Short Term Noise Monitoring Program, *Hawthorne*

9 May 2024 – 13 October 2024

Version Control

Version	Date	Comments	Sections
1.0	31 October 2024	Initial Version	All

Summary

Deployment Purpose

This deployment aims to capture noise levels from departures and arrivals aligned with the new Brisbane Airport runway, specifically from runway 19R and runway 01L.

Deployment monitoring Period

9 May 2024 – 13 October 2024

Monitoring Details

Capture zone: 2.0km radius x 8,202ft (2,500m) altitude.

Noise threshold settings by time of day: 00:00-05:59 = Threshold 52dB(A), 06:00-14:59 = Threshold 60dB(A), 15:00-19:59 = Threshold 58dB(A), 20:00-23:59 = Threshold 55dB(A)

Key Findings

- Noise Correlation

  96.6% of the aircraft from Brisbane Airport, as per the focus group, generated noise events that correlated to the aircraft.

- Noise Daily Distribution

  The distribution of the maximum noise levels generated by aircraft falls within the following ranges:

  - 85.8% within the range of 65dB(A) to 75dB(A)
  - 12.4% within 55dB(A) to 65dB(A)
  - 1.7% exceeds 75dB(A).
  - 0.03% below 55dB(A).

- Most Common aircraft

  The most prevalent aircraft type during the deployment period was the B738 aircraft.

- Top loudest noise events

  The top 10 noise events for this deployment originated from aircraft and community sources. Additionally, the top 10 correlated noise events were associated with aircraft noise.

- Busiest Day

  The purpose was to analyze the day that had the most significant impact on the community. The busiest day during the deployment period occurred on 22 August 2024.

Glossary of Terms

A	Arrivals
Background noise Level (L90)	The noise level in dB(A) that is exceeded 90% of the time. It is considered the background noise level of an environment.
Capture Zone	The region relative to the noise monitor that an aircraft can be within and be able to be correlated to a noise event.
Correlated Noise Event (CNE)	A noise event matched to an aircraft movement that flew through the capture zone.
D	Departures
Data Availability	The degree of data completeness achieved during the deployment period. The data availability percentage factors in any monitor outages that occur.
Day	6:00am-10:00pm
dB(A)	A-weighted decibel. It is an expression of the relative loudness of sounds as perceived by the human ear.
General Aviation	Movements other than scheduled commercial airline operations. This includes private, sports, charter and training operations.
LaMax	Each noise event will have a peak noise level which is referred to as the maximum sound level in dB(A) or LaMax
Movement	An aircraft operation, such as an arrival or departure
Night	10:00 pm to 6:00 am
NMT	Noise Monitoring Terminal also referred to as the noise monitor.
Noise Event	A noise event is created when the noise level exceeds the threshold settings for a specified period.
O	Overflight i.e. an aircraft movement that flew over the area but did not arrive or depart from the airport of concern.
Overall Correlation Percentage	The total number of correlated noise events (CNE) is divided by the total number of aircraft movements through the capture zone to calculate the overall correlation percentage.
RWY	Runway
T	An operation by an aircraft that arrives and departs on a runway without stopping or exiting the runway. It is also known as Touch and Go.
Threshold	The threshold represents the value that the noise level must surpass for a specified period to create a noise event.
YBBN	Brisbane Airport, Queensland

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1 Purpose

The short-term noise monitoring program targets locations in suburbs chosen by Airservices Australia with consideration for community feedback. This deployment aimed to capture noise levels from departures and arrivals aligned with the new Brisbane Airport runway, specifically from runway 19R and to runway 01L. Furthermore, an extensive analysis was conducted for the busiest day of the deployment period. This day was chosen for its potential to provide significant statistical data and insight into a day that had the greatest impact on the community during the deployment. The analysis provided details of the loudest noise events experienced and the most prevalent aircraft operations observed.

To adequately depict the variation in flight paths, weather conditions and operational patterns from Brisbane Airport movements, a monitoring period between 9 May 2024 – 13 October 2024 was deemed sufficient.

This short-term monitor was deployed in Hawthorne, QLD. The noise monitoring terminal (NMT) was positioned to capture aircraft within a three-dimensional cylinder capture zone. The zone spans a radius of 2.0km and extends to 8,202ft (2,500m) above the NMT site level, as depicted in Figure 1. Considering that the focus group of aircraft operates below 5,000ft (1,524m), a ceiling of 8,202 (2,500m) was adopted to accommodate potential variations.

The Focus Group for this deployment consists of aircraft operating to the south Brisbane Airport which include:

- Fixed-wing aircraft arriving at runway 01L of YBBN.
- Fixed-wing aircraft departing from runway 19R of YBBN.

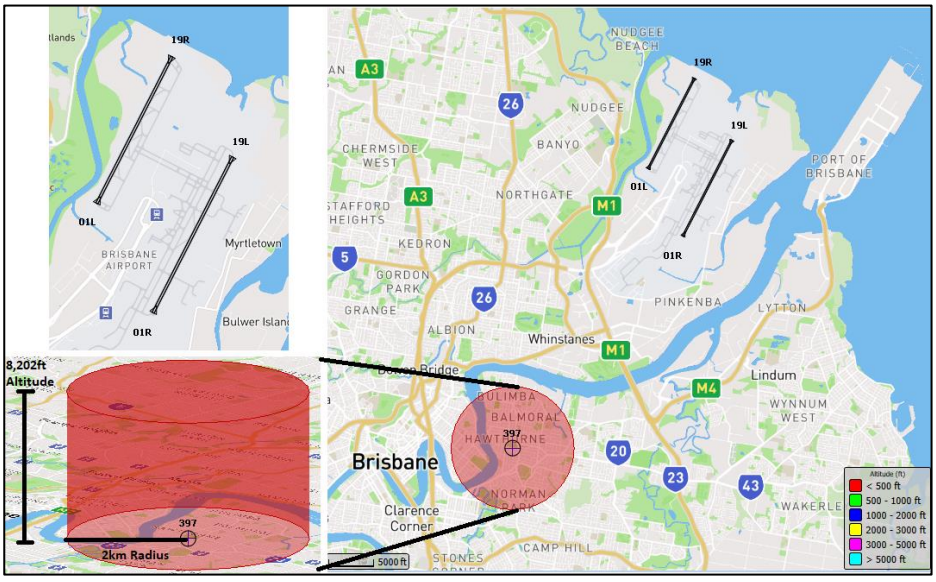

Figure 1: NMT Correlation Zone

2 Deployment Details

The Hawthorne monitor was installed on 8 May 2024 and removed on 14 October 2024. Complete data is available from 9 May 2024 to 13 October 2024.

NMT ID	397
Deployment Period	9/05/2024 – 13/10/2024
Location	Dutton St Hawthorne, QLD 4171
NMT Altitude	69ft (21m)
Capture Zone	2.0km radius x 8,202ft (2,500m) altitude
Data Availability	100%
Threshold Settings[1]	The noise detection thresholds which have been selected: • 00:00-05:59 = Threshold 52dB(A) • 06:00-14:59 = Threshold 60dB(A) • 15:00-19:59 = Threshold 58dB(A) • 20:00-23:59 = Threshold 55dB(A)

Table 1: NMT Details

3 Findings

3.1. Noise Correlation Summary

The total number of aircraft correlated noise events (CNEs) that were captured by the noise monitor during the 5-month deployment period is shown in Table 2 below.

	All Movements[2]	Brisbane Airport Movements	Brisbane Airport Focus Group
Number of Movements through capture zone	25,655	25,551	18,130
Number of CNE	18,902	18,871	17,516
Correlation Summary	73.7%	73.9%	96.6%

Table 2: Aircraft correlation rate

70.7% of all operations that passed through the capture zone were Brisbane Airport movements. A one-week sample of these movements is shown in Figure 2, below. Other operations included traffic from other airports, such as Amberley, Archerfield, and Wellcamp Airports. A correlation of 96.6 % was achieved for the focus group of Brisbane Airport movements.

[1] Threshold setting procedures are explained in section 6.1.1.

[2] All-movement tab accounts for operations to and from other airports (e.g. Amberley, Archerfield and Wellcamp) as well as YBBN operations.

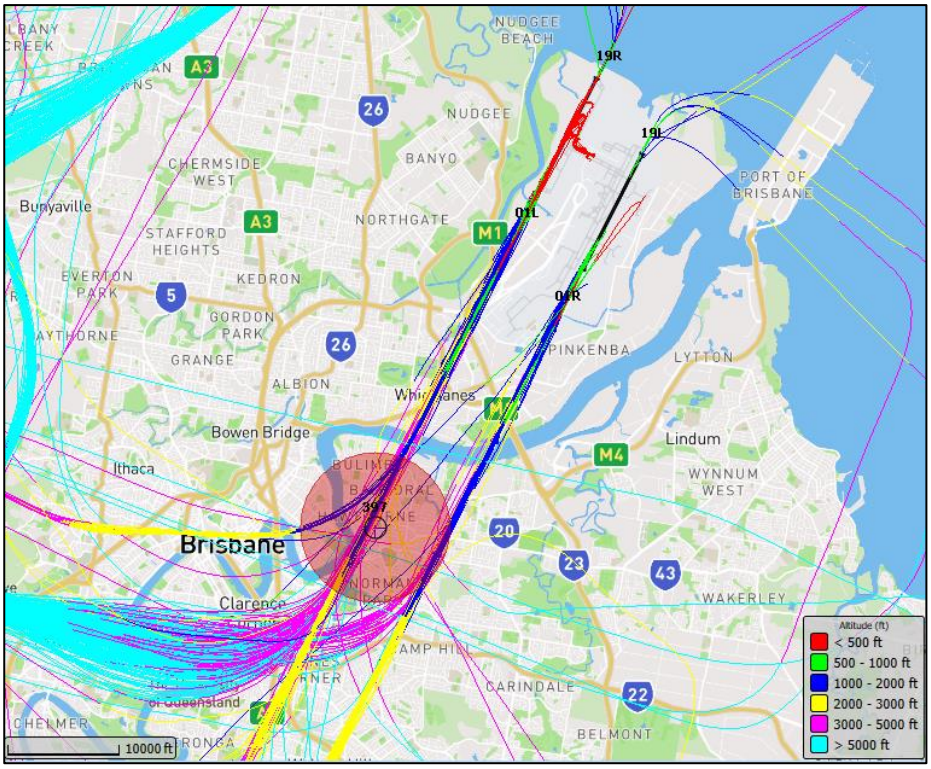

Figure 2: One week of Brisbane Airport flight tracks passing through the correlation zone

The findings obtained during the short-term deployment at Hawthorne are as follows:

- Departure runway 19R and 19L accounted for 50.3% and 5.4% of the operations respectively from Brisbane Airport over the noise monitor.
- Arrival runway 01L and 01R account for 42.5 % and 1.2% of the operations respectively from Brisbane Airport over the noise monitor.
- The average LaMax and highest LaMax for arrival and departure runways are detailed in Table 3, below.

Operation Type	Runway	Average LaMax noise dB(A)	Highest LaMax dB(A)
Brisbane Airport Departure	19R	69.4	87.2
Brisbane Airport Arrival	01L	68.6	80.8
Brisbane Airport Departure	19L	66.2	74.7
Brisbane Airport Arrival	01R	63.3	73.7

Table 3: Average LaMax and highest LaMax noise levels corresponding to each runway.

3.2. Daily Distribution of Correlated Noise Events

A summary of the total number of correlated noise events by time of day, and the minimum to maximum number of CNE on any day, are summarized below in Table 4.

Correlated Noise Event (CNE)	Day Time Count (6:00am-10:00pm)	Night-time Count (10:00pm-6:00am)	Min number of CNE per day	Max number of CNE per day
N- Above[3] 50 dB(A) (N50+[4])	17,669	1,377	35	194
N- Above 60 dB(A) (N60+[4])	17,617	1,269	35	192
N- Above 70 dB(A) (N70+[4])	3,412	335	3	50

Table 4: Total correlated noise events during deployment period by time

Examination of the N-above distribution values in Figure 3 and Figure 4 (below) show that the highest daytime noise levels (N70+) were recorded on 12 August 2024, 13 August 2024 and 19 September 2024. The nighttime distribution peak was observed on 28 July 2024. 85.8% of the maximum noise level generated by aircraft falls within a range of 65dB(A) to 75dB(A), with only 1.7% exceeding 75dB(A).

[3] N-above (or Number-above) is defined as the number of noise event with a LaMax above the specified (eg.N50+) value.
[4] N50+, N60+, N70+ are expressed as number of noise events with a LaMax above 50dB(A), 60 dB(A) and 70 dB(A), respectively.

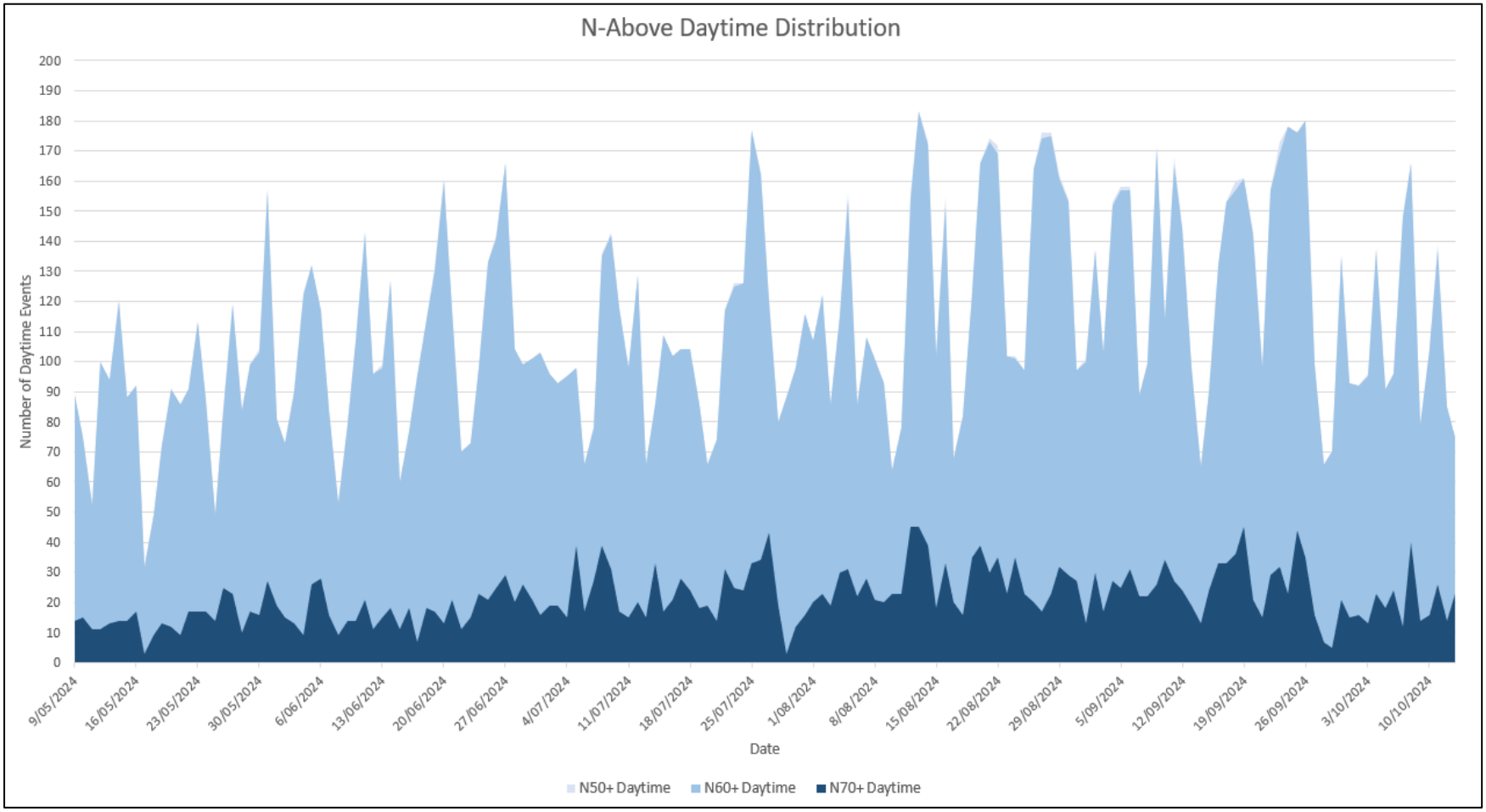

Figure 3: Daytime Daily N-Above Distribution Graph

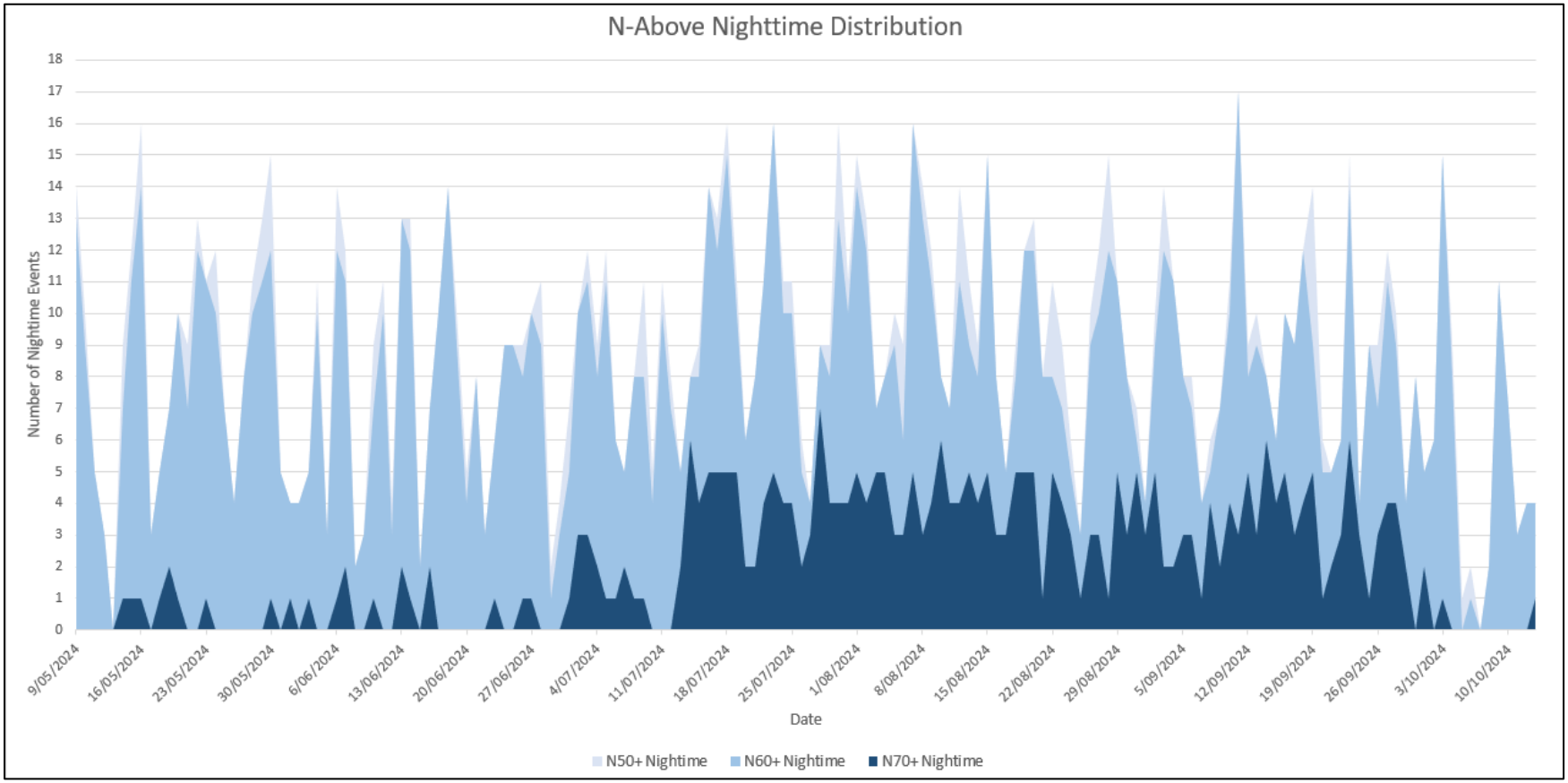

Figure 4: Nighttime Daily N-Above Distribution Graph

3.3. Most Common Aircraft

The most common aircraft type that flew through the zone during the deployment period is a B738 aircraft as shown in Table 5, below.

Brisbane Airport Operation Type	Operations	Correlated %
Arrival	4,696	40%
Departure	2,734	97%
Touch and Go	8	100%
Overflight	0	0%

Table 5: B738 correlation percentage across the deployment period

3.4. Top 10 Correlated Aircraft

The following table shows the top 10 average and maximum noise levels of correlated noise events (CNEs) for the deployment period from 9 May 2024 to 13 October 2024. The highest average LaMax of 69.5 dB(A) is attributed to F100 jets departing from runway 19R, shown in Table 6.

Aircraft Type	Aircraft Category	Airport Code	Operation Type	Runway	Total CNE	Average LaMax dB(A)	Max dB(A)
B738	J	YBBN	D	19R	2,373	69.2	78.3
E190	J	YBBN	D	19R	2,015	67.9	77.3
B738	J	YBBN	A	01L	1,767	69.4	78.3
E190	J	YBBN	A	01L	1,261	68.8	75.2
DH8D	T	YBBN	A	01L	1,115	67.1	77.7
F70	J	YBBN	D	19R	968	68.2	87.2
A320	J	YBBN	D	19R	943	68.2	78
F100	J	YBBN	D	19R	886	69.5	81.2
F70	J	YBBN	A	01L	653	66.5	80.8
F100	J	YBBN	A	01L	623	66.6	77.2

Table 6: Top 10 aircraft in the deployment period by total CNE

Aircraft Category: *J = Jets, T = Turboprop.* ***Operation Type:*** *D = Departure, A = Arrival*

3.5. Noise Event Analysis

The audio verification process involved listening to and confirming the accuracy of the top 100 loudest (LaMax) noise events.

Table 7 outlines the top 10 noise events from all sources. The maximum noise levels (LaMax) of the noise events for this deployment originated from community sources such as rain, vehicles, and aircraft noise other nearby local airports (overflights) associated with the annual Riverfire flyover on the 30/08/2024 and 31/08/2024.

Table 8 outlines the top 10 correlated noise events (that is, correlated with aircraft noise); these include Riverfire overflights and two Brisbane Airport movements. Table 9 outlines the top 10 correlated noise events excluding Riverfire.

Future aircraft noise monitoring in the Hawthorne area can achieve greater precision by:

- Choosing a location further away from the main road to minimise contamination of aircraft noise events by community sources.

Start Date/Time	Correlated to Aircraft?	LaMax dB(A)	Noise Source	Aircraft Type[5]	Operation Type[6]	Runway
09/10/2024 17:53	No	92.5	Rain	-	-	-
30/08/2024 12:50	Yes	91.4	Aircraft	-	O	-
31/08/2024 17:12	Yes	90.6	Aircraft	-	O	-
30/08/2024 12:36	Yes	90.5	Aircraft	-	O	-
30/08/2024 12:45	Yes	89.7	Aircraft	-	O	-
31/08/2024 17:15	Yes	89.5	Aircraft	-	O	-
31/08/2024 17:16	Yes	89.1	Aircraft	-	O	-
30/08/2024 12:47	Yes	88.9	Aircraft	-	O	-
30/08/2024 12:31	Yes	88.6	Aircraft	-	O	-
20/08/2024 17:56	No	87.2	Vehicle	-	-	-

Table 7: Top 10 loudest noise events during the deployment period by LaMax

[5] Dash (-) indicates the details are not publicly available.
[6] Operation types O = Overflight from Amberley Airport, Archerfield Airport, Toowoomba Airport, etc

Start Date/Time	Movement Airport[7]	LaMax dB(A)	Noise Source	Aircraft Type[8]	Operation Type[9]	Runway
30/08/2024 12:50	Overflight	91.4	Aircraft	-	O	-
31/08/2024 17:12	Overflight	90.6	Aircraft	-	O	-
30/08/2024 12:36	Overflight	90.5	Aircraft	-	O	-
30/08/2024 12:45	Overflight	89.7	Aircraft	-	O	-
31/08/2024 17:15	Overflight	89.5	Aircraft	-	O	-
31/08/2024 17:16	Overflight	89.1	Aircraft	-	O	-
30/08/2024 12:47	Overflight	88.9	Aircraft	-	O	-
30/08/2024 12:31	Overflight	88.6	Aircraft	-	O	-
16/07/2024 11:21	Brisbane	81.9	Aircraft	A332	D	19R
19/07/2024 22:28	Brisbane	81.3	Aircraft	A332	D	19R

Table 8: Top 10 loudest aircraft correlated noise events during the deployment period by LaMax

Start Date/Time	Movement Airport[7]	LaMax dB(A)	Noise Source	Aircraft Type	Operation Type[9]	Runway
16/07/2024 11:21	Brisbane	81.9	Aircraft	A332	D	19R
19/07/2024 22:28	Brisbane	81.3	Aircraft	A332	D	19R
09/05/2024 18:09	Brisbane	81.2	Aircraft and birds	F100	D	19R
09/07/2024 13:51	Brisbane	80.8	Aircraft and dog	F70	A	01L
16/09/2024 23:22	Brisbane	80.0	Aircraft	A332	D	19R
16/06/2024 02:30	Overflight	79.9	Aircraft	B412	O	Heli
08/07/2024 11:35	Brisbane	79.9	Aircraft	A333	D	19R
06/06/2024 11:53	Brisbane	79.8	Aircraft	A333	D	19R
07/08/2024 22:28	Brisbane	79.8	Aircraft	A332	D	19R
08/10/2024 13:08	Brisbane	79.7	Aircraft and truck	B763	A	01L

Table 9: Top 10 loudest aircraft correlated noise events during the deployment period by LaMax excluding the Riverfire flyovers on the 30/08/2024 and 31/08/2024.

[7] Overflights refers to movements from Amberley Airport, Archerfield Airport, Toowoomba Airport, etc. [8] Dash (-) indicates the details are not publicly available
[9] Operation types D = Departure, A = Arrival, O = Overflight

Figure 5: Top 9 correlated noise events from Table 8 graphed and analysed.

4 Busiest Day Analysis

4.1. Discussion

The busiest day during the deployment period occurred on 22 August 2024, with a total of 453 noise events. The noise events consisted of jet, helicopter, bird, machinery, and vehicle noise. There were 325 aircraft captured passing through the zone from Brisbane Airport movements, of which 54% were from the focus group. The predominant movement over the capture zone was from jet operations (73%).

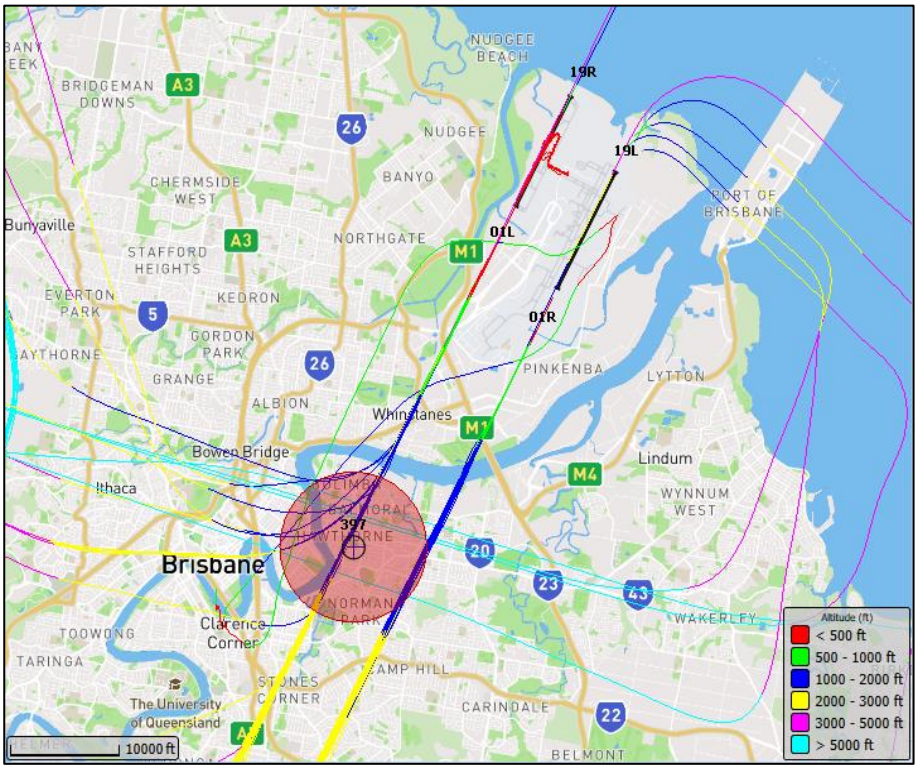

Figure 6: Busiest day flight tracks

4.2. Busiest Day Graph

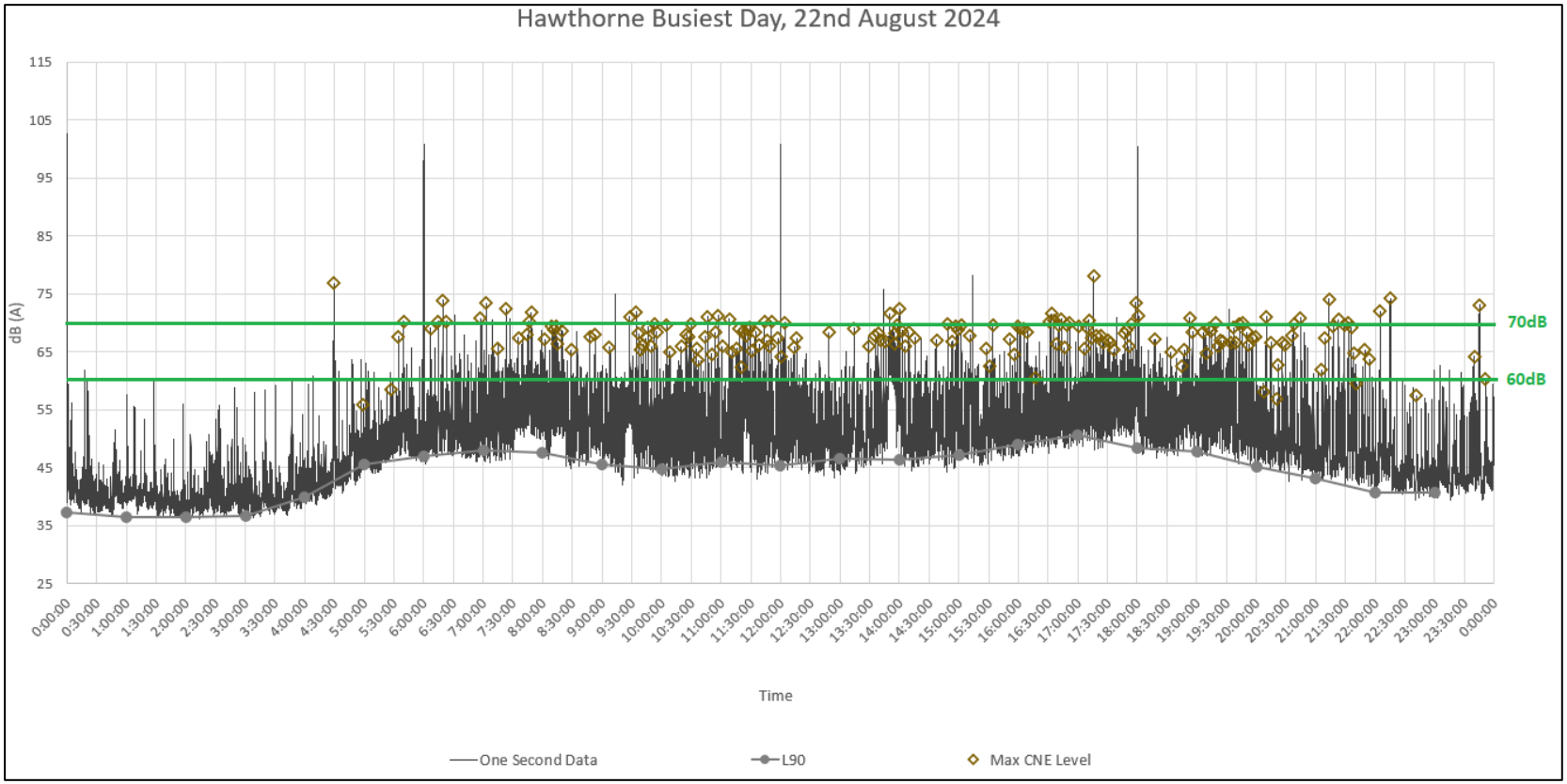

Figure 7: Distributions of hourly L90, max CNE level and one-second noise data on the busiest day. Hourly L90 refers to background noise levels; see Section 6.1.1 for more information. Max CNE level refers to the maximum noise level of the noise event, known as LaMax, which occurs when the aircraft is within the capture zone of the noise monitor; see Section 6.1.2 for more information. One-second noise data refers to the sound levels that are recorded every second by the noise monitor.

4.3. Busiest Day Noise Levels

The loudest event on the busiest day was created by an aircraft, reaching a maximum noise level of 78 dB(A) at 17:15:51 in the afternoon, lasting for 57 seconds.

5 Further Information

The following platforms provide further information on Brisbane aircraft noise monitoring.

5.1. Airservices Australia

Information on the noise and flight path monitoring system including approach to noise monitoring and frequently asked questions: https://www.airservicesaustralia.com/community/environment/aircraft-noise/monitoring-aircraft-noise/

5.2. Aircraft in Your Neighbourhood

Brisbane Noise Monitoring Report (interactive tool to explore monthly noise monitoring data): https://aircraftnoise.airservicesaustralia.com/2020/10/29/brisbane-noise-monitoring-report/

The Brisbane Noise and Flight Path Monitoring System (long term noise monitor terminal locations):https://aircraftnoise.airservicesaustralia.com/2020/06/03/the-brisbane-noise-and-flight-path-monitoring-system-nfpms/

5.3. WebTrak

Aircraft noise data is displayed from live noise monitors across Brisbane, along with historical data: https://webtrak.emsbk.com/bne3

5.4. Brisbane Airport

Dashboard for live noise monitor and PDF reports from past monitor locations provided by Brisbane Airport Corporation (all short term monitor placements): https://www.bne.com.au/corporate/community-and-environment/flight-paths-aircraft-noise/noise-management

6 Appendix

6.1. Noise Event Detection Details:

ISO 20906 provided technical guidance in this short-term noise monitoring. The NMT (i.e., sound level monitor) used for testing passed the Class 1 periodic calibration tests outlined in clauses of IEC 61672-3:2013 and IEC 61260-3:2016. The placement of NMT considered the vicinity of reflective surfaces and the height of the NMT relative to the target aircraft operations to minimise potential unintended anomalies. The NMT height is fixed on a supporting pole and the captured noise events were observed acceptable throughout the deployment. The background noise levels were taken into account in the monitoring area, to appropriately capture aircraft noise levels.

6.1.1. Threshold Settings

Noise monitor threshold settings are established by collecting hourly average L90 data over a period of two to five days following installation of the noise monitor. L90 represents noise level which are exceeded 90% of the time. It is considered the background noise level of an environment. For instance, if the L90 hourly noise level reads 50dB(A), it means that for 90% of that hour, the noise level is above 50dB(A). The threshold is set close to the average L90+10dB(A). The addition of 10dB(A) effectively filters out most community noise, such as birds and animal sounds, machinery, and vehicle noises. As a result, the created noise event will predominantly contain aircraft noise with minimal community noise.

6.1.2. Aircraft and Noise Event Correlation

The correlation of a noise event with an aircraft requires meeting the following conditions:

- The aircraft passes through the defined capture zone set by the monitor as shown in Figure 1.
- The rise and fall time of the measured event matches a sound pattern representative of an aircraft flyover.
- Noise levels are greater than the specified threshold for a specified period when aircraft flies over, this creates a noise event.
- Maximum noise level of the noise event known as LaMax must occur while the aircraft is within the capture zone of the noise monitor.

Aircraft that flew within the vicinity of the monitor but did not trigger a correlated noise event may have failed to meet some of the parameters above. In other instances, this could be attributed to the lack of air traffic control data (ATC). This occurs when aircraft do not have an operating transponder or when there are radar outages. Despite a noise event being created by the aircraft, without available ATC data, there will be no aircraft to correlate with the noise event.

6.2. Calibration Check

The integrity of the noise monitor relies on regularly verifying the accuracy of the microphone recording levels and time synchronisation of samples with radar data. The microphones are replaced with laboratory certified microphones every 12 months and electrostatic calibration tests are automatically performed daily to ensure data quality.