

# ANCCG Meeting

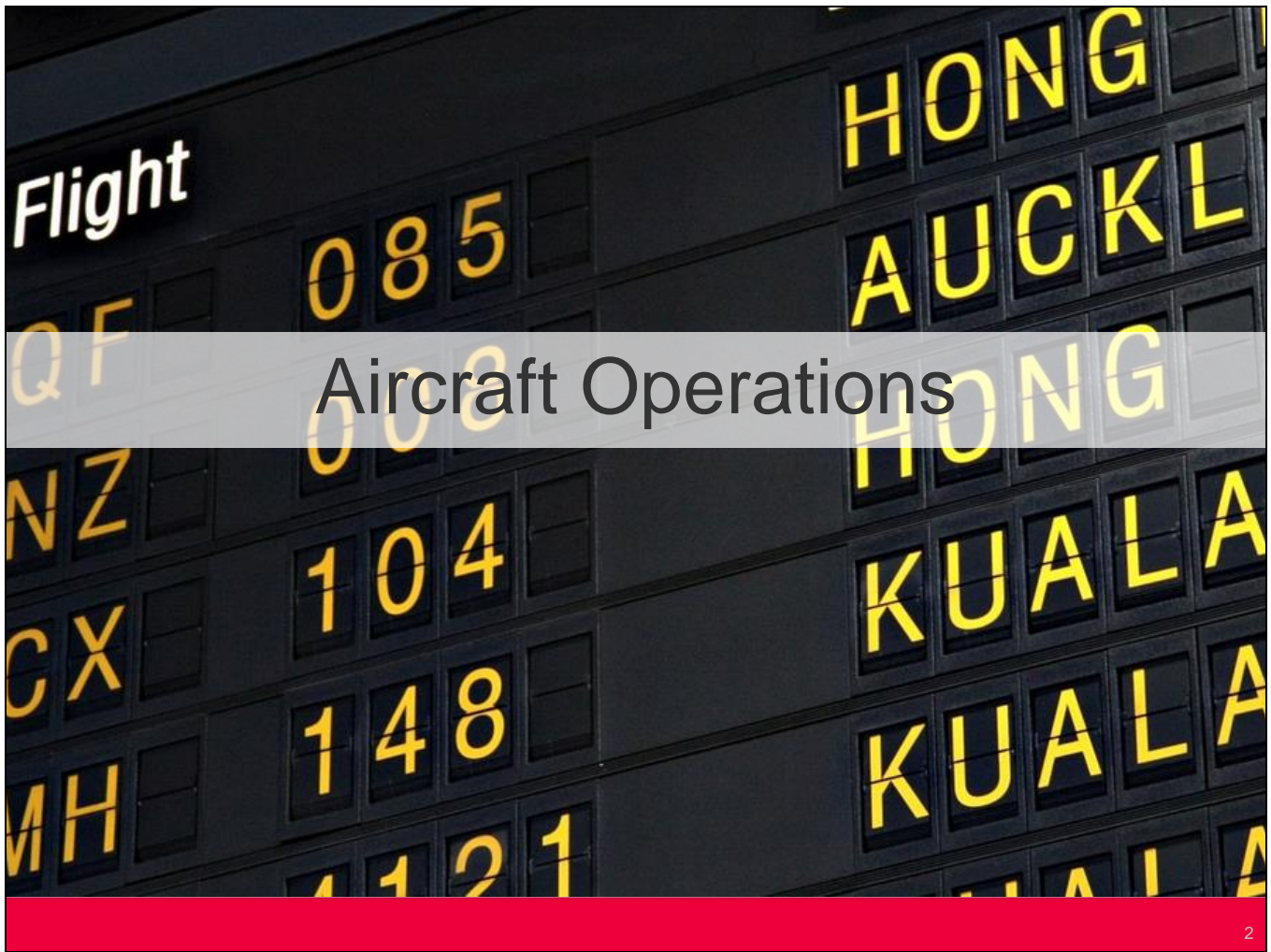
Monitoring Period

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

The chart displays the number of aircraft operations per month from January 2000 to January 2022. The y-axis represents the number of operations, ranging from 0 to 16,000 in increments of 2,000. The x-axis shows time in months, with labels every six months (Jan, Jul). A blue line represents the monthly number of aircraft operations, and a black line represents the 12-month rolling average. The data shows a general upward trend from 2000 to 2019, peaking at approximately 15,000 operations per month. A sharp decline occurred in early 2020, reaching a low of about 2,000 operations. Operations then recovered, reaching approximately 10,000 by late 2021, with a slight dip in early 2022.

Month	No. Aircraft Operations (Approx.)	12 Month Rolling Average (Approx.)
Jan-00	12,000	12,000
Jul-00	12,500	12,500
Jan-01	12,000	12,000
Jul-01	11,500	11,500
Jan-02	11,000	11,000
Jul-02	11,500	11,500
Jan-03	12,000	12,000
Jul-03	12,500	12,500
Jan-04	13,000	13,000
Jul-04	13,500	13,500
Jan-05	13,000	13,000
Jul-05	13,500	13,500
Jan-06	13,000	13,000
Jul-06	13,500	13,500
Jan-07	13,000	13,000
Jul-07	13,500	13,500
Jan-08	13,000	13,000
Jul-08	13,500	13,500
Jan-09	13,000	13,000
Jul-09	13,500	13,500
Jan-10	13,000	13,000
Jul-10	13,500	13,500
Jan-11	13,000	13,000
Jul-11	13,500	13,500
Jan-12	13,000	13,000
Jul-12	13,500	13,500
Jan-13	13,000	13,000
Jul-13	13,500	13,500
Jan-14	13,000	13,000
Jul-14	13,500	13,500
Jan-15	13,000	13,000
Jul-15	13,500	13,500
Jan-16	13,000	13,000
Jul-16	13,500	13,500
Jan-17	14,000	14,000
Jul-17	14,500	14,500
Jan-18	14,000	14,000
Jul-18	14,500	14,500
Jan-19	15,000	15,000
Jul-19	15,500	15,500
Jan-20	15,000	15,000
Jul-20	2,000	10,000
Jan-21	8,000	7,000
Jul-21	9,000	8,000
Jan-22	10,000	8,500

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

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
Total	31,309	27,711	3,598

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

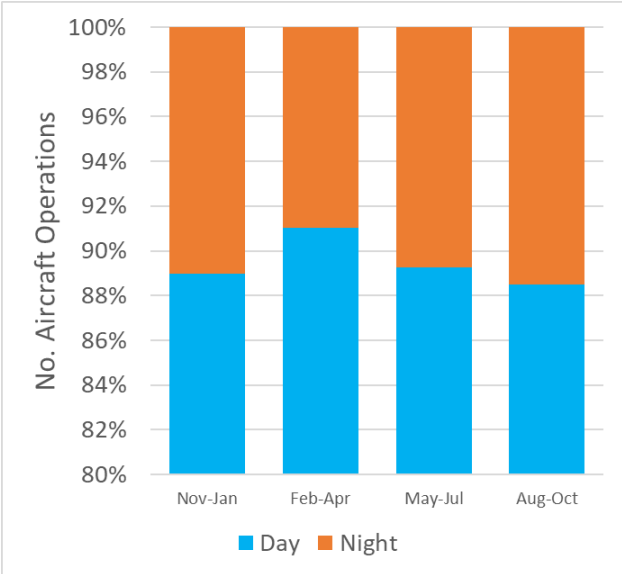


Figure 3: Aircraft Operations by Aircraft Type

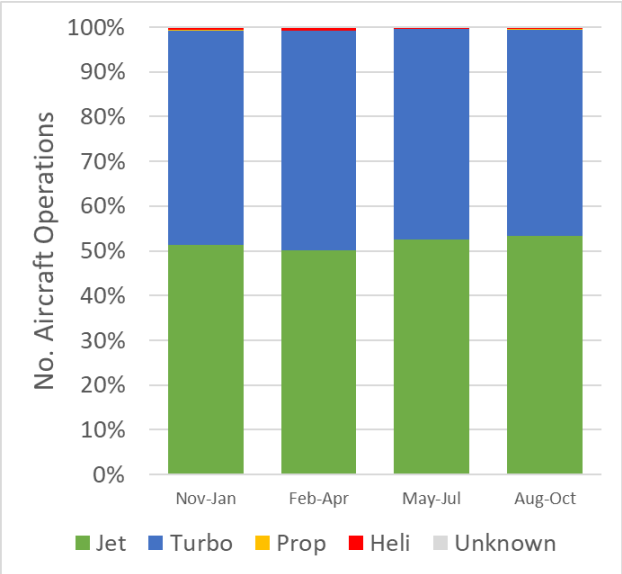


Figure 2 shows the breakdown of aircraft operations by time of day for this three-month period August 2022 to October 2022 and the three quarters preceding.

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

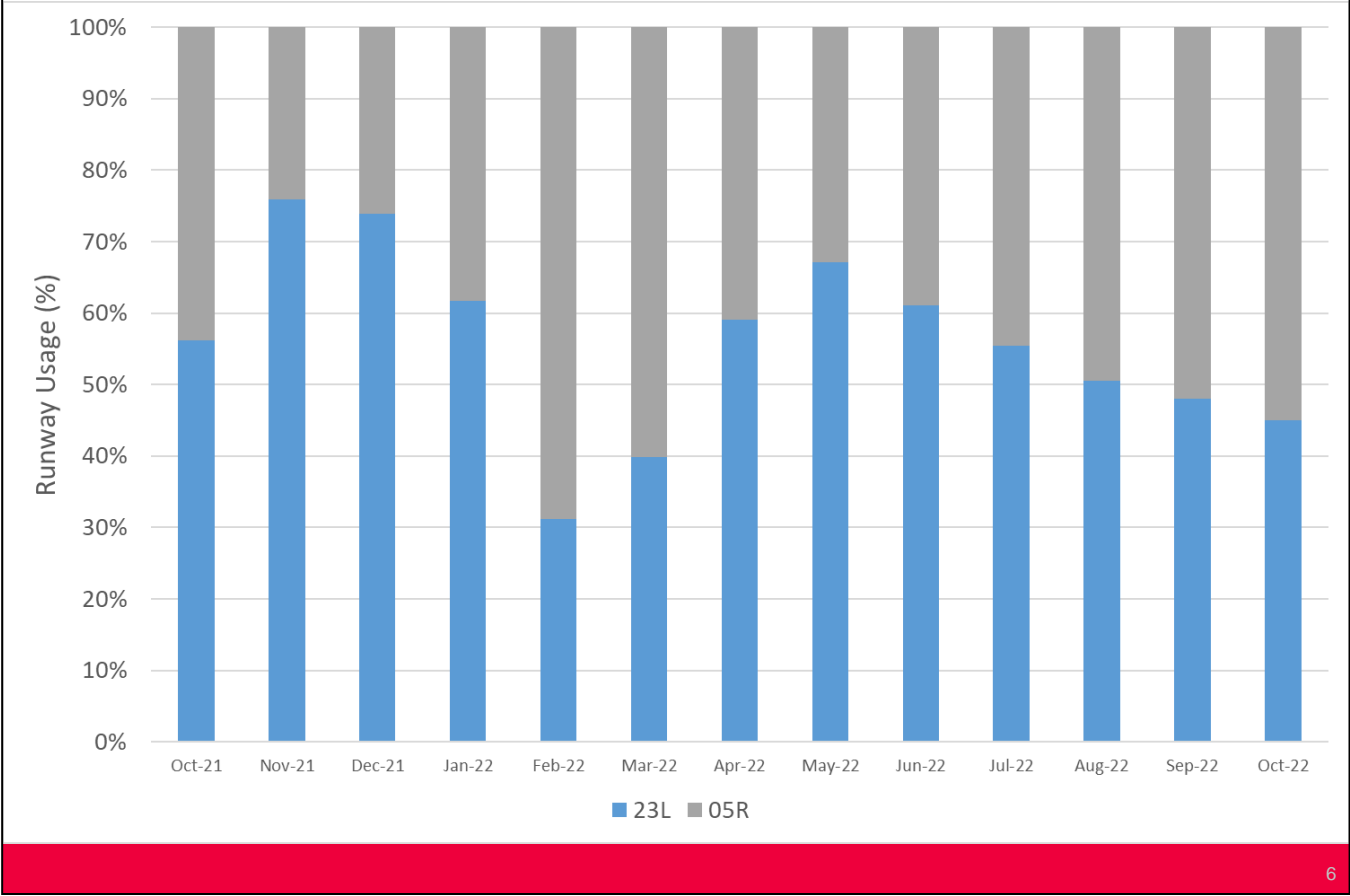


Figure 4 shows the percentage of aircraft operations that used each runway (23L and 05R) over the past 13 months.

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

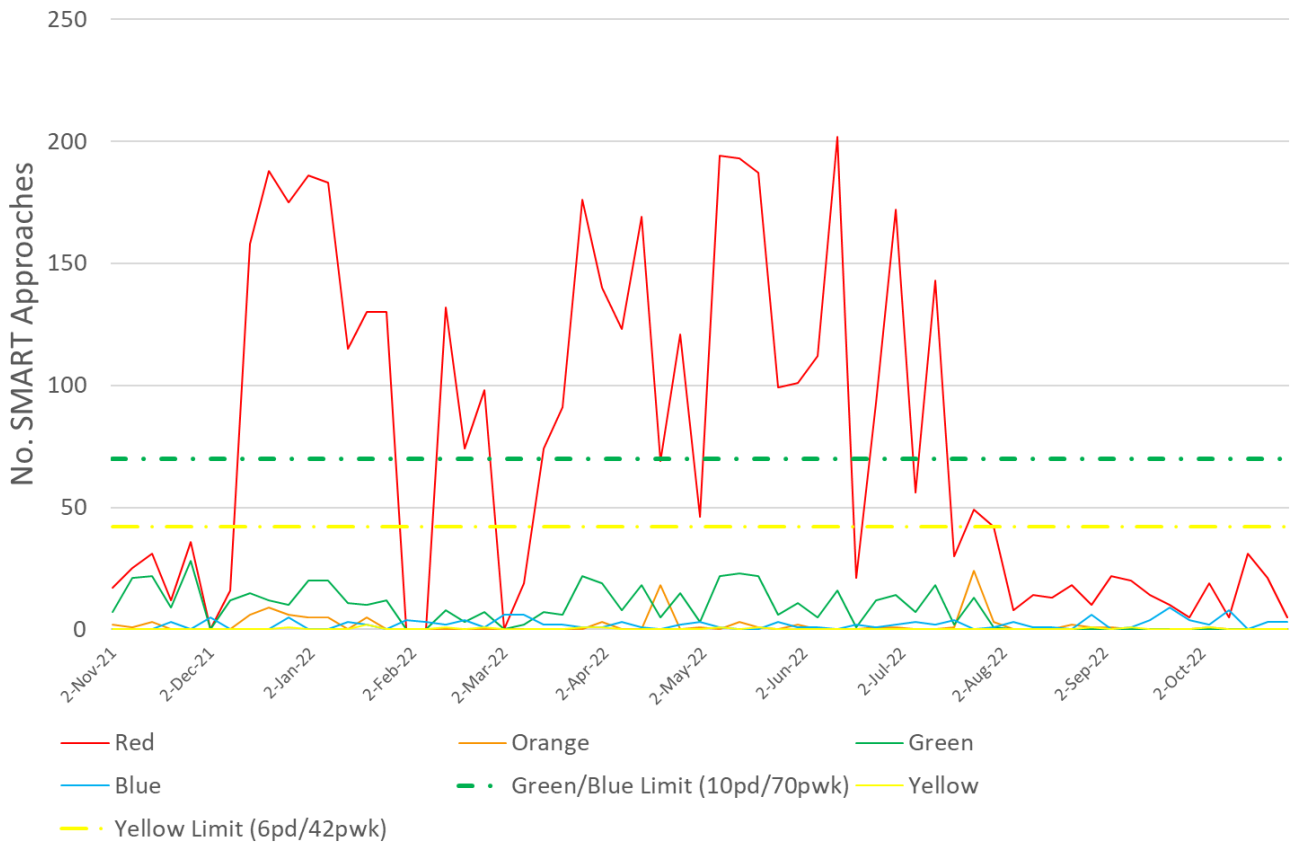


Figure 5 shows the number of SMART flights flown per week in the past 12 months.

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.



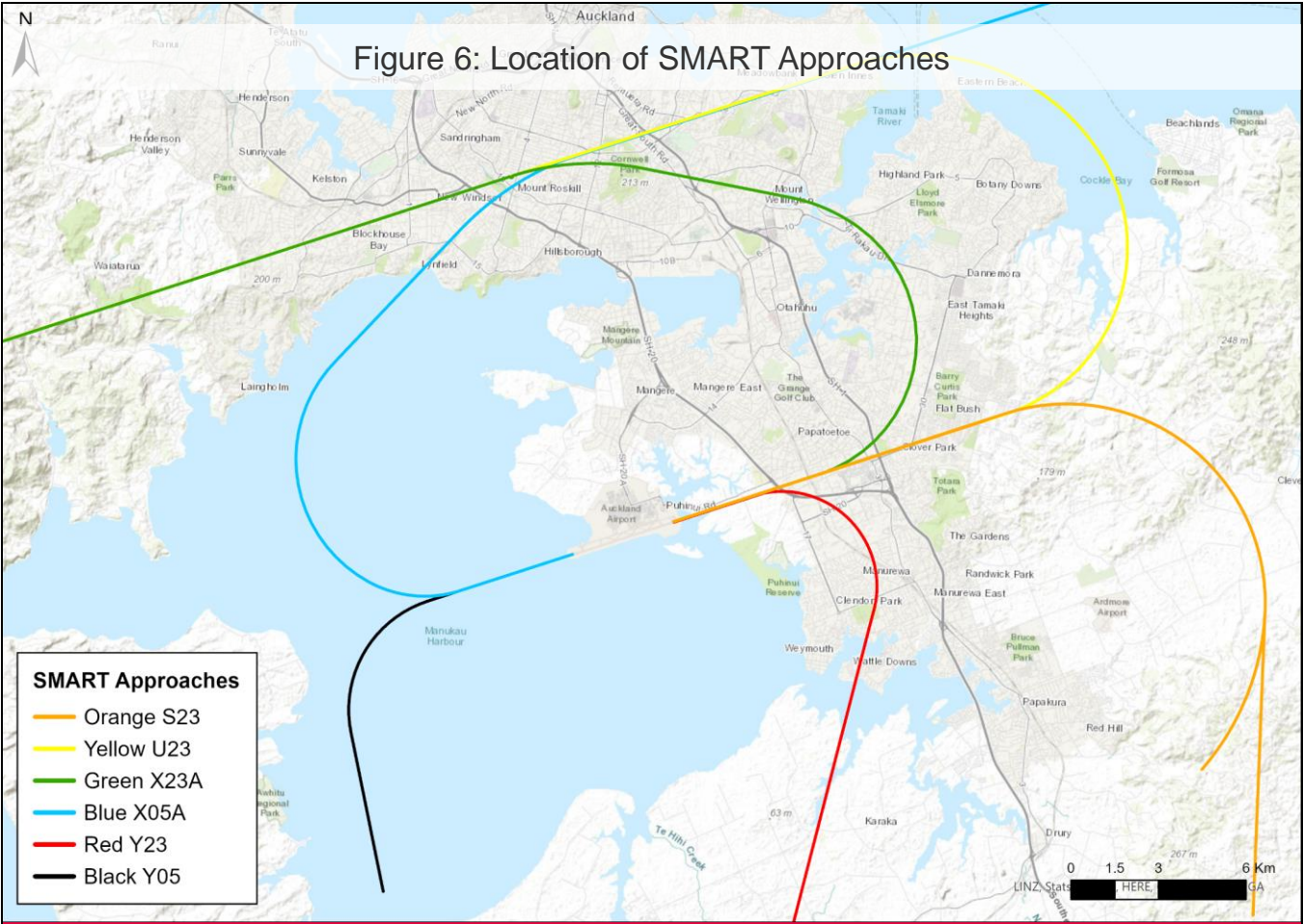


Figure 6 shows the location of the SMART approach flight paths.





# Flight Path Diagrams

Figure 7: Flight Paths for a Busy Runway 23L Day (7am-10pm)  
100% Westerly Winds/Runway 23L

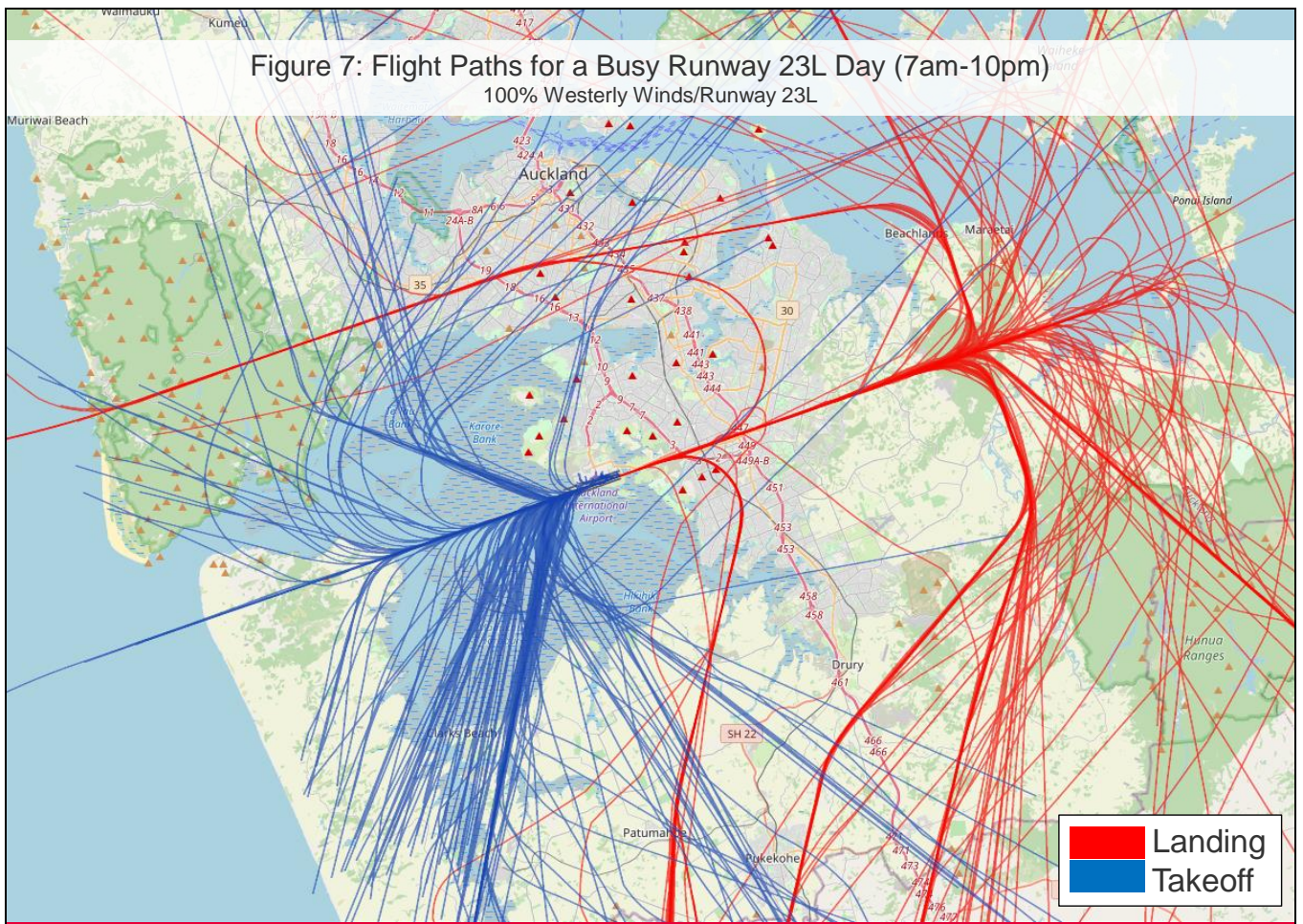


Figure 7 shows the daytime (7am-10pm) flight paths for Thursday 6 October 2022, the busiest day in the three-month period August 2022 to October 2022 when Runway 23L was primarily in use.

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 347 daytime Runway 23L flights on this day.



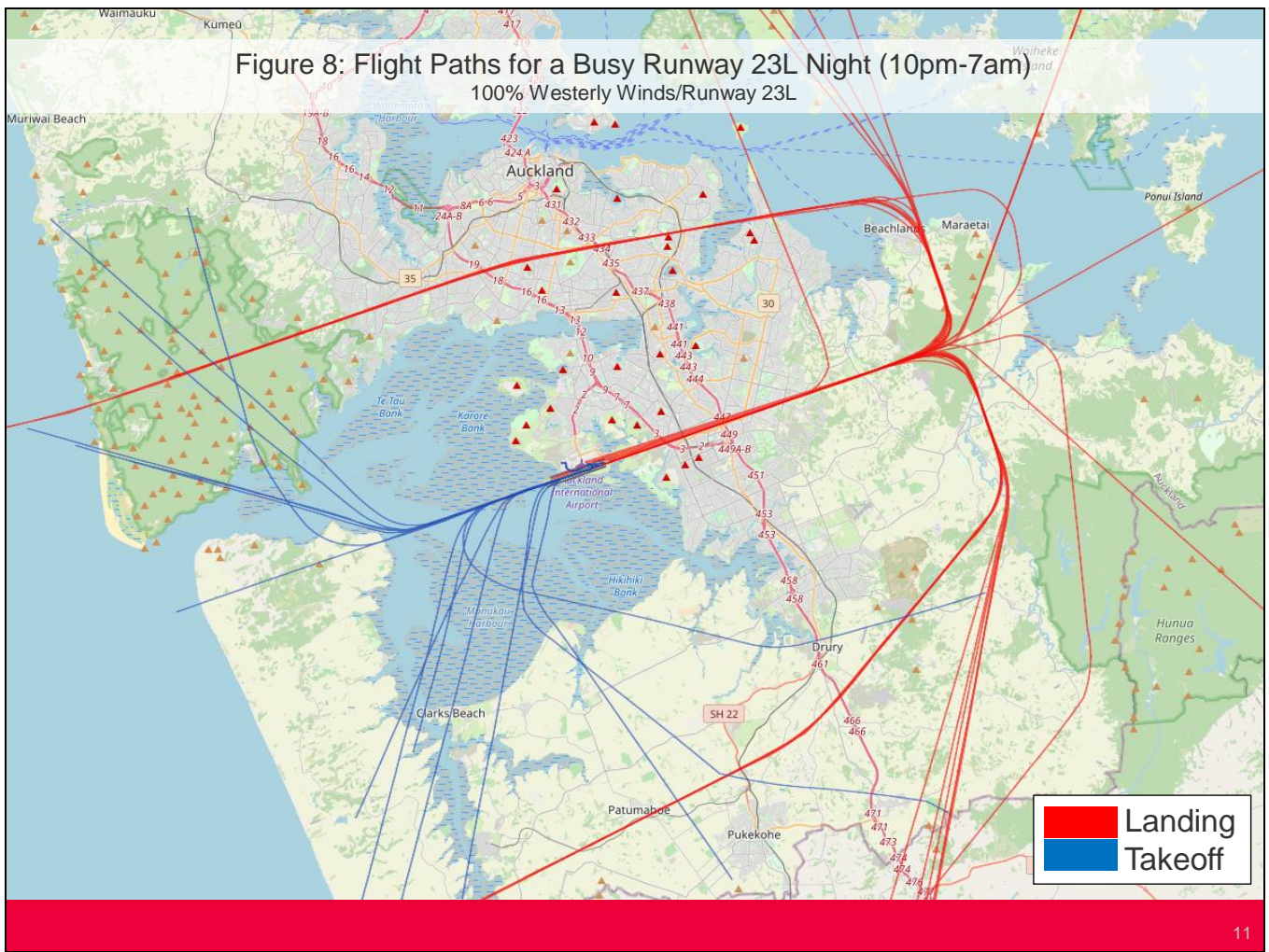


Figure 8 shows the night-time (10pm-7am) flight paths for Thursday 6 October 2022, the busiest day in the three-month period August 2022 to October 2022 when Runway 23L was primarily in use.

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

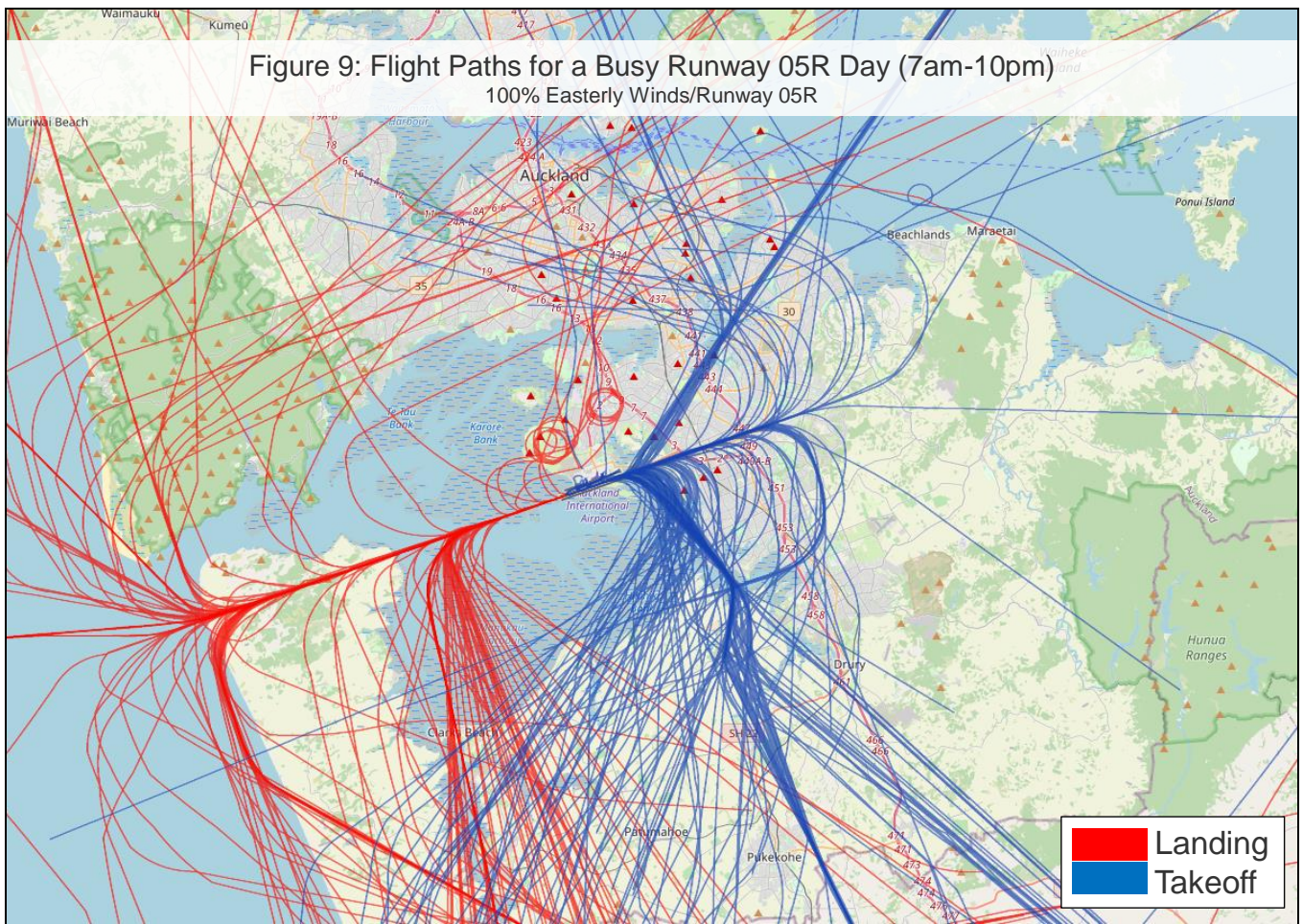


Figure 9 shows the daytime (7am-10pm) flight paths for Friday 14 October 2022, the busiest day in the three-month period August 2022 to October 2022 when Runway 05R was primarily in use.

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.



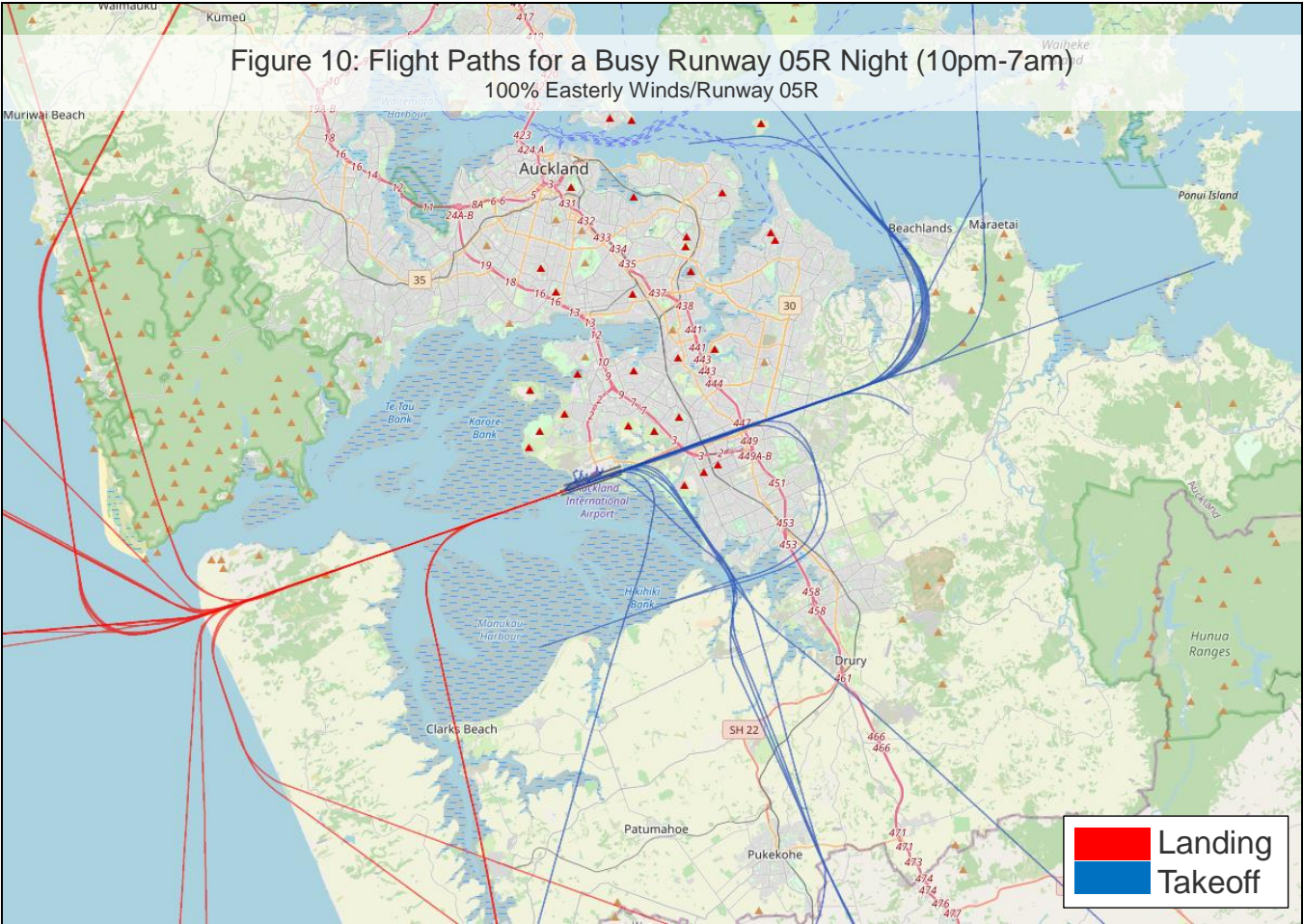


Figure 10 shows the night-time (10pm-7am) flight paths for Friday 14 October 2022, the busiest day in the three-month period August 2022 to October 2022 when Runway 05R was primarily in use.

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

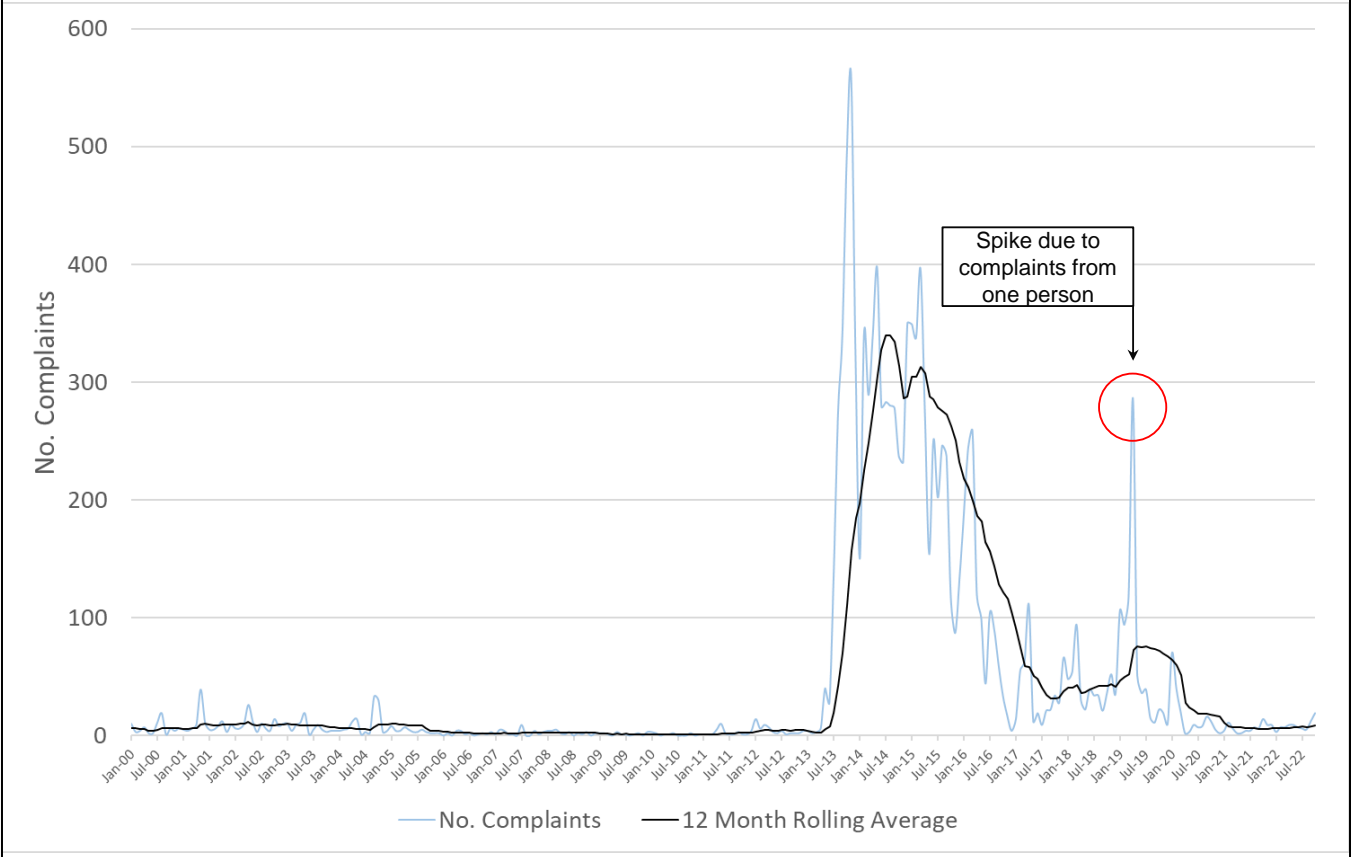


Figure 11 shows the total number of aircraft noise complaints made per month since the year 2000 (blue line) and the 12-month rolling average (black line).

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.

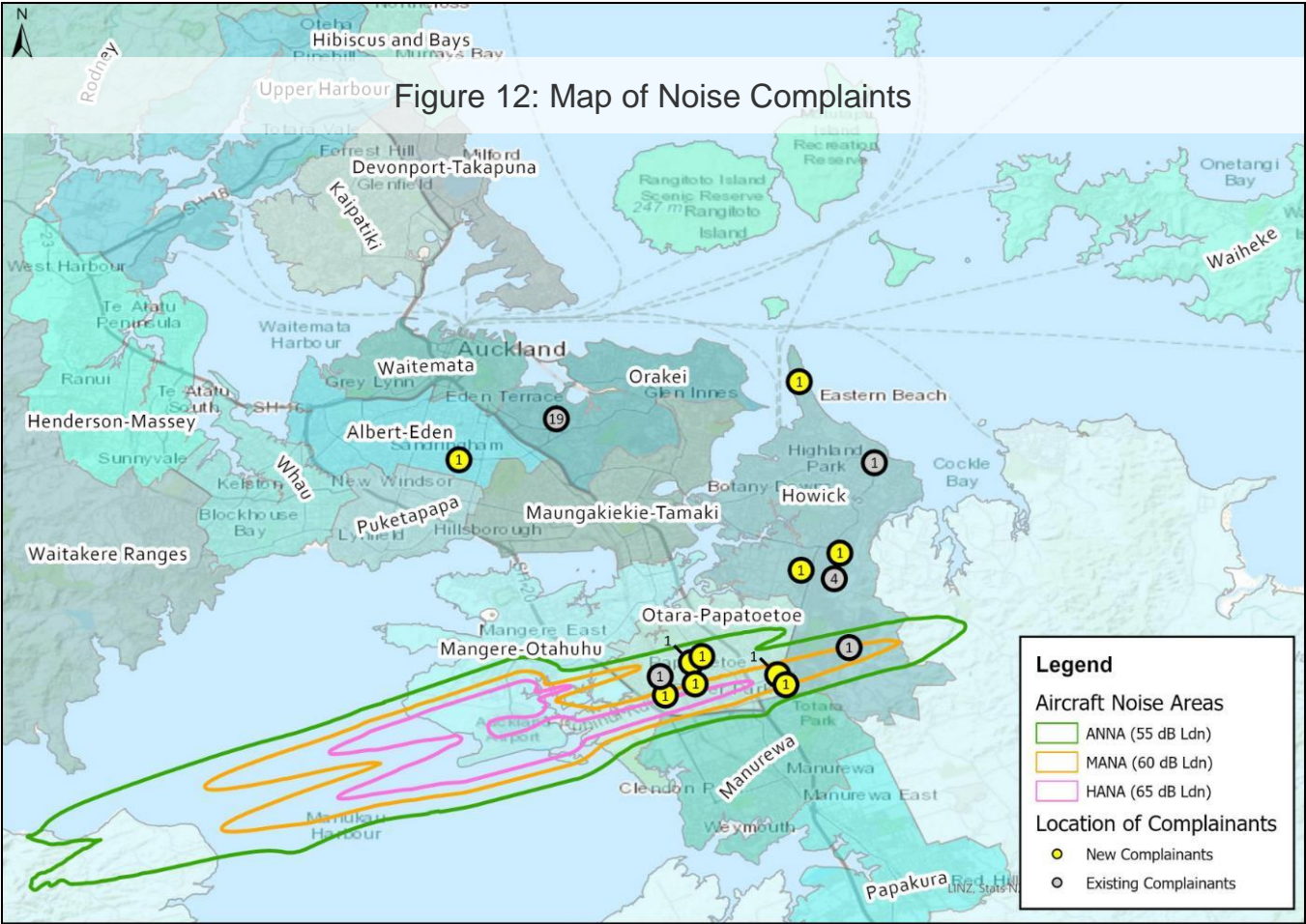


Figure 12 shows a map with the location of each complainant. Each point represents the location of a person who complained in the three-month period August 2022 to October 2022.

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

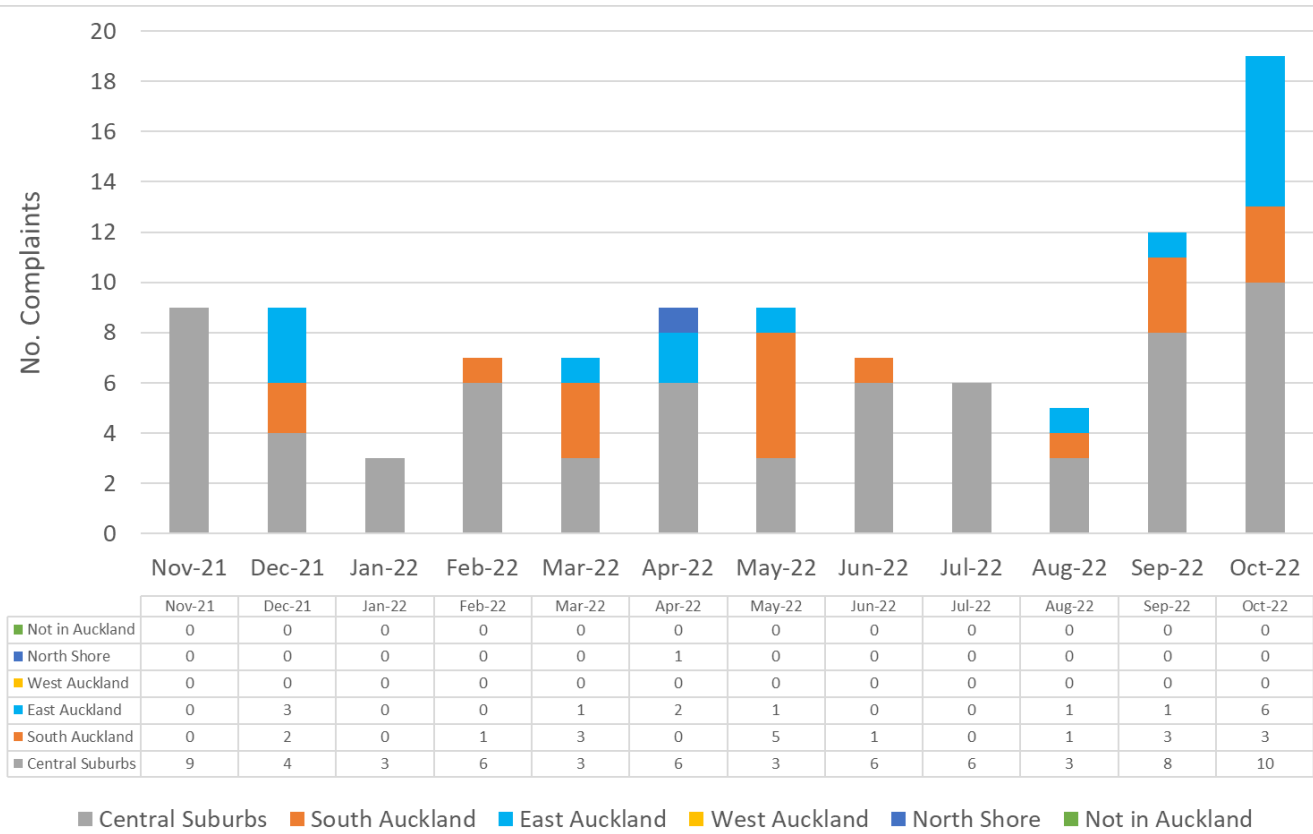


Figure 13 shows the number of complaints made by people residing in different areas of Auckland over the past 12 months.

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

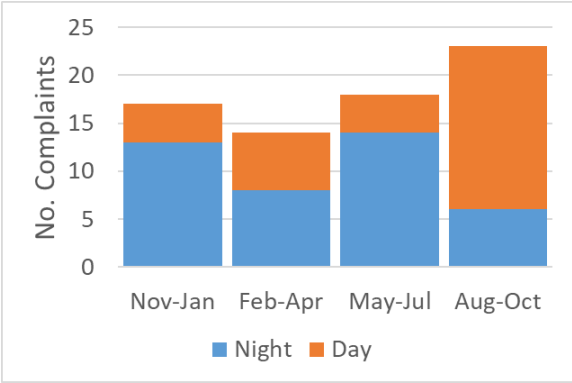


Figure 15: Noise Complaints by Runway

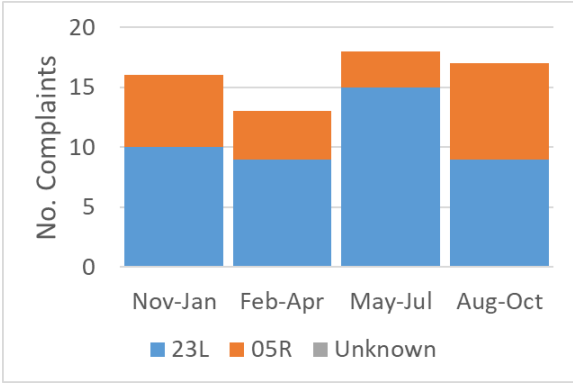


Figure 16: Noise Complaints by Aircraft

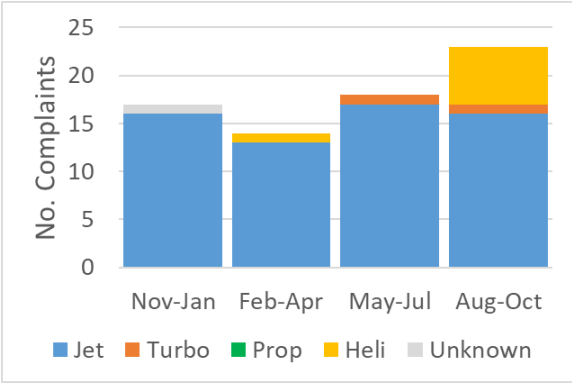
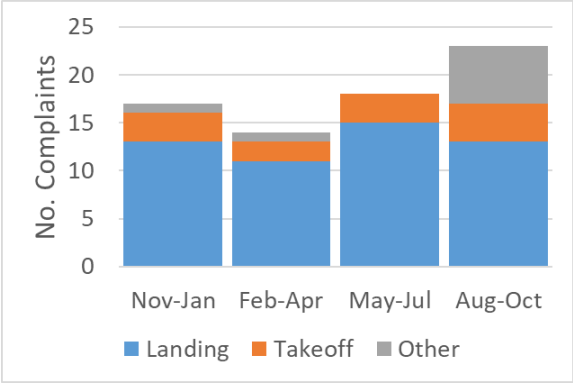


Figure 17: Noise Complaints by Operation



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

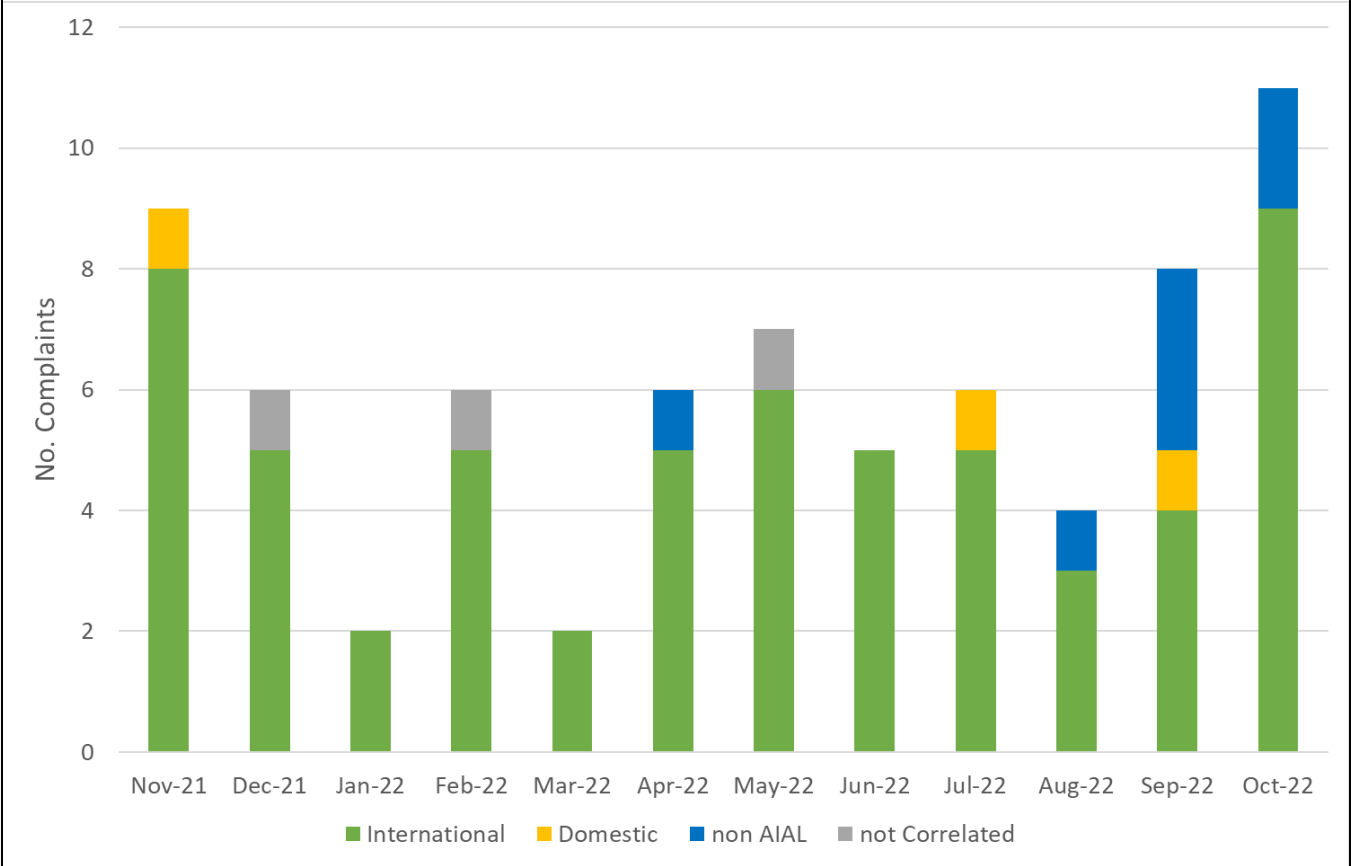


Figure 18 shows the number of specific aircraft complaints made about international and domestic flights over the past 12 months.

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

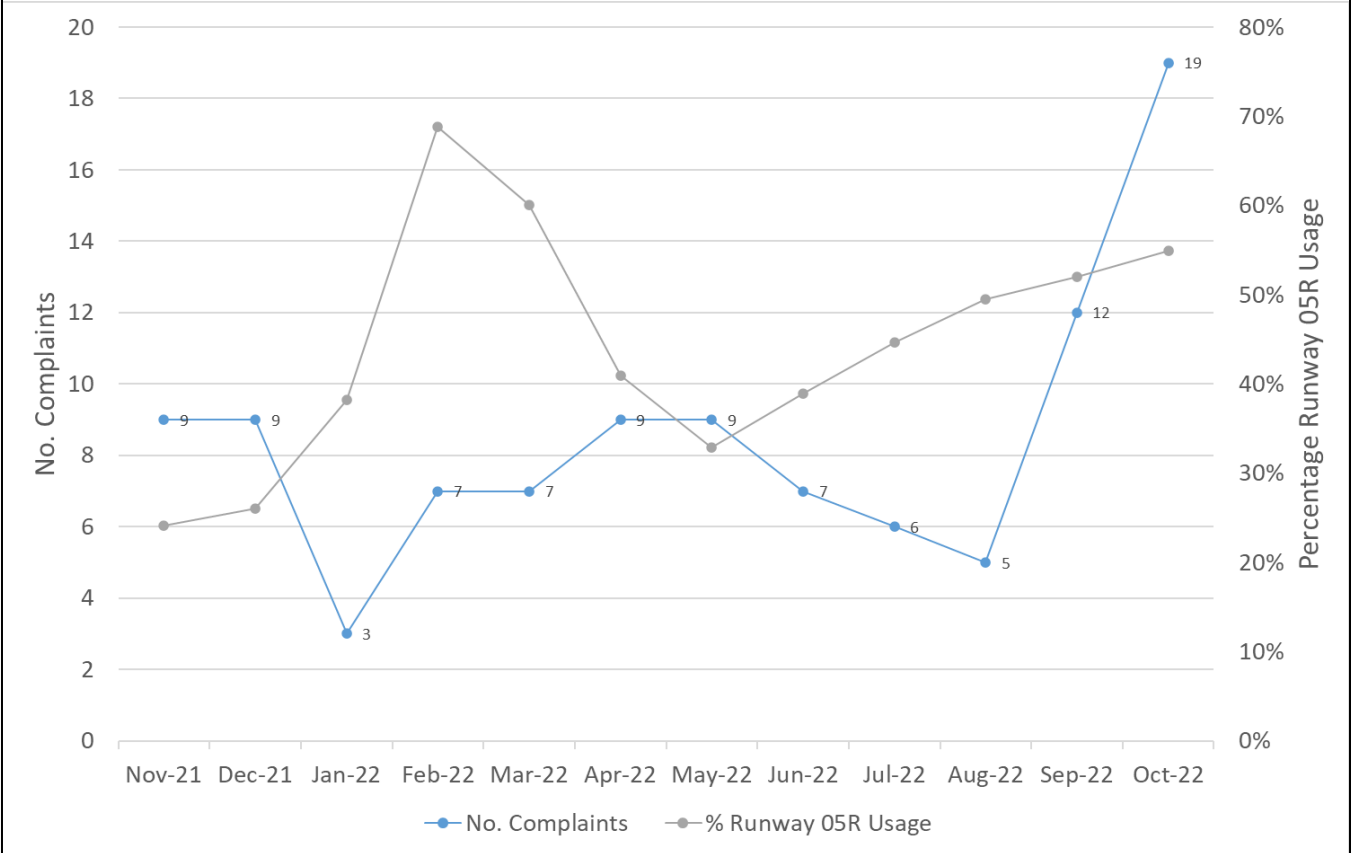


Figure 19 shows the number of specific noise complaints per month received in the past 12 months compared to the usage of Runway 05R.

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

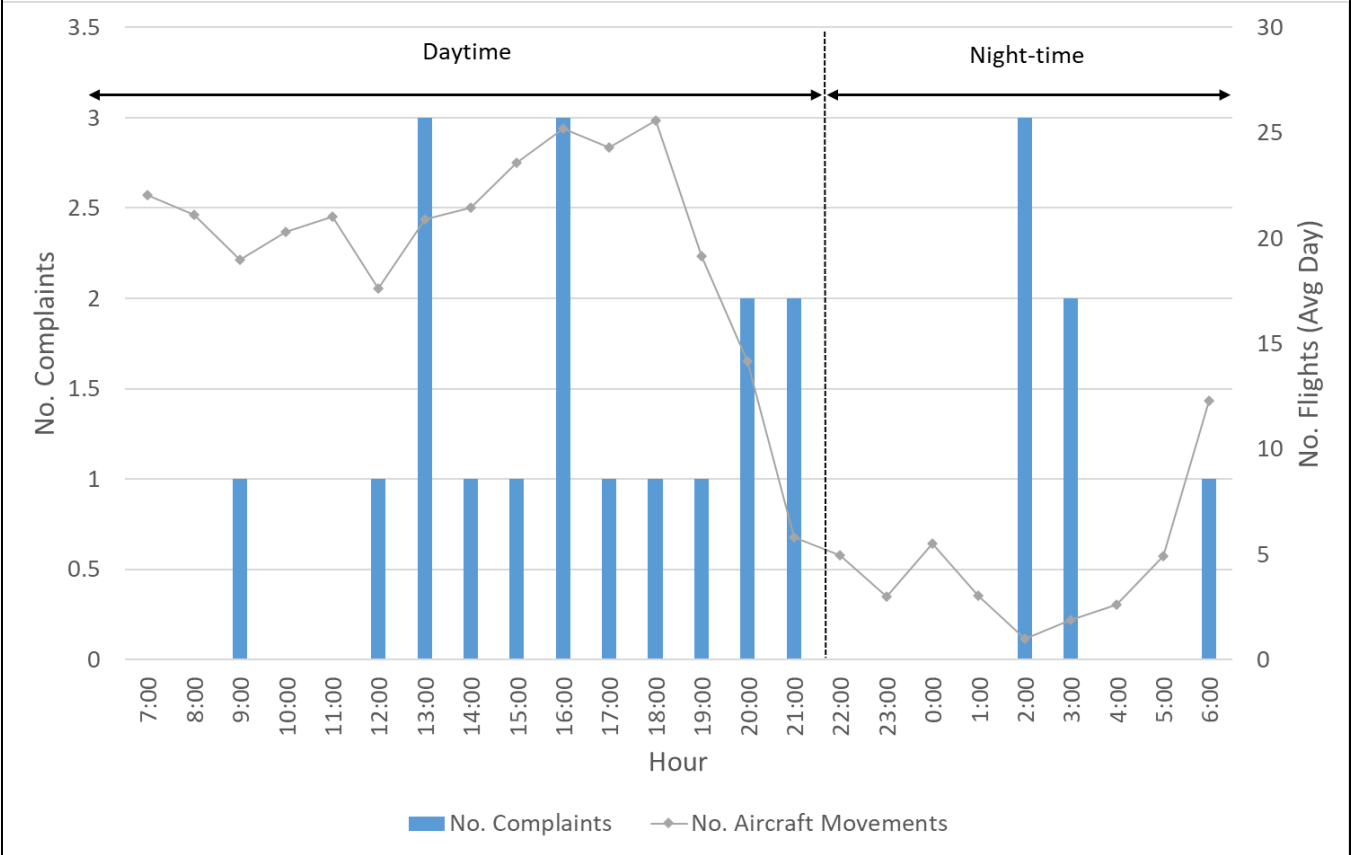


Figure 20 shows the number of specific aircraft noise complaints and the number of aircraft operations per hour.

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

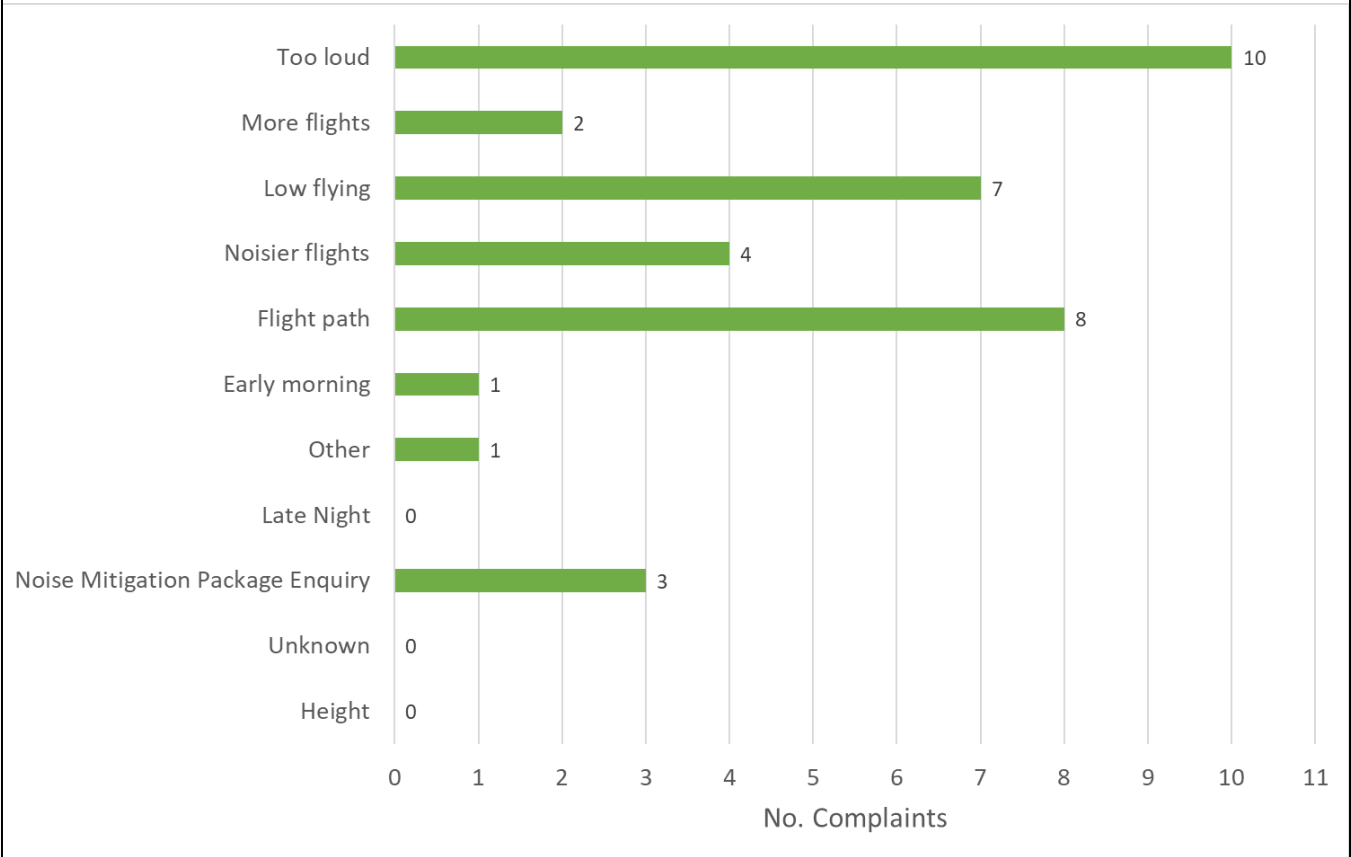


Figure 21 shows the reason for each noise complaint in the three-month period August 2022 to October 2022. This includes all complaints (generic, question and specific). A full description of each cause is given in Appendix B.

Figure 22: Specific Aircraft Identified in Noise Complaints

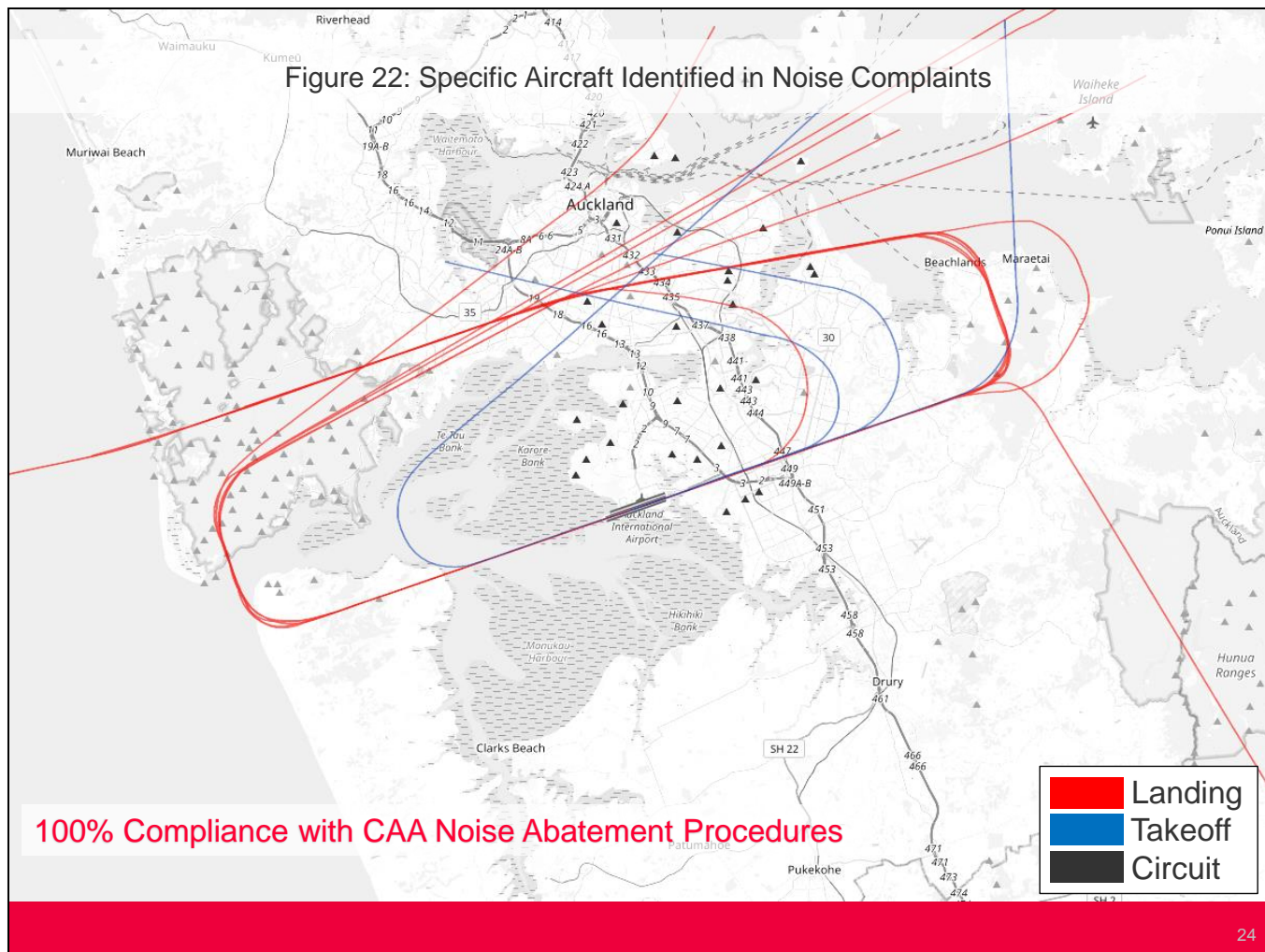


Figure 22 shows the flight paths for specific aircraft from Auckland Airport identified in noise complaints for the three-month period August 2022 to October 2022.

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.

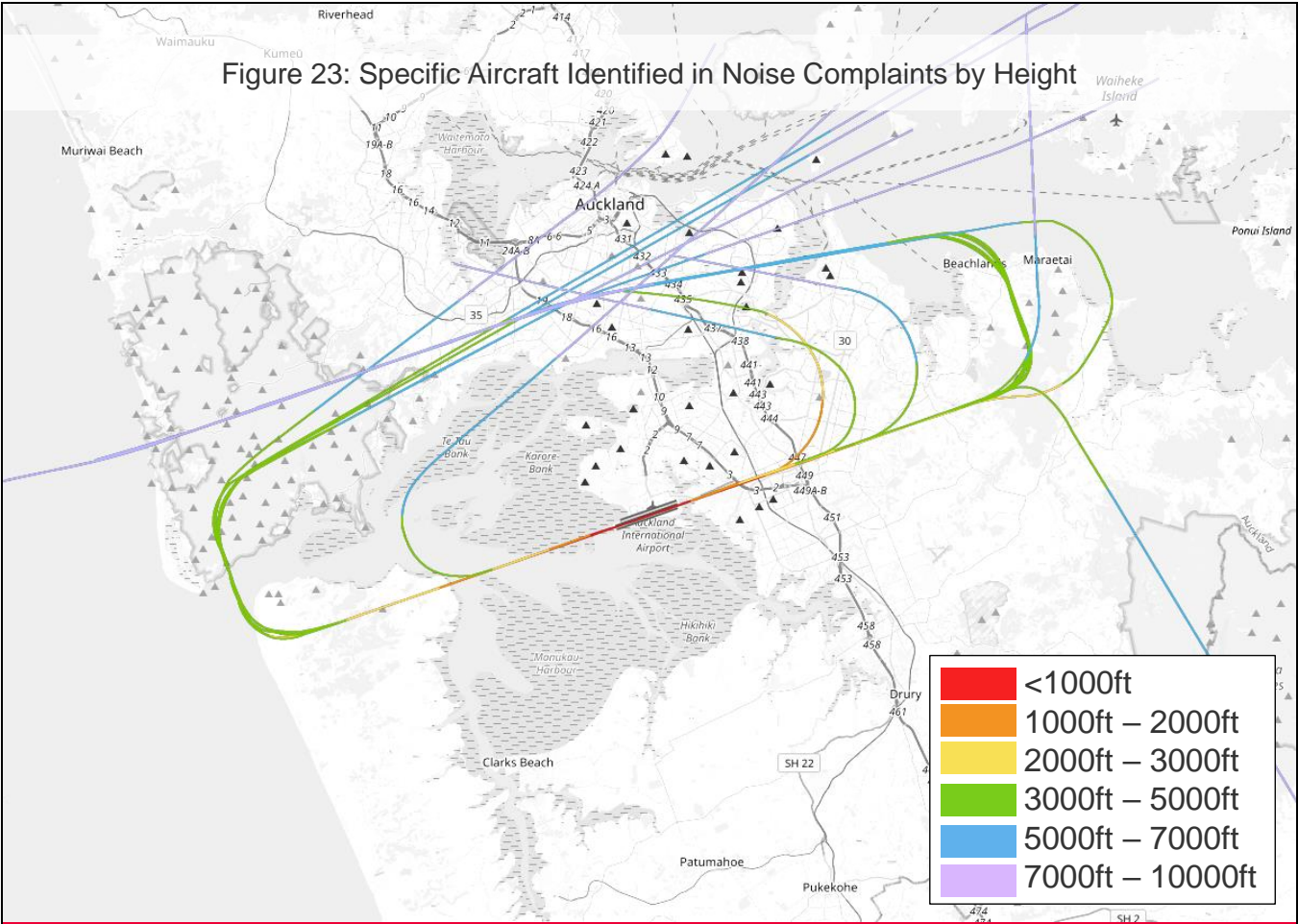


Figure 23 shows the flight paths for specific aircraft from Auckland Airport identified in noise complaints for the three-month period August 2022 to October 2022.

The flight paths are shown in terms of altitude.



# Noise Monitoring



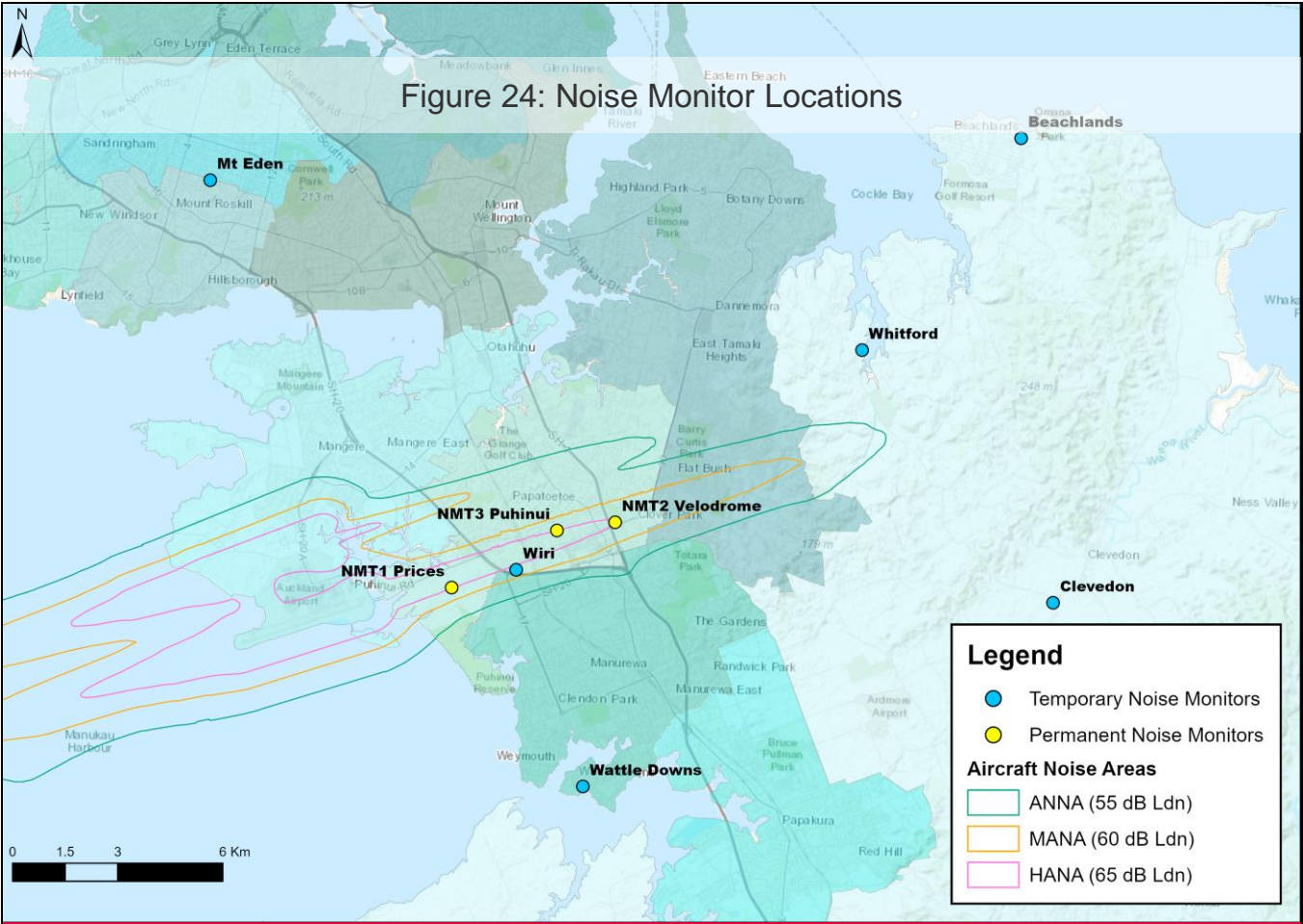


Figure 24 shows the location of Auckland Airport’s three permanent and five temporary noise monitors.

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

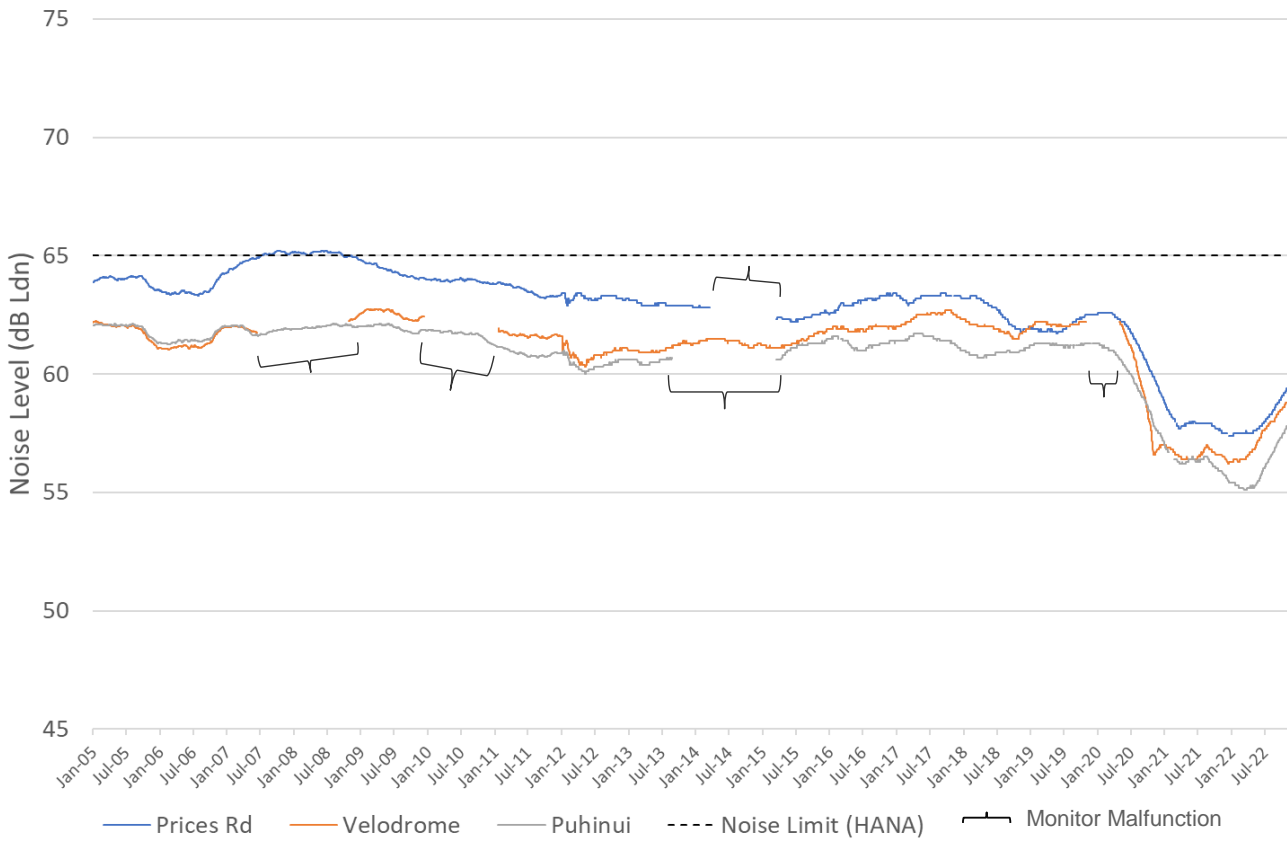


Figure 25 shows the rolling 365-day Noise Exposure ( $L_{dn}$ ) at the permanent noise monitors since January 2005.

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

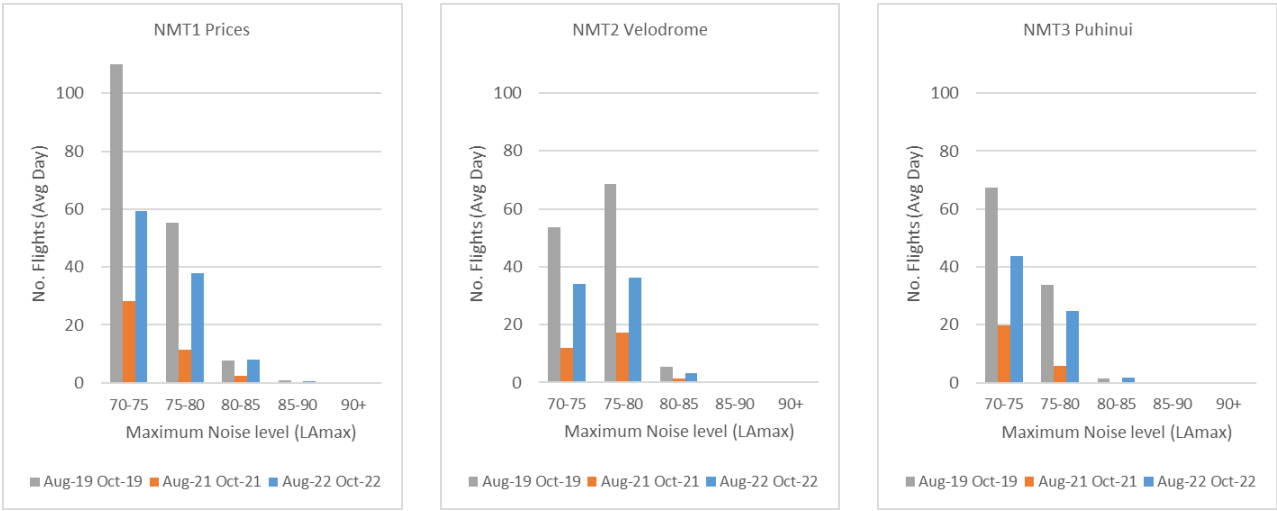
Financial Year	Prices Rd	Velodrome	Puhinui
FY09 (Jul-08 to Jun-09)	64.3	62.6	62.0
FY10 (Jul-09 to Jun-10)	64.0	62.4	61.8
FY11 (Jul-10 to Jun-11)	63.5	61.6	60.7
FY12 (Jul-11 to Jun-12)	63.1	60.8	60.3
FY13 (Jul-12 to Jun-13)	63.0	61.0	60.6
FY14 (Jul-13 to Jun-14)	63.6	61.4	60.3
FY15 (Jul-14 to Jun-15)	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 Puhunui 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

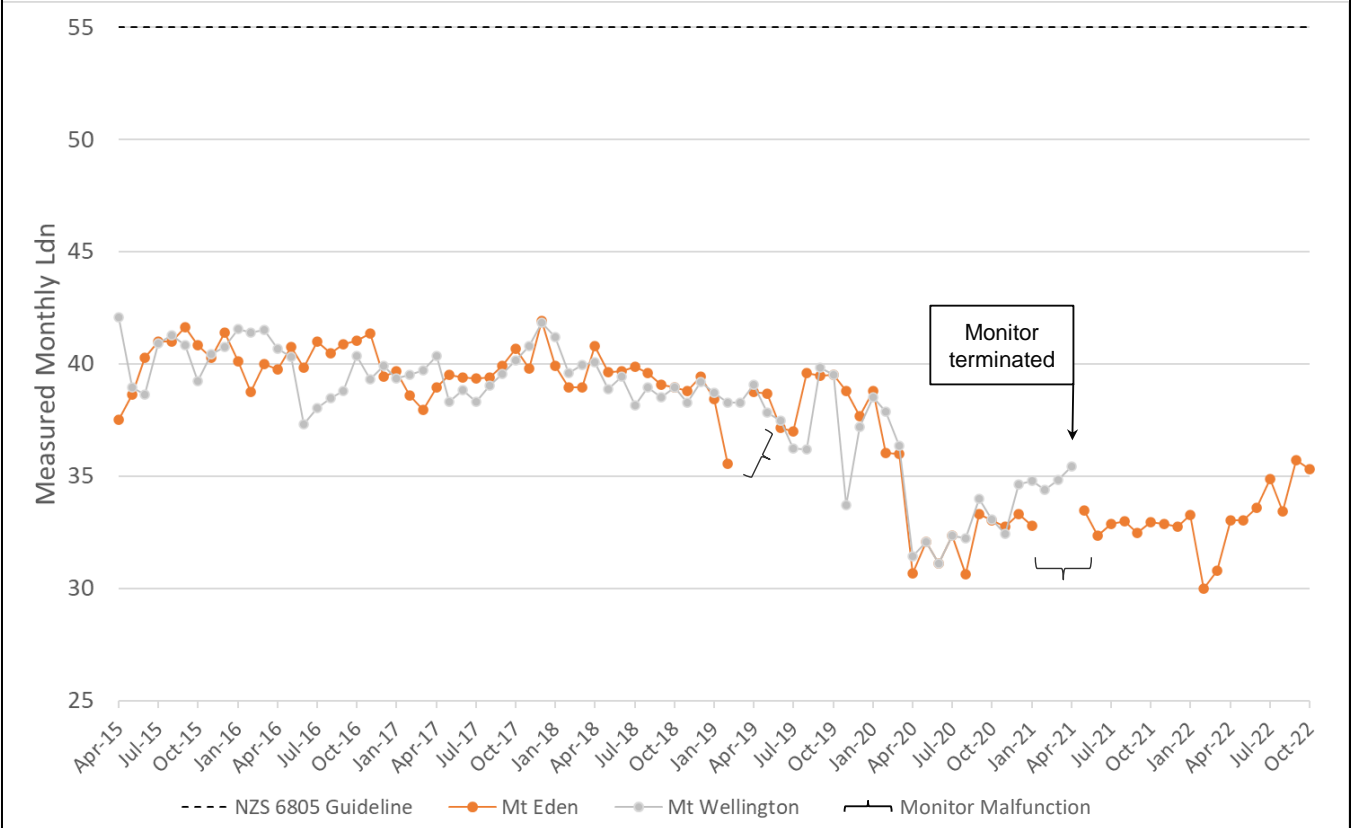


Figure 27 shows the monthly Noise Exposure ( $L_{dn}$ ) trends for aircraft noise at the temporary noise monitor in the Central Suburbs since its deployment.

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

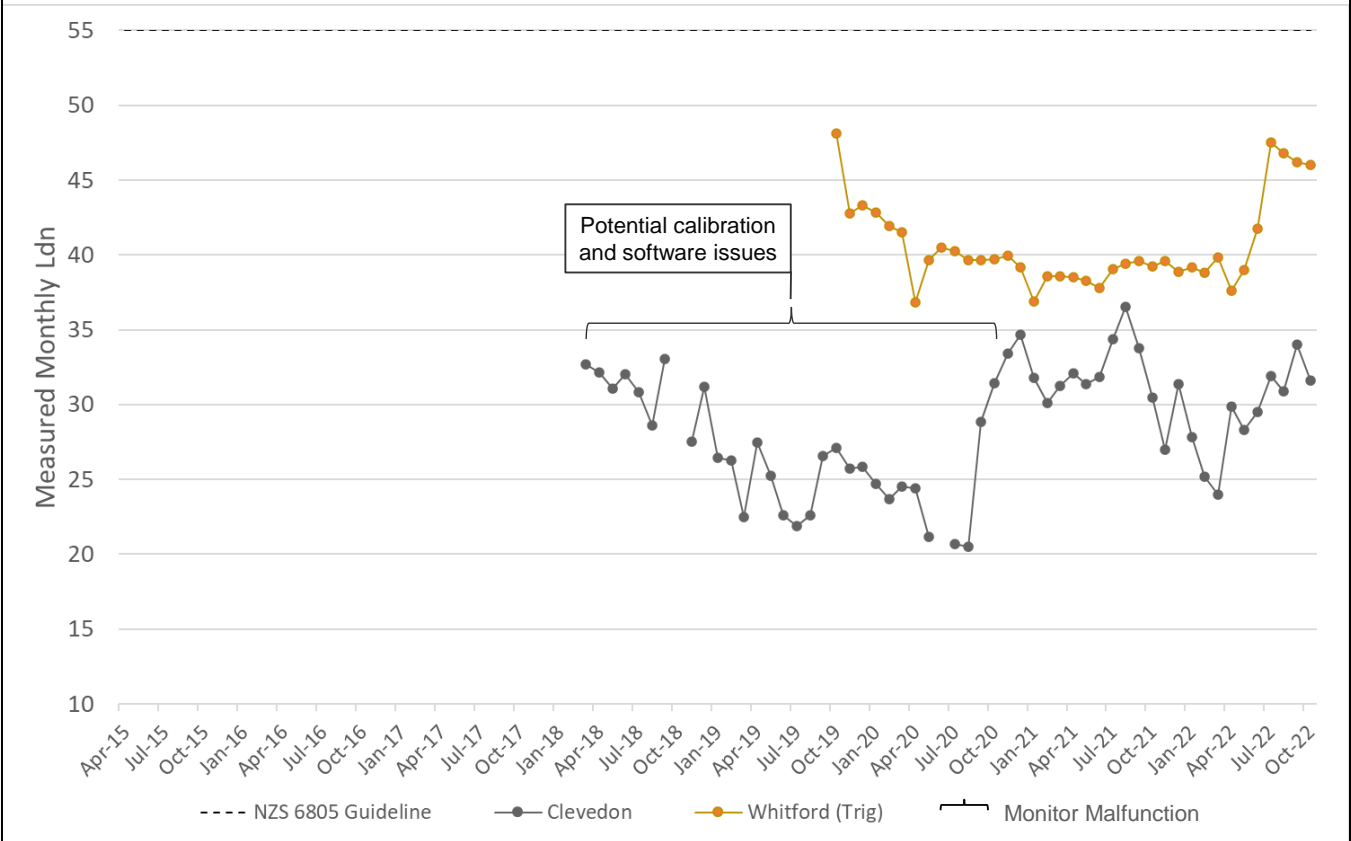


Figure 28 shows the monthly Noise Exposure ( $L_{dn}$ ) trends for aircraft noise at the temporary noise monitors in East Auckland since their deployment.

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

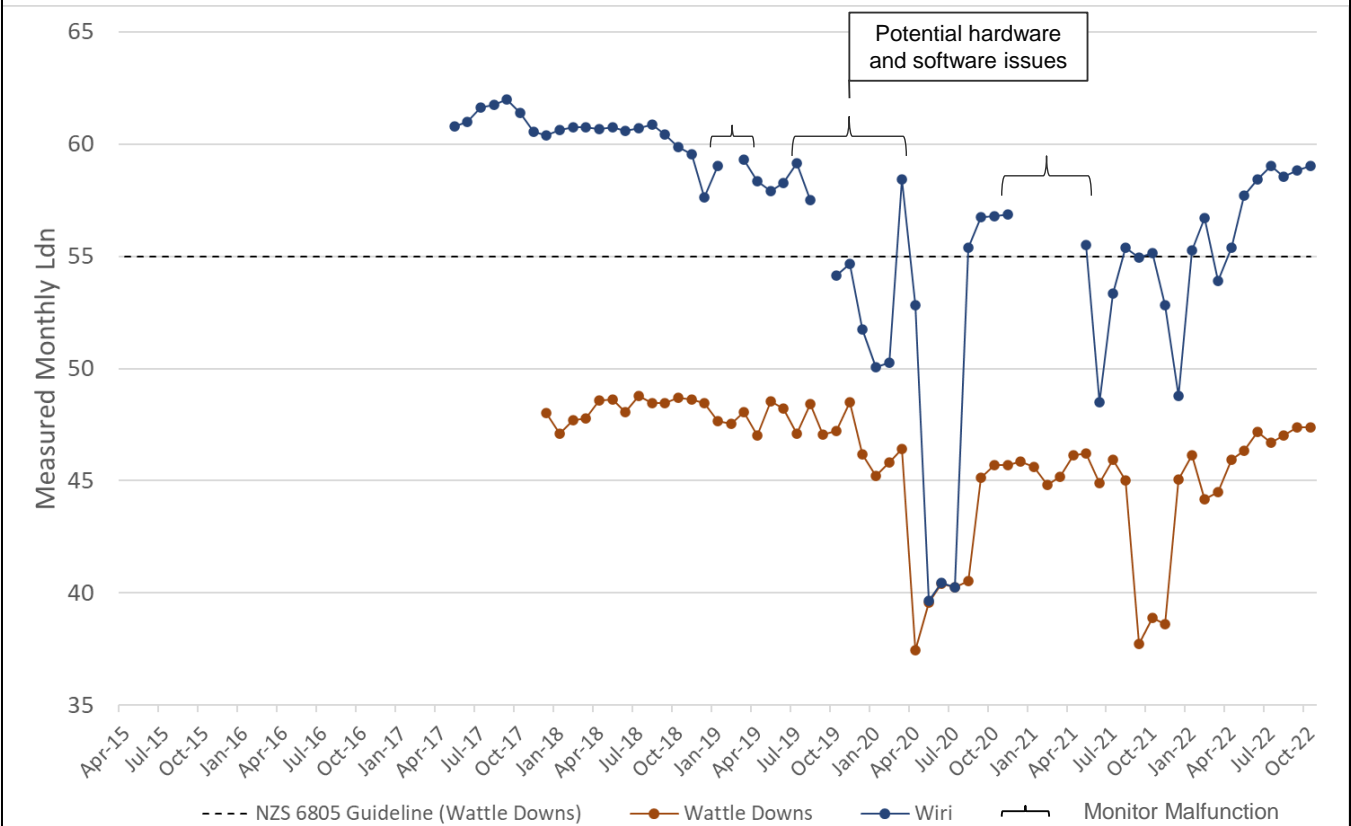


Figure 29 shows the monthly Noise Exposure ( $L_{dn}$ ) trends for aircraft noise at the temporary noise monitors in South Auckland since their deployment.

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.

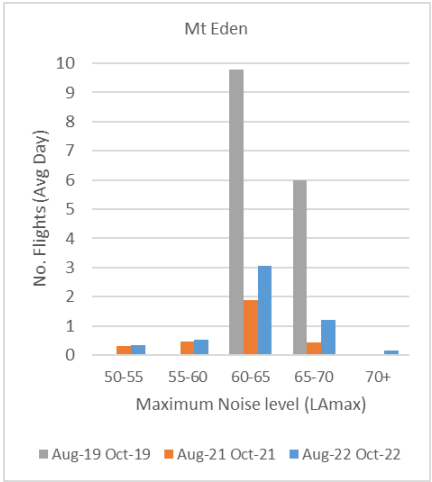
New Zealand Standard NZS 6805 states that areas exposed to noise levels below 55 dB  $L_{dn}$  are suitable for residential development.

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)



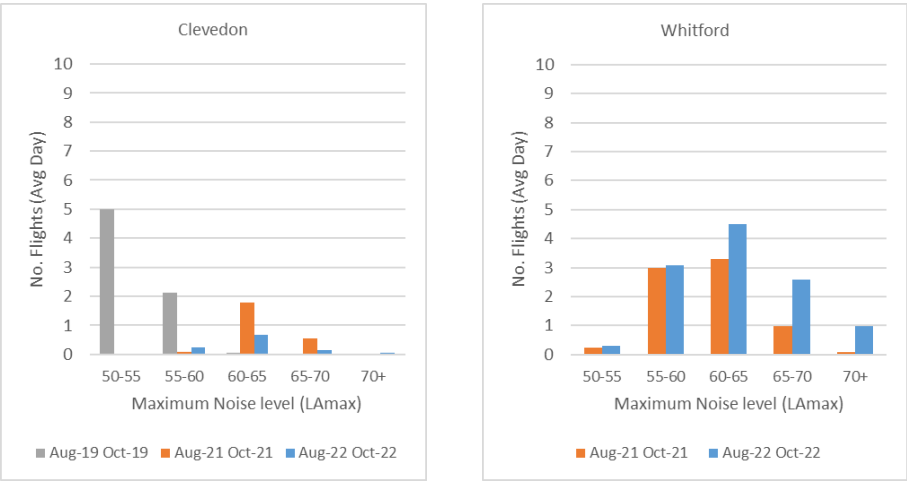
NB: Aircraft noise events over 70-75  $L_{Amax}$  start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

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)

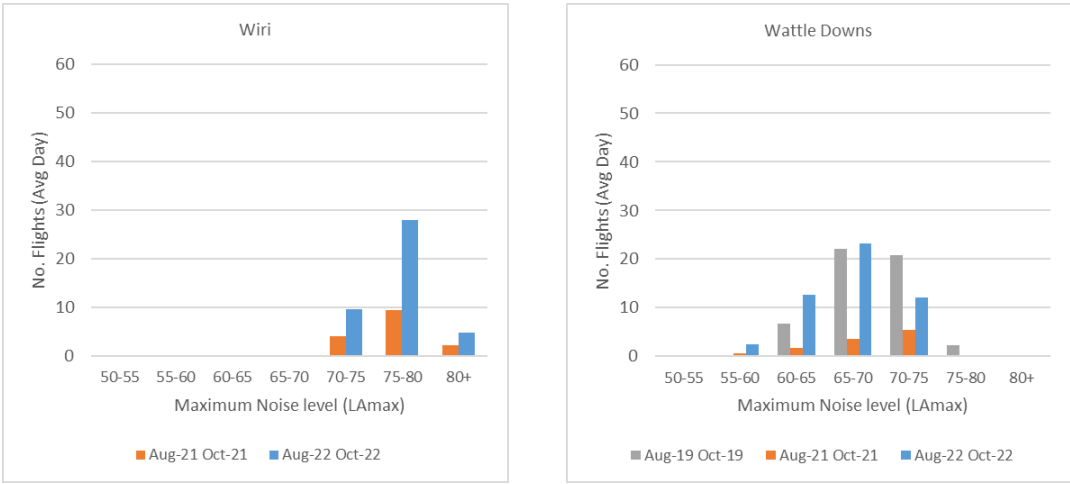


NB: Aircraft noise events over 70-75  $L_{Amax}$  start to become disturbing inside houses with windows open as they have the potential to interfere with watching tv, talking etc.

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

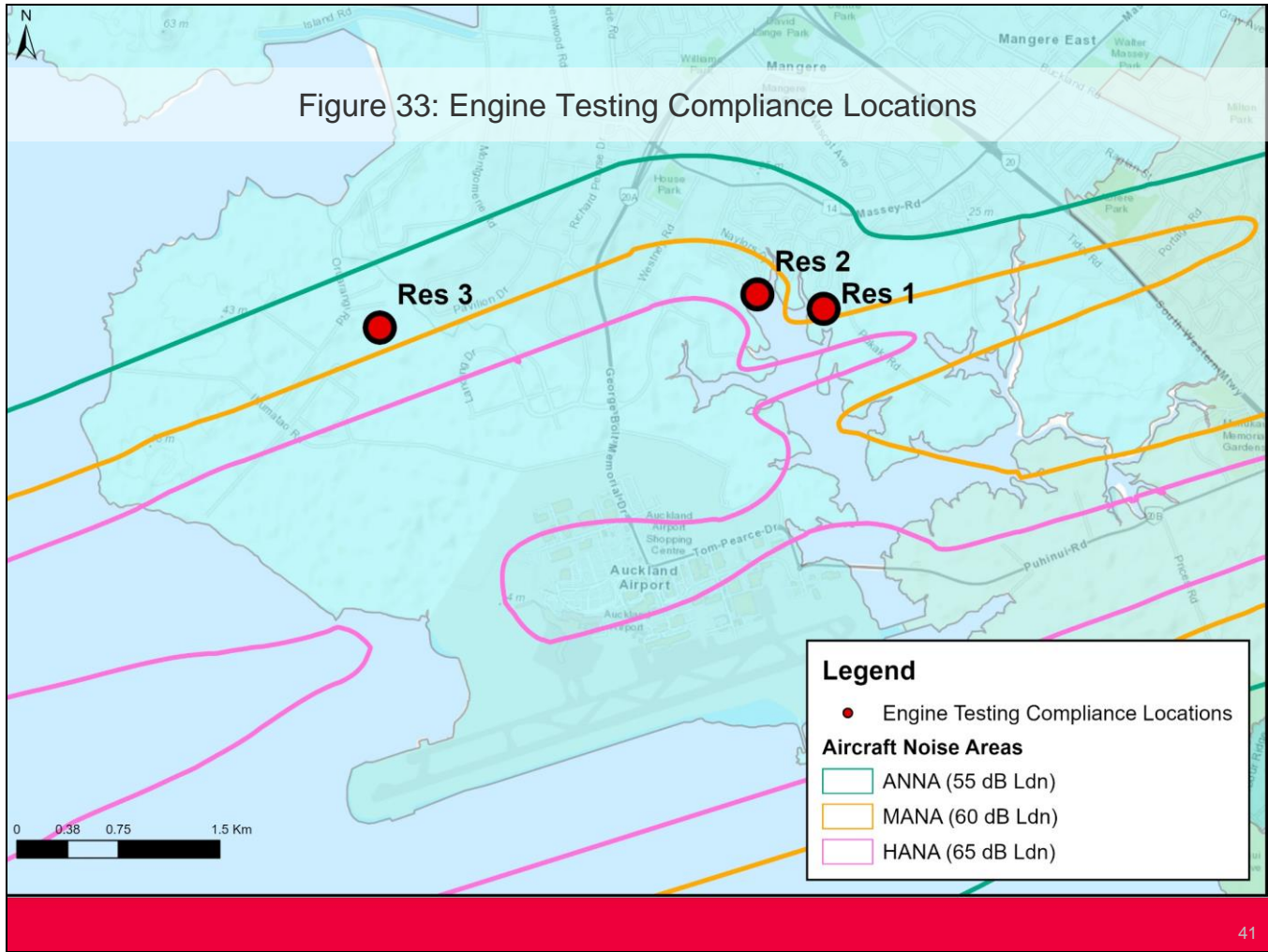


Figure 33 shows the three locations where compliance with the engine testing noise rule is calculated.

Figure 34: Engine Testing Summary

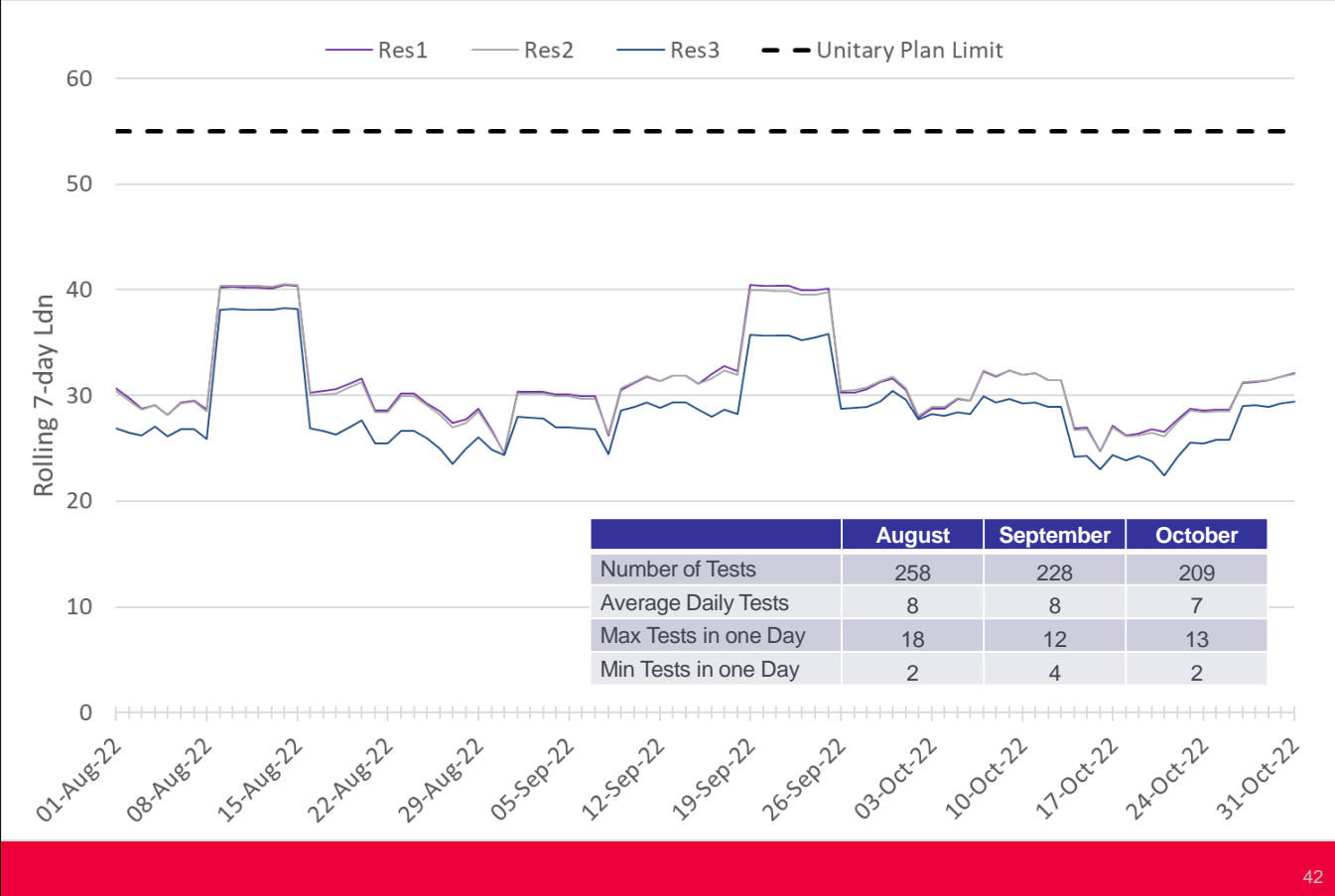


Figure 34 shows the rolling 7-day average noise level for engine testing activity at the airport in the three-month period August 2022 to October 2022.

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>Occurs in Westerly Wind Conditions</div> <div>Occurs in Easterly Wind Conditions</div>
<div><div>Runway 23</div><div><div>Departure to South West</div><div>Runway</div><div>Arrival from North East</div></div></div> <div><div>Runway 05</div><div><div>Arrival from South West</div><div>Runway</div><div>Departure to North East</div></div></div>	
Complaint Type	
“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	<div>The total noise that is from general ambient noise sources (cars, wind etc.).</div> <div>Includes noise from aircraft operations.</div>
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