



Short Term Noise Monitoring Program, *Samford (Brisbane)*

04 December 2021 – 04 February 2022

Version Control

Version	Date	Comments	Sections
1.0	15 May 2024	Initial Version	All

Summary

Deployment Purpose

The deployment aims to capture RNP arrival runway 01L operations and to a lesser extent departure runway 19R operations.

Deployment monitoring Period

04 December 2021 – 04 February 2022

Monitoring Details

Capture zone: 2.5km radius x 8,202ft (2,500m) altitude.

Threshold settings: 00:00 - 23:59 = Threshold 54dB(A)

Key Findings

- Noise Correlation**
 The purpose was to determine the number of aircraft correlated noise events (CNEs) captured by the noise monitor during the two-month deployment. 70.6% of the aircraft from Brisbane airport, as per the focus group, generated noise events that correlated to the aircraft.
- Noise Daily Distribution**
 The purpose was to establish the number of aircraft where the maximum noise level (LaMax) of the noise event created by the aircraft exceeded a specific threshold. 94.% of the maximum noise level generated by aircraft fall within the range of 55dB(A) to 65dB(A).
- Most Common aircraft**
 The purpose was to identify the most prevalent aircraft during the deployment period, which was the B738 aircraft.
- Top loudest noise events**
 The purpose was to verify the accuracy of the top 100 loudest (LaMax) noise events. The top 10 noise events for this deployment originated from community sources.
- 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 9 December 2021.

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
Local	Movement that departs and arrives at the same airport, including circuits and training flights.
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

Table of Contents

Short Term Noise Monitoring Program, Samford (Brisbane)	1
Version Control	2
Summary	2
Glossary of Terms	3
1 Purpose	5
2 Deployment Details	6
3 Findings	6
3.1. Noise Correlation Summary	6
3.2. Daily Distribution of Correlated Noise Events.....	8
3.3. Most Common Aircraft.....	11
3.4. Top 10 Correlated Aircraft	11
3.5. Noise Event Analysis	12
4 Busiest Day Analysis	13
4.1. Discussion.....	13
4.2. Busiest Day Graph	14
4.3. Busiest Day Noise Levels.....	15
5 Further Information	15
5.1. Airservices Australia.....	15
5.2. Aircraft in Your Neighbourhood	15
5.3. WebTrak.....	15
5.4. Brisbane Airport	15
6 Appendix	16
6.1. Noise Event Detection Details:.....	16
6.1.1. <i>Threshold Settings</i>	16
6.1.2. <i>Aircraft and Noise Event Correlation</i>	16
6.2. Calibration Check	17

1 Purpose

The short-term noise monitoring program target’s locations in suburbs chosen by Airservices Australia with consideration for community feedback. This deployment aims to capture noise levels of RNP runway 01L arrival and runway 19R departure operations south of the airport in the Samford area. Furthermore, we will conduct an extensive analysis on a selected day, specifically the busiest day of the deployment period. This day has been chosen due to its potential to offer significant statistical data and insight into a day that has the greatest impact on the community during the deployment. The analysis will provide 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 04 December 2021 – 04 February 2022 was deemed sufficient.

This short-term monitor was deployed in Samford, QLD. The noise monitoring terminal (NMT) was positioned to capture aircraft within a three-dimensional cylinder capture zone. The zone spans a radius of 2.5km and extends to 8,202ft (2,500m) above the NMT site level as depicted in Figure 1. Considering that the focus group of aircraft operate below 5,500ft (1,676m), 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 RNP arrival runway 01L of YBBN.
- Fixed-wing aircraft departing from runway 19R of YBBN.
- All touch-and-go and helicopter YBBN operations flying into the correlation zone.

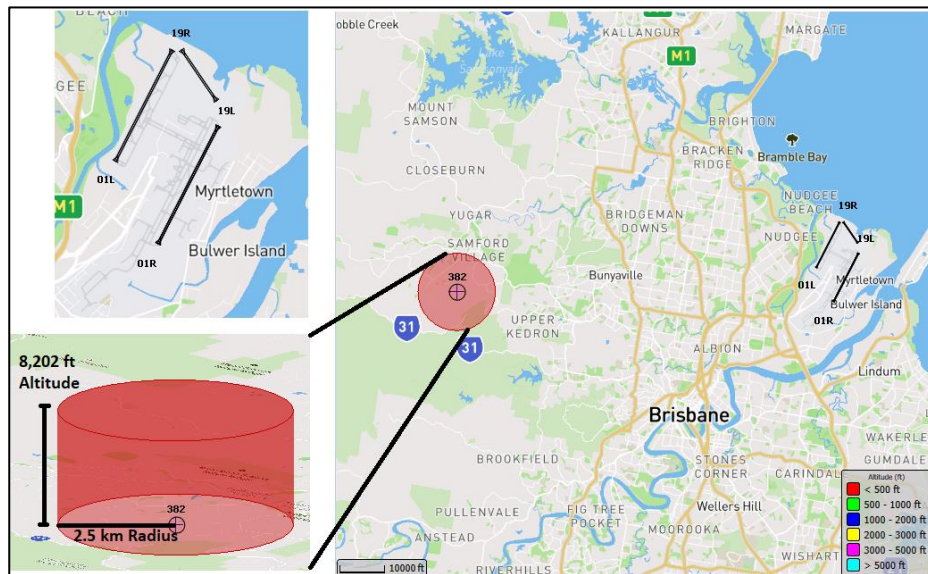


Figure 1: NMT Correlation Zone of 2.5km radius x 8,202ft altitude zone of the monitor

2 Deployment Details

The Samford monitor was installed on 03 December 2021 and removed on 05 February 2022. Complete data is available from 04 December 2021 to 04 February 2022.

NMT ID	382
Deployment Period	04/12/2021 - 04/02/2022
Location	Upper Camp Mountain Rd, QLD 4520
NMT Altitude	331ft (100m)
Capture Zone	2.5km radius x 8,202ft (2,500m) altitude
Data Availability	99.9%
Threshold Settings¹	The noise detection threshold which has been selected: <ul style="list-style-type: none"> • 00:00-23:59 = Threshold 54dB(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 three-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	2610	2100	497
Number of CNE	574	416	351
Correlation Summary	21.9%	19.8%	70.6%

Table 2: Aircraft correlation rate

80.4% 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 70.6% was achieved for the focus group of Brisbane airport movements. The uncorrelated aircraft from the focus group failed to correlate as the generated aircraft noise level did not sustain long enough to create an event.

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.

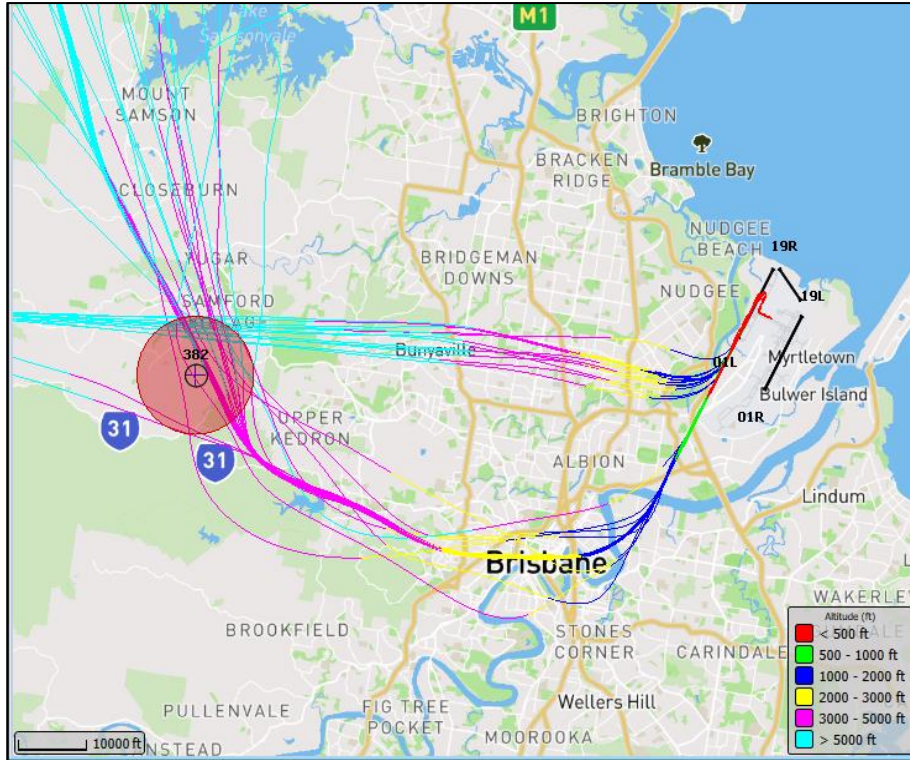


Figure 2: One week of Brisbane airport flight tracks passing through the correlation zone

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

- Departure runway 19R accounted for 1.7% of the operations from Brisbane airport over the noise monitor.
- RNP arrival runway 01L accounted for 84.9% of the operations 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	61.6	65.5
Brisbane Airport Arrival	01L	61.2	71.4

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)	403	16	1	23
N- Above 60 dB(A) (N60+ ⁴)	203	9	0	20
N- Above 70 dB(A) (N70+ ⁴)	4	0	0	1

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 8, 11, 16. 94.0% of the maximum noise level generated by aircraft falls within a range of 55dB(A) to 65dB(A), with only 0.95% exceeding 70dB(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.

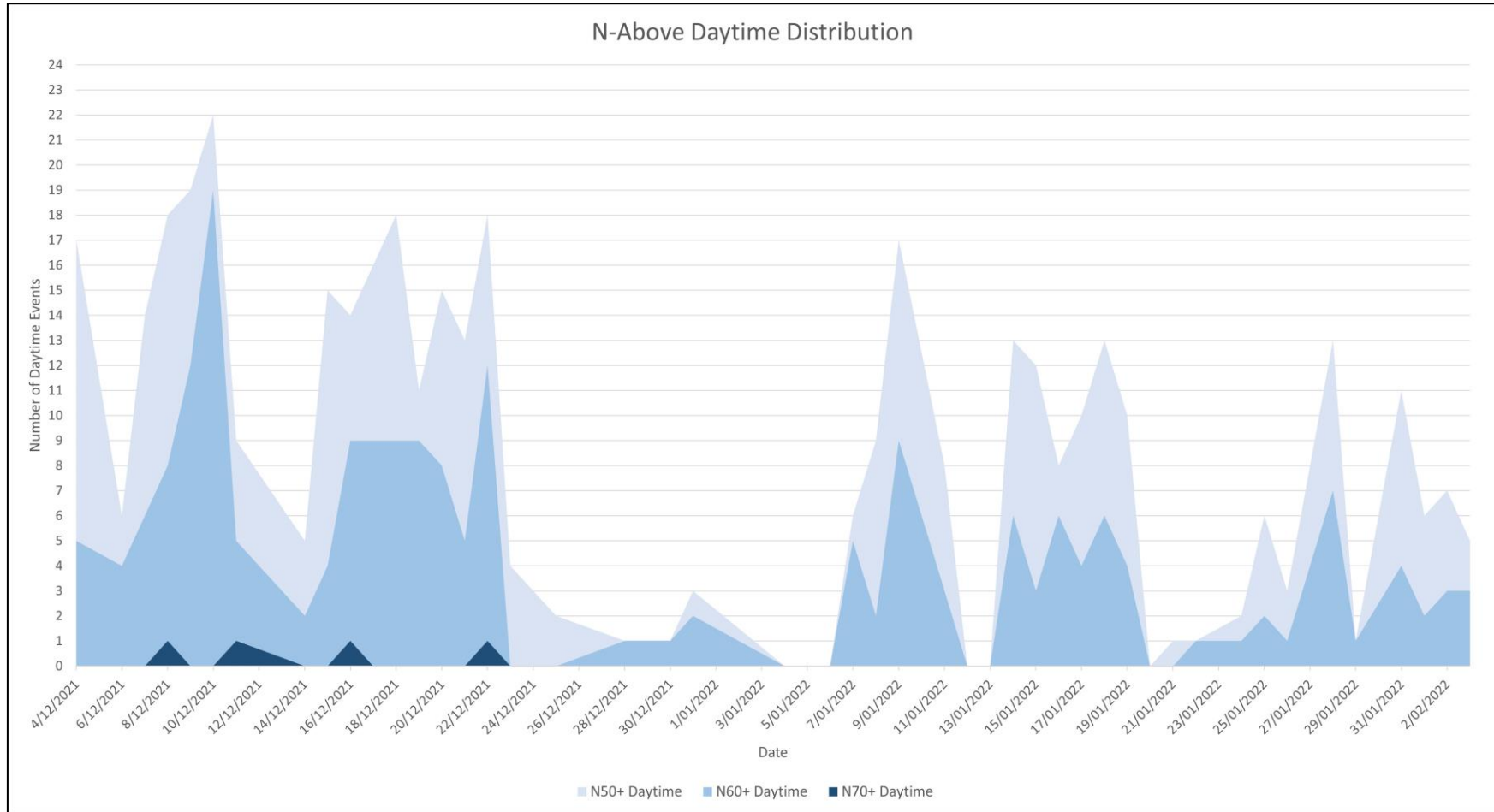


Figure 3: Day-time Daily N-Above Distribution Graph

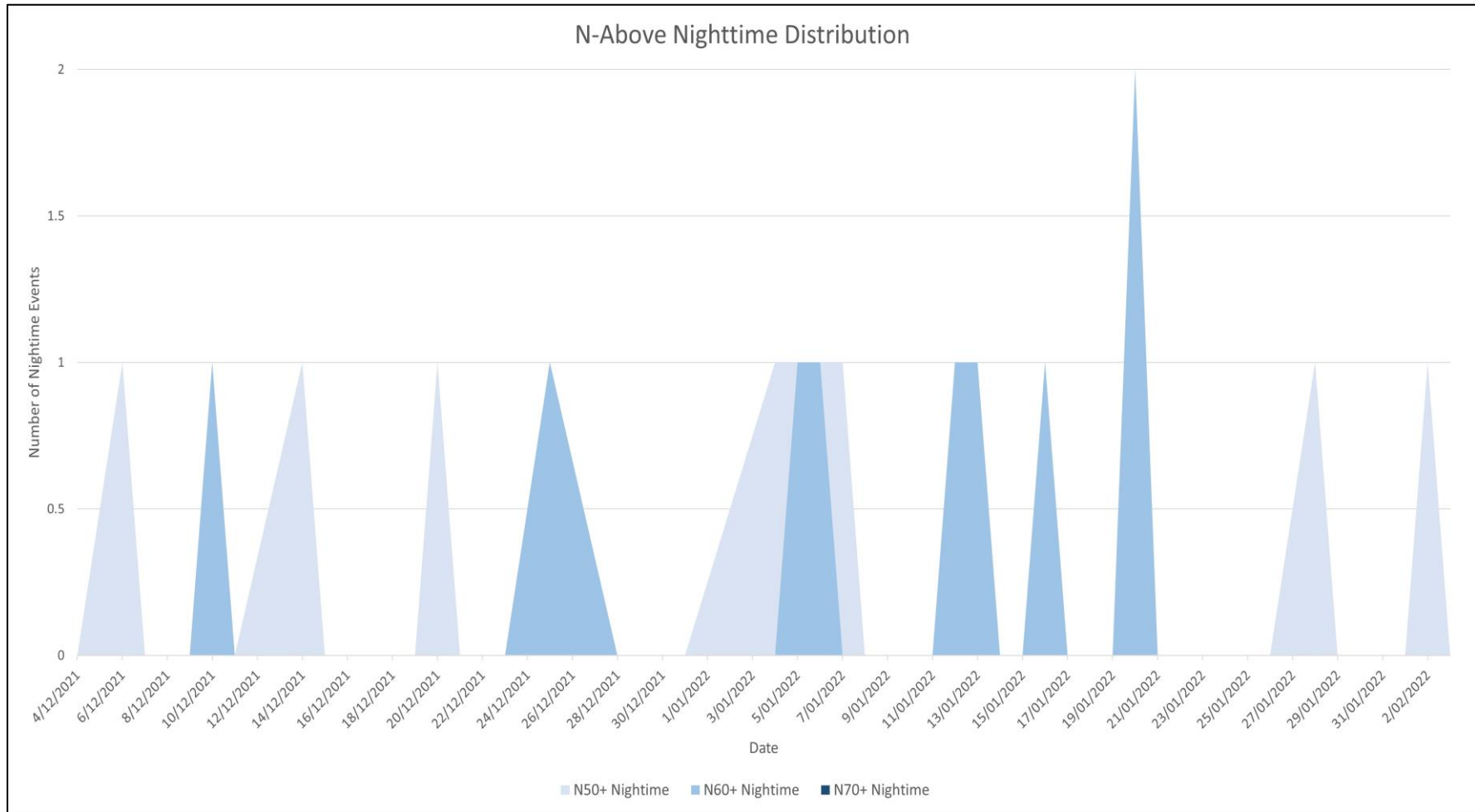


Figure 4: Night-time Daily N-Above Distribution Graph

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	749	34%
Departure	4	50%
Touch and Go	0	0%
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 04 December to 04 February. The highest average LaMax of 64.1dB(A) is attributed to DH8D turboprop aircraft arriving on runway 01L and B77W jet aircraft departing from runway 19L, 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	A	01L	256	60.9	71.4
A320	J	YBBN	A	01L	80	62.0	69.8
B737	J	YBBN	A	01L	22	60.6	64.4
AC50	P	YBBN	D	19L	8	62.4	65.4
DH8D	T	YBBN	A	01L	6	64.1	70.9
B77W	J	YBBN	D	19L	6	64.1	66.7
SF34	T	YBBN	A	01L	5	59.2	60.7
SF34	T	YBBN	D	19R	5	59.2	61.0
A139	H	YBBN	D	H	4	63.7	67.2
D228	T	YBBN	A	01L	3	59.4	60.8

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

Aircraft Type: 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 were all from community sources such as strong wind, thunder, and rain.

Future aircraft noise monitoring in the Samford area can achieve more precision by:

- Choosing a location with fewer trees will minimise the contamination of the noise events by wildlife.
- Selecting autumn and winter periods, typically between May and August, for deployment. During these seasons, bird activity tends to decrease, thereby reducing the amount of bird noise captured in the noise events.

Start Date/Time	Correlated to Aircraft?	LaMax dB(A)	Noise Source	Aircraft Type	Operation Type	Runway
09/12/2021 18:45	No	110.8	Thunder and rain	-	-	-
09/12/2021 18:49	No	102.8	Thunder and rain	-	-	-
09/12/2021 18:47	No	99.5	Thunder and rain	-	-	-
09/12/2021 18:51	No	97.5	Thunder and rain	-	-	-
09/12/2021 18:39	No	97.1	Thunder and rain	-	-	-
02/02/2022 14:41	No	93.1	Thunder and rain	-	-	-
09/12/2021 18:57	No	92.4	Thunder and rain	-	-	-
09/12/2021 18:22	No	91.0	Thunder and wind	-	-	-
23/12/2021 14:03	No	90.8	Thunder and rain	-	-	-
09/12/2021 18:43	No	90.7	Thunder and rain	-	-	-

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

4 Busiest Day Analysis

4.1. Discussion

The busiest day of the deployment period occurred on 9th December, with a total of 410 noise events. The noise events consisted of jet, rain, thunder, and wildlife noise. There were 58 aircraft captured passing through the zone from Brisbane airport movements, of which 21 aircraft were from the focus group. The predominant movement over the capture zone was from jet operations (100%).

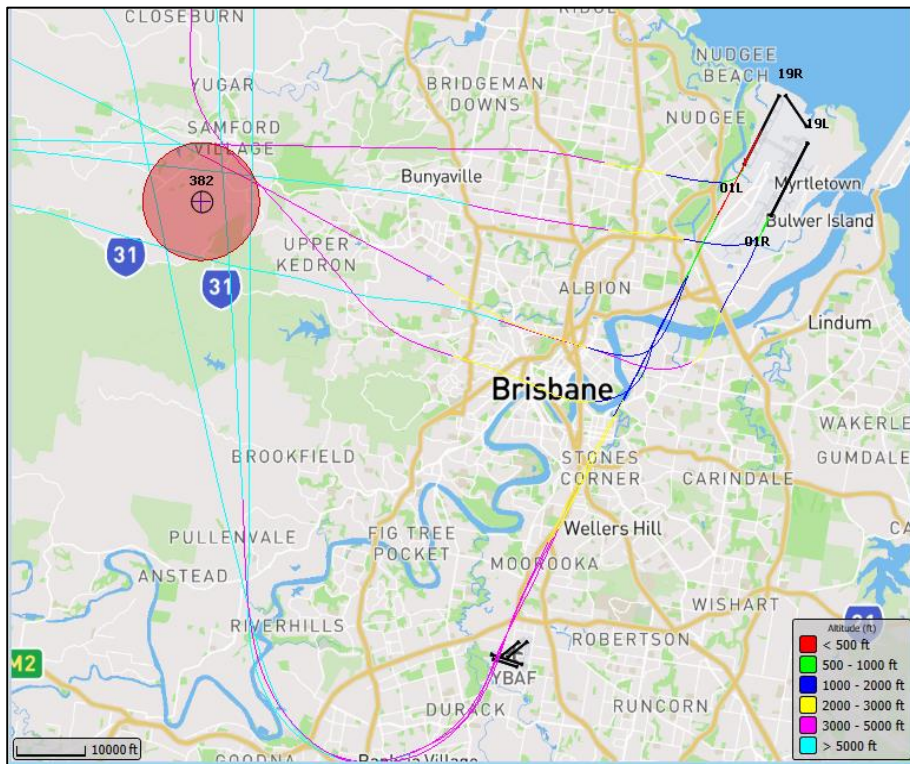


Figure 5: Busiest day flight tracks

4.2. Busiest Day Graph

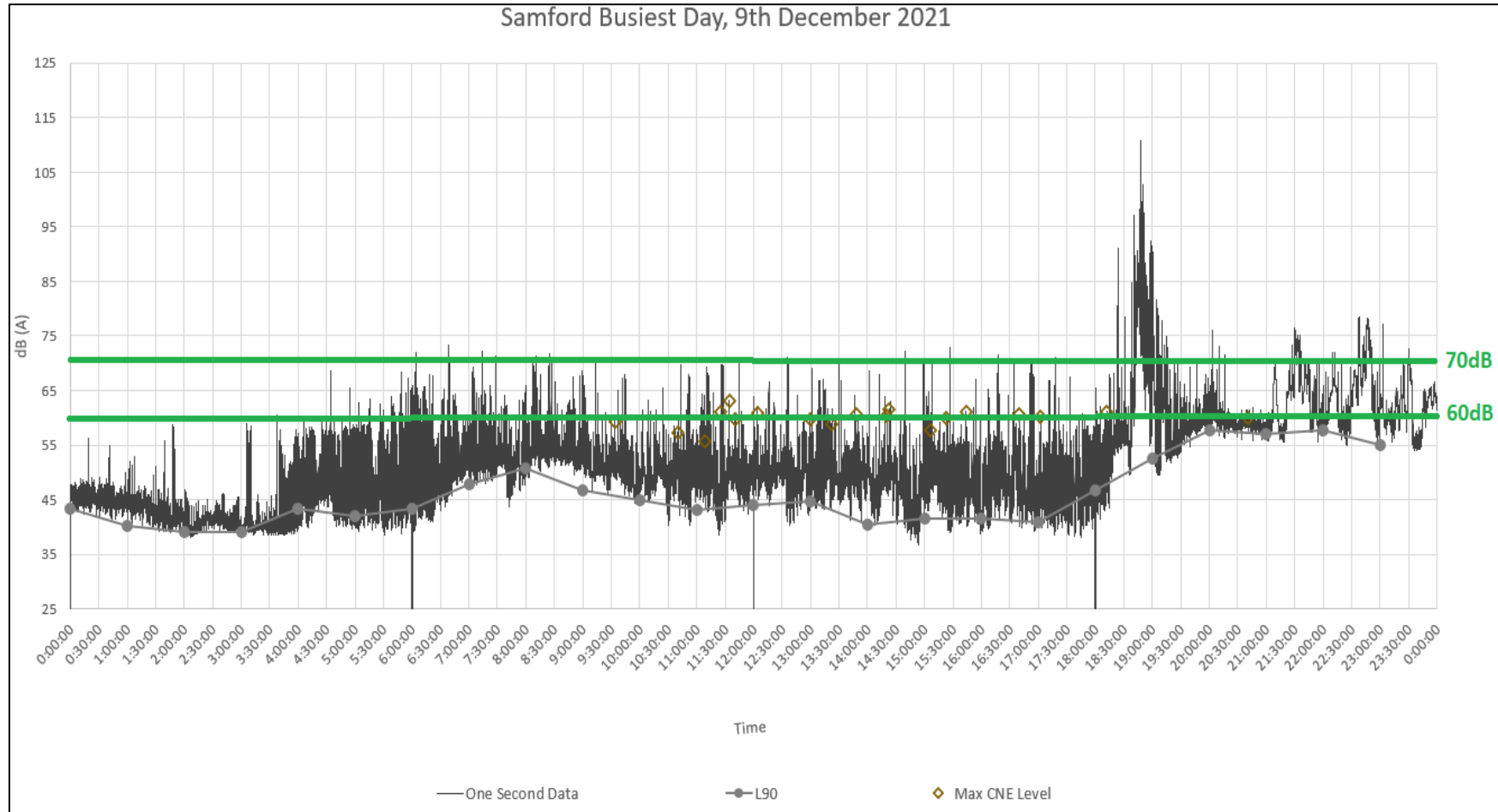


Figure 6: Distributions of max CNE level, hourly L90 and one-second noise data on the busiest day

4.3. Busiest Day Noise Levels

The loudest event on the busiest day was created by thunder and rain, reaching a maximum noise level of 110.8 dB(A) at 18:45:42 in the afternoon, lasting for 120 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.