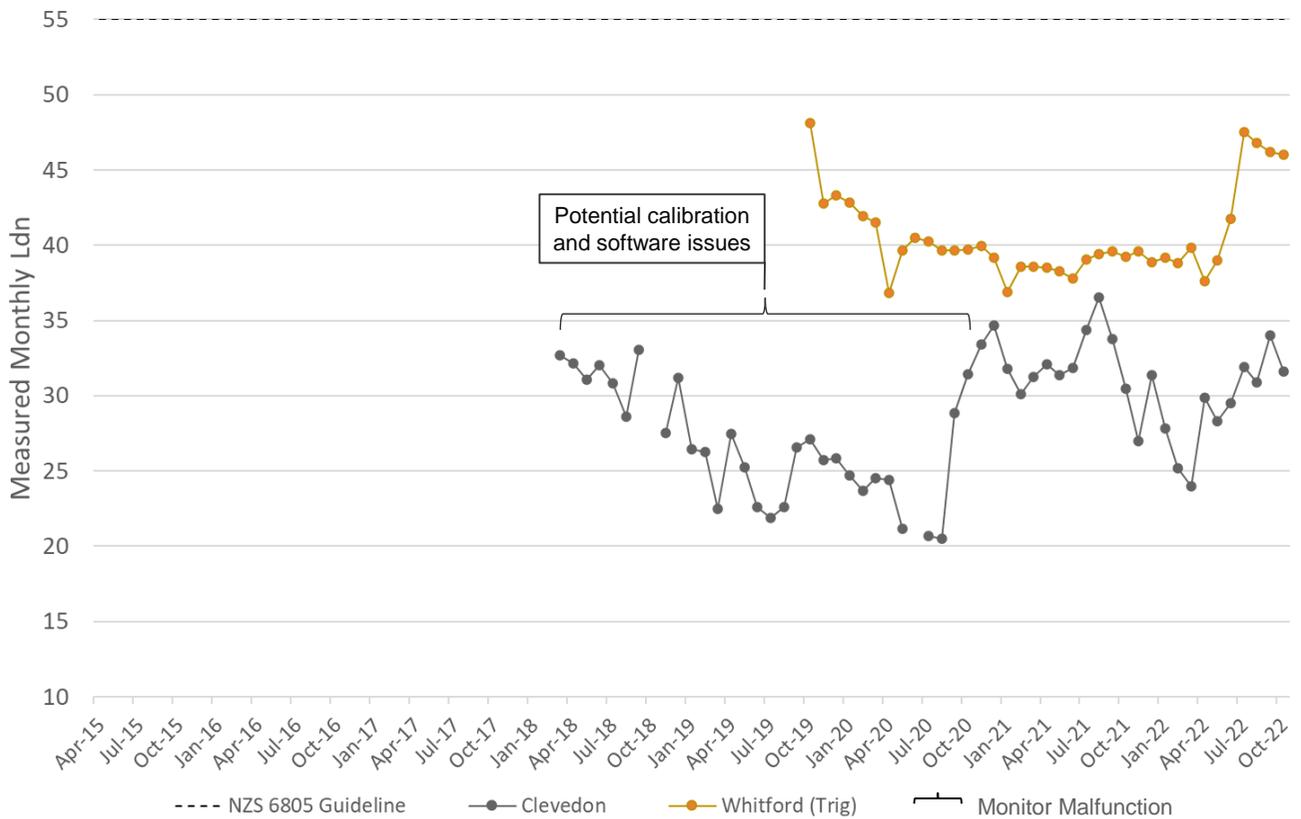


Figure 28 shows the monthly Noise Exposure ( $L_{dn}$ ) trends for aircraft noise at the temporary noise monitors in East Auckland since their deployment.

The  $L_{dn}$  fluctuates month on month by 5-10 dB at each noise monitor depending on aircraft operations, wind direction and other factors.

There are no significant trends in the data.

The measured  $L_{dn}$  for aircraft noise ranges from 20-48 dB  $L_{dn}$  per month across the Eastern Suburb monitor locations.

New Zealand Standard NZS 6805 states that areas exposed to noise levels below 55 dB  $L_{dn}$  are suitable for residential development.

The noise levels measured at these monitors in the Eastern Suburbs is 7-35 dB below this level.

The quarterly  $L_{dn}$  has decreased by 2 dB at the Clevedon monitor and has increased by 7 dB for the Whitford monitor, when compared to the same quarter last year.

Clevedon monitor data from deployment to October 2020 may be unreliable, due to instances of higher-than-normal calibration deviations and potential software setup issues. However, Casper have noted that the period May 2019 – July 2019 had robust and accurate data.

As reported earlier, the Whitford monitor has been relocated to Beachlands, starting

November. And the Clevedon monitor will be relocated to Flat Bush (Southern Auckland).

Figure 29: Measured Monthly Noise Exposure ( $L_{dn}$ ) – Southern Suburbs Temporary Monitors

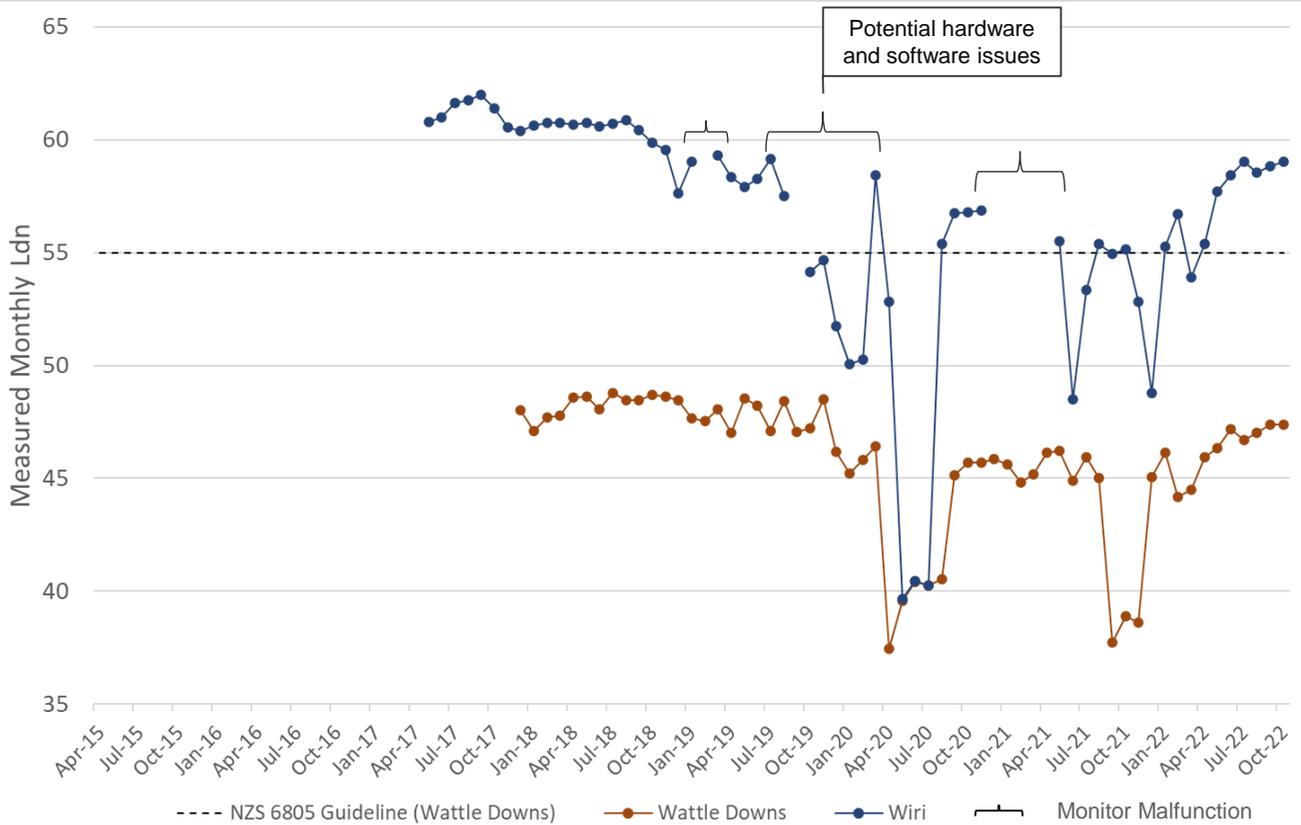


Figure 29 shows the monthly Noise Exposure ( $L_{dn}$ ) trends for aircraft noise at the temporary noise monitors in South Auckland since their deployment.

The  $L_{dn}$  fluctuates month on month by around 5-10 dB at each noise monitor depending on aircraft operations, wind direction and other factors.

There are no significant trends in the data, besides the recent reduction in  $L_{dn}$  due to the COVID-19 pandemic.

There were likely hardware and software issues with the Wiri monitor from July 2019 to March 2020, as such this data may not be reliably used.

The measured  $L_{dn}$  for aircraft noise ranges from 37-62 dB  $L_{dn}$  per month across the Southern Suburb monitor locations.

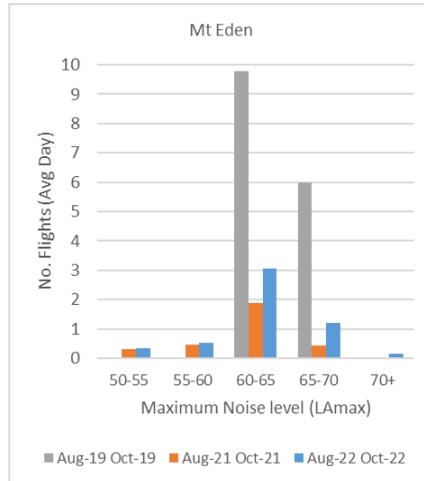
New Zealand Standard NZS 6805 states that areas exposed to noise levels below 55 dB  $L_{dn}$  are suitable for residential development.

The noise level measured at the Wattle Downs noise monitor is 9 dB below this level.

This noise level measured at the Wiri noise monitor is typically above this level, which is why this location is within the Moderate Aircraft Noise Area.

The quarterly  $L_{dn}$  has increased by 5 dB at Wattle Downs and increased by 4 dB at Wiri when compared to the same quarter last year.

Figure 30: Number of Aircraft Noise Events in Each Noise Band  
Central Suburbs Monitors ( $L_{Amax}$  – Maximum Noise Level)



NB: Aircraft noise events over 70-75  $L_{Amax}$  start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

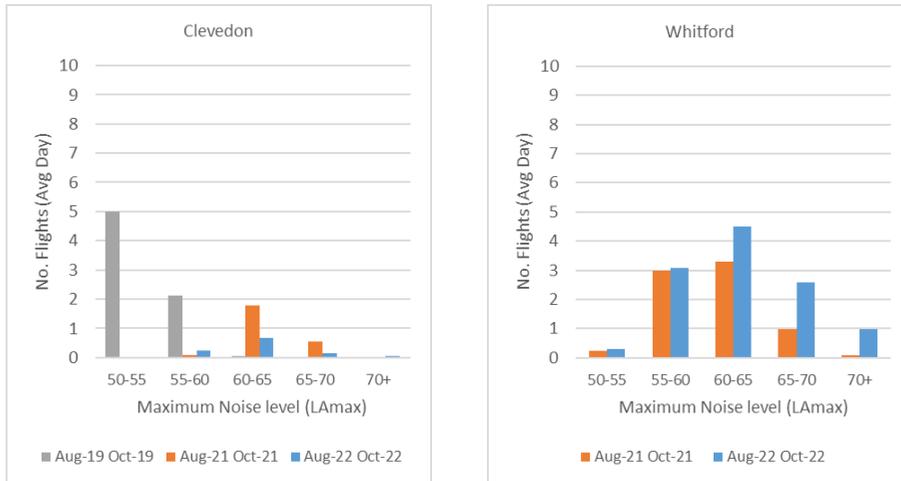
Figure 30 shows the average daily number of aircraft that overflowed the Mt Eden noise monitor in each noise band in the three-month period August 2022 to October 2022 (blue bars), the same quarter last year (orange bars), and the same quarter from 2019 (grey bars).

We note that the Mt Wellington monitor is no longer deployed, so Mt Eden is the only active monitor in the Central Suburbs.

$L_{Amax}$  is the maximum noise level experienced as an aircraft overflies a monitor.

This noise monitor received less than one event above 70  $L_{Amax}$  per day.

Figure 31: Number of Aircraft Noise Events in Each Noise Band  
Eastern Suburbs Monitors ( $L_{Amax}$  – Maximum Noise Level)



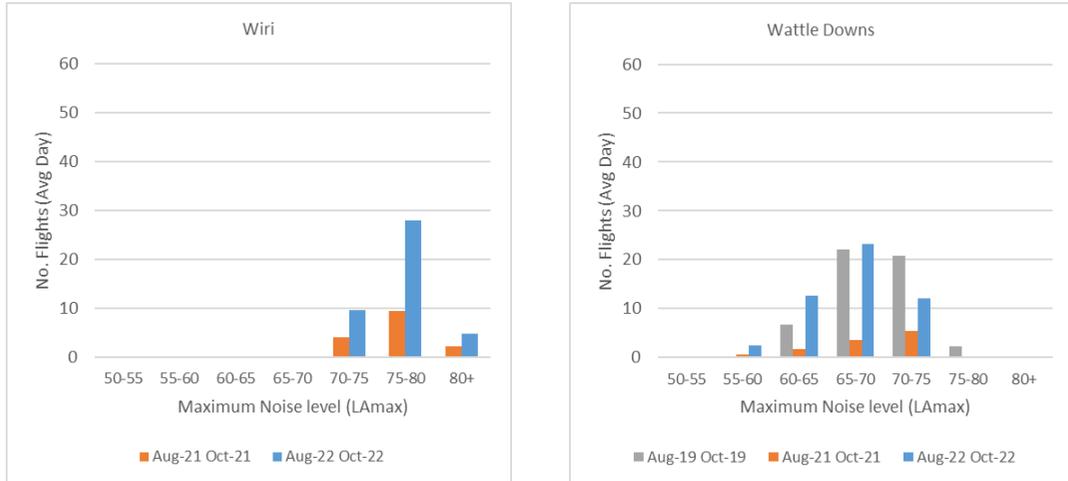
NB: Aircraft noise events over 70-75  $L_{Amax}$  start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

Figure 31 shows the average daily number of aircraft that overflowed each of the Eastern Suburbs temporary noise monitors in each noise band in the three-month period August 2022 to October 2022 (blue bars), the same quarter last year (orange bars), and for Clevedon the same quarter from 2019 pre-pandemic (grey bars). As noted however, data from the Clevedon monitor from 2019 (and through to October 2020) may be unreliable due to instances of higher-than-normal calibration deviations and potential software setup issues, apart from the period May 2019 – July 2019 which was robust and accurate. 2019 data for Whitford is not included as it was deployed in December 2019.

$L_{Amax}$  is the maximum noise level experienced as an aircraft overflies a monitor.

The Whitford noise monitor received one event above 70  $L_{Amax}$  per day and the Clevedon monitor received less than one event.

Figure 32: Number of Aircraft Noise Events in Each Noise Band  
Southern Suburbs Monitors ( $L_{Amax}$  – Maximum Noise Level)

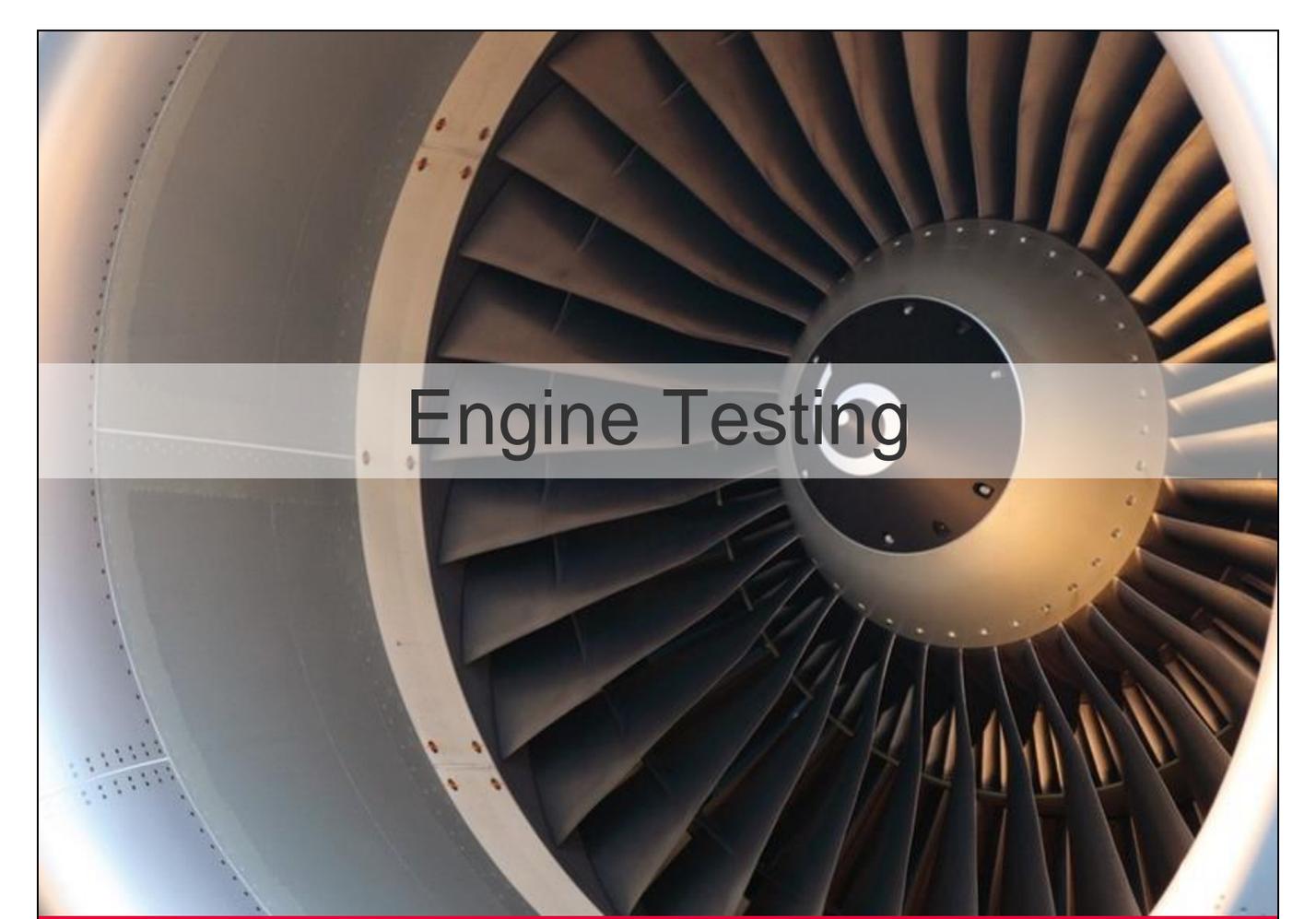


NB: Aircraft noise events over 70-75  $L_{Amax}$  start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

Figure 32 shows the average daily number of aircraft that overflowed the Southern Suburbs temporary noise monitors in each noise band in the three-month period August 2022 to October 2022 (blue bars), the same quarter last year (orange bars), and for Wattle Downs the same quarter from 2019 pre-pandemic (grey bars). Some of the Wiri data from the same quarter in 2019 pre-pandemic was potentially compromised due to hardware and software issues so has been excluded.

$L_{Amax}$  is the maximum noise level experienced as an aircraft overflies a monitor.

The Wattle Downs and Wiri monitors recorded approximately 12 and 42 flyovers per day above 70 dB  $L_{Amax}$  respectively.



# Engine Testing

Figure 33: Engine Testing Compliance Locations

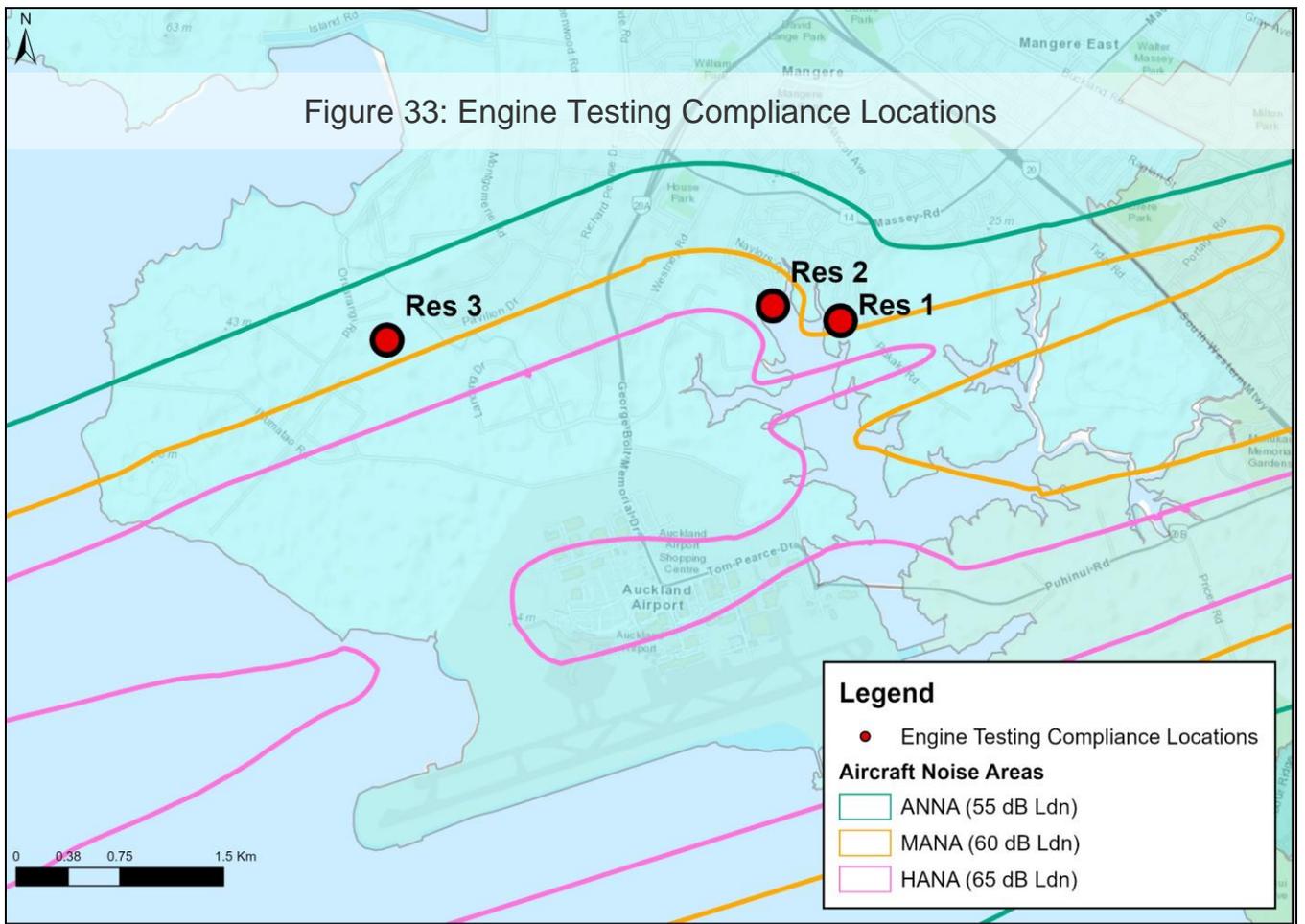


Figure 33 shows the three locations where compliance with the engine testing noise rule is calculated.

Figure 34: Engine Testing Summary

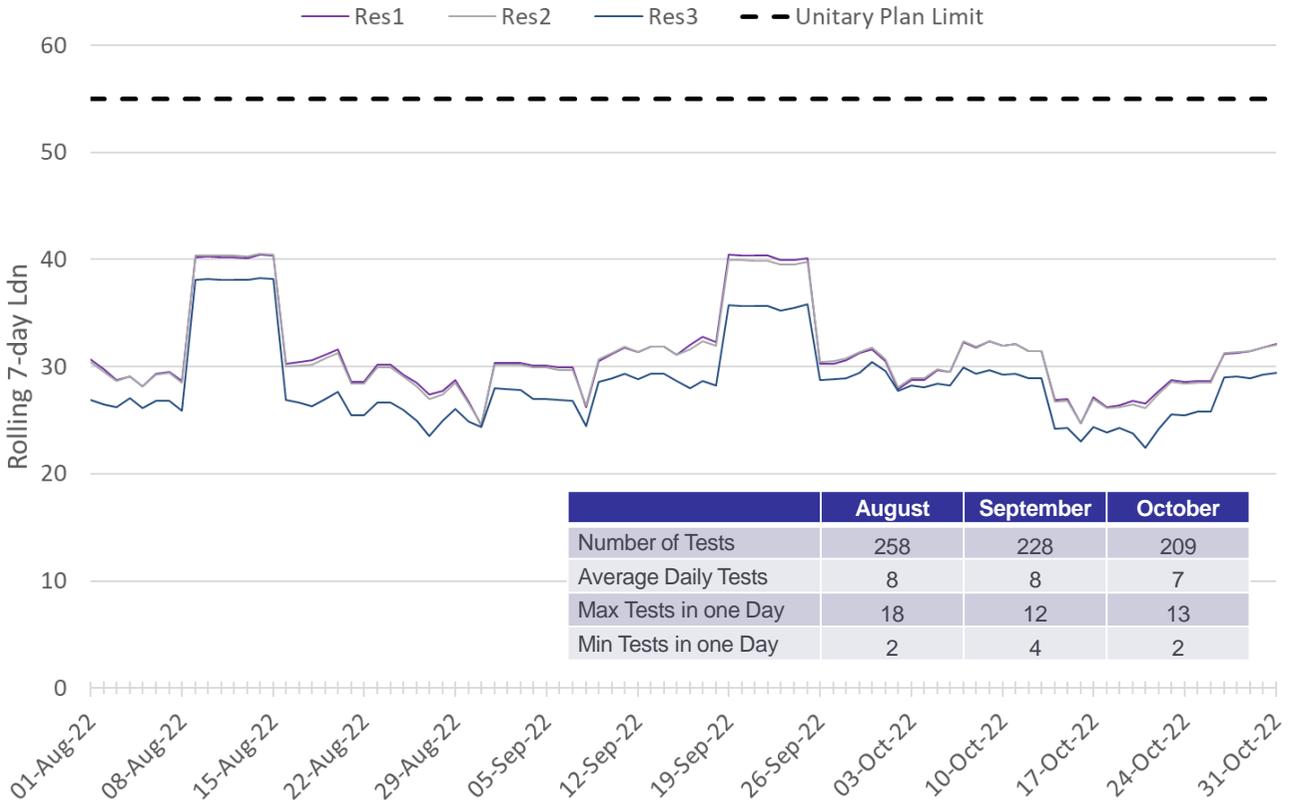


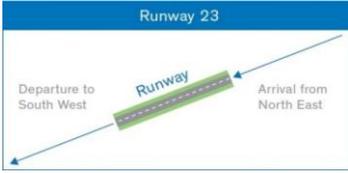
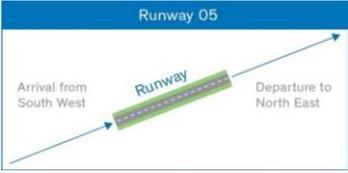
Figure 34 shows the rolling 7-day average noise level for engine testing activity at the airport in the three-month period August 2022 to October 2022.

The District Plan noise limit for engine testing activity is 55 dB L<sub>dn</sub> (7 day rolling).

The engine testing noise levels were compliant with this noise limit.

The Table insert shows the average, maximum, and minimum (above zero) number of engine tests performed on an average day in each month along with the total number of tests completed in each month.

# Appendix A: Glossary of Terminology

| Term                                    | Definition  |
|---|---|
| Daytime                                 | The period from 7:00am to 10:00pm   |
| Night-time                              | The Period from 10:00pm to 7:00am   |
| Runway 23L/Runway 05R                   | <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Occurs in Westerly Wind Conditions</p>  </div> <div style="text-align: center;"> <p>Occurs in Easterly Wind Conditions</p>  </div> </div> |
| <b>Complaint Type</b>                   |   |
| “Specific” complaint                    | Complaints relating to a specific aircraft operation.   |
| “Generic” complaint                     | Complaints that don’t relate to a specific aircraft operation but relate to noise in general.   |
| “Question” enquiry                      | An enquiry to find out more information about noise related topics.   |
| “Aircraft” Noise                        | Noise that is from aircraft operations only.  |
| “Ambient” Noise                         | The total noise that is from general ambient noise sources (cars, wind etc.).<br>Includes noise from aircraft operations.   |
| A-weighting                             | The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.  |
| L <sub>dn</sub> – Noise Exposure        | The average A-weighted noise level over a day/month/year with a 10 dB penalty applied to the night-time (10pm – 7am).   |
| L <sub>Amax</sub> – Maximum Noise Level | The highest A-weighted noise level which occurs during an aircraft operation.   |
| ANNA                                    | Aircraft Noise Notification Area – Set at 55-60 dB L <sub>dn</sub>  |
| MANA                                    | Moderate Aircraft Noise Area – Set at 60-65 dB L <sub>dn</sub>  |
| HANA                                    | High Aircraft Noise Area – Set at 65+ dB L <sub>dn</sub>  |

## Appendix B: Noise Complaint Type

| Cause                            | Description   |
|----------------------------------|---|
| Low flying                       | Aircraft flying at a low altitude                     |
| Too loud                         | Aircraft making too much noise                        |
| Early morning                    | Aircraft flying in the early morning                  |
| Late night                       | Aircraft flying late at night or overnight            |
| Height                           | Aircraft flying higher or lower than usual            |
| More flights                     | More aircraft operations than usual                   |
| Noisier flights                  | Aircraft are noisier than usual                       |
| Flight path                      | Aircraft flying on a different flight path than usual |
| Other                            | The disturbance is different from those listed        |
| Unknown                          | Cause not stated                                      |
| Noise Mitigation Package Enquiry | Enquiry relating to the Noise Mitigation Packages     |

## Appendix C: Suburbs by Area

| Suburb              | Area            | Suburb           | Area            | Suburb            | Area            | Suburb          | Area            |
|---------------------|-----------------|------------------|-----------------|-------------------|-----------------|-----------------|-----------------|
| Alfriston           | South Auckland  | Grafton          | Central Suburbs | Mount Eden        | Central Suburbs | Rothesay Bay    | North Shore     |
| Anawhata            | West Auckland   | Greenhithe       | North Shore     | Mount Roskill     | Central Suburbs | Royal Oak       | Central Suburbs |
| Arkles Bay          | North Shore     | Greenlane        | Central Suburbs | Mount Wellington  | Central Suburbs | Saint Andrews   | Central Suburbs |
| Auckland            | Central Suburbs | Grey Lynn        | Central Suburbs | Muriwai           | West Auckland   | Saint Heliers   | Central Suburbs |
| Auckland Central    | Central Suburbs | Gulf Harbour     | North Shore     | Newmarket         | Central Suburbs | Saint Johns     | Central Suburbs |
| Avondale            | West Auckland   | Half Moon Bay    | East Auckland   | Northcote Point   | North Shore     | Saint Marys Bay | Central Suburbs |
| Beachlands          | East Auckland   | Hauraki          | North Shore     | Northcross        | North Shore     | Sandringham     | Central Suburbs |
| Birkdale            | North Shore     | Henderson        | West Auckland   | Northpark         | South Auckland  | Shamrock Park   | East Auckland   |
| Birkenhead          | North Shore     | Henderson Valley | West Auckland   | One Tree Hill     | Central Suburbs | Shelly Park     | South Auckland  |
| Blockhouse Bay      | West Auckland   | Herne Bay        | Central Suburbs | Onehunga          | Central Suburbs | Silverdale      | North Shore     |
| Botany Downs        | East Auckland   | Howick           | East Auckland   | Oneroa            | Central Suburbs | Snells Beach    | North Shore     |
| Bucklands Beach     | East Auckland   | Huntly           | Not in Auckland | Onewhero          | Not in Auckland | Somerville      | South Auckland  |
| Chatswood           | North Shore     | Hunua            | South Auckland  | Orakei            | Central Suburbs | Stanley Point   | North Shore     |
| Clendon Park        | South Auckland  | Karaka           | South Auckland  | Oratia            | West Auckland   | Sunnyhills      | East Auckland   |
| Clevedon            | South Auckland  | Kohimarama       | Central Suburbs | Otahuhu           | South Auckland  | Takanini        | South Auckland  |
| Clover Park         | South Auckland  | Laingholm        | West Auckland   | Otara             | South Auckland  | Te Atatu South  | West Auckland   |
| Coatesville         | North Shore     | Long Bay         | North Shore     | Pakuranga         | East Auckland   | Titirangi       | West Auckland   |
| Cockle Bay          | East Auckland   | Lynfield         | Central Suburbs | Pakuranga Heights | East Auckland   | Totara Heights  | South Auckland  |
| Cornwallis          | West Auckland   | Mangere          | South Auckland  | Panmure           | Central Suburbs | Totara Vale     | South Auckland  |
| Drury               | South Auckland  | Mangere Bridge   | South Auckland  | Papakura          | South Auckland  | Waiheke Island  | Central Suburbs |
| East Tāmaki         | East Auckland   | Mangere East     | South Auckland  | Papatoetoe        | South Auckland  | Waitakere       | West Auckland   |
| East Tamaki Heights | East Auckland   | Manukau          | South Auckland  | Parnell           | Central Suburbs | Waiuku          | South Auckland  |
| Ellerslie           | Central Suburbs | Manukau Heads    | South Auckland  | Patumahoe         | South Auckland  | Wattle Downs    | South Auckland  |
| Epsom               | Central Suburbs | Manurewa         | South Auckland  | Point Chevalier   | Central Suburbs | Westmere        | Central Suburbs |
| Farm Cove           | East Auckland   | Massey           | West Auckland   | Point England     | Central Suburbs | Weymouth        | South Auckland  |
| Flat Bush           | East Auckland   | Meadowbank       | Central Suburbs | Pollok            | South Auckland  | Whanganui       | Not in Auckland |
| Forrest Hill        | North Shore     | Mellons Bay      | East Auckland   | Ponsonby          | Central Suburbs | Whangaparaoa    | North Shore     |
| Glendowie           | Central Suburbs | Milford          | North Shore     | Randwick Park     | South Auckland  | Whangaripo      | North Shore     |
| Glenfield           | North Shore     | Mission Bay      | Central Suburbs | Ranui             | West Auckland   | Whitford        | East Auckland   |
| Goodwood Heights    | South Auckland  | Mount Albert     | Central Suburbs | Remuera           | Central Suburbs | Wiri            | South Auckland  |