Supplementary Discussion Document Sydney Night Flight Arrivals Track on Runway 23

June 2022

1. INTRODUCTION

At the March 2022 ANCCG meeting, Auckland Airport presented a Discussion Paper on the Sydney Night Flight Arrivals Track on Runway 23 (available on the ANCCG section of the AIAL corporate website here). This document has been prepared in response to requests from the Orakei Local Board Representative on the ANCCG for a Sydney Night STAR to be developed which removes these flights from over-flying central Auckland. For discussion purposes this March paper outlined an as yet, untested and untrialled, concept flight path that could be used to move some or all of Sydney night flights onto the Melbourne/South Australia Night STAR. This alternative route was an extra 8 track miles long per arriving flight, or approximately 10 000 track miles per annum (at 2019 flight volumes).

Feedback from ANCCG members to this concept was mixed, with no clear support for either the concept flight path developed or for change from the existing standard Western arrivals path used by Sydney flights at night. ANCCG members requested that a concept moving Sydney night flights onto a flight path North of the urban areas be developed for discussion by the ANCCG. The ANCCG also requested further information on:

- the safety risks identified by Airways regarding potential crossing of flight paths
- an assessment of the volumes of people or households affected by the concept flight paths
- the methodology used to calculate the carbon impact of the concept route

This Supplementary Discussion Paper provides that further information, together with concept flight path for discussion purposes that could be used to move some or all of Sydney night flights onto the Brisbane/North Australia Night STAR crossing Auckland at Stillwater/ Silverdale. This Supplementary Discussion Paper should be read together with the March 2022 Discussion Paper.

It is important to note that all concept flight paths outlined in both the March and June Discussion Papers are as yet untested and untrialled, and would need testing, development and publication in the Aeronautical Information Publication (AIP) before they could be implemented.

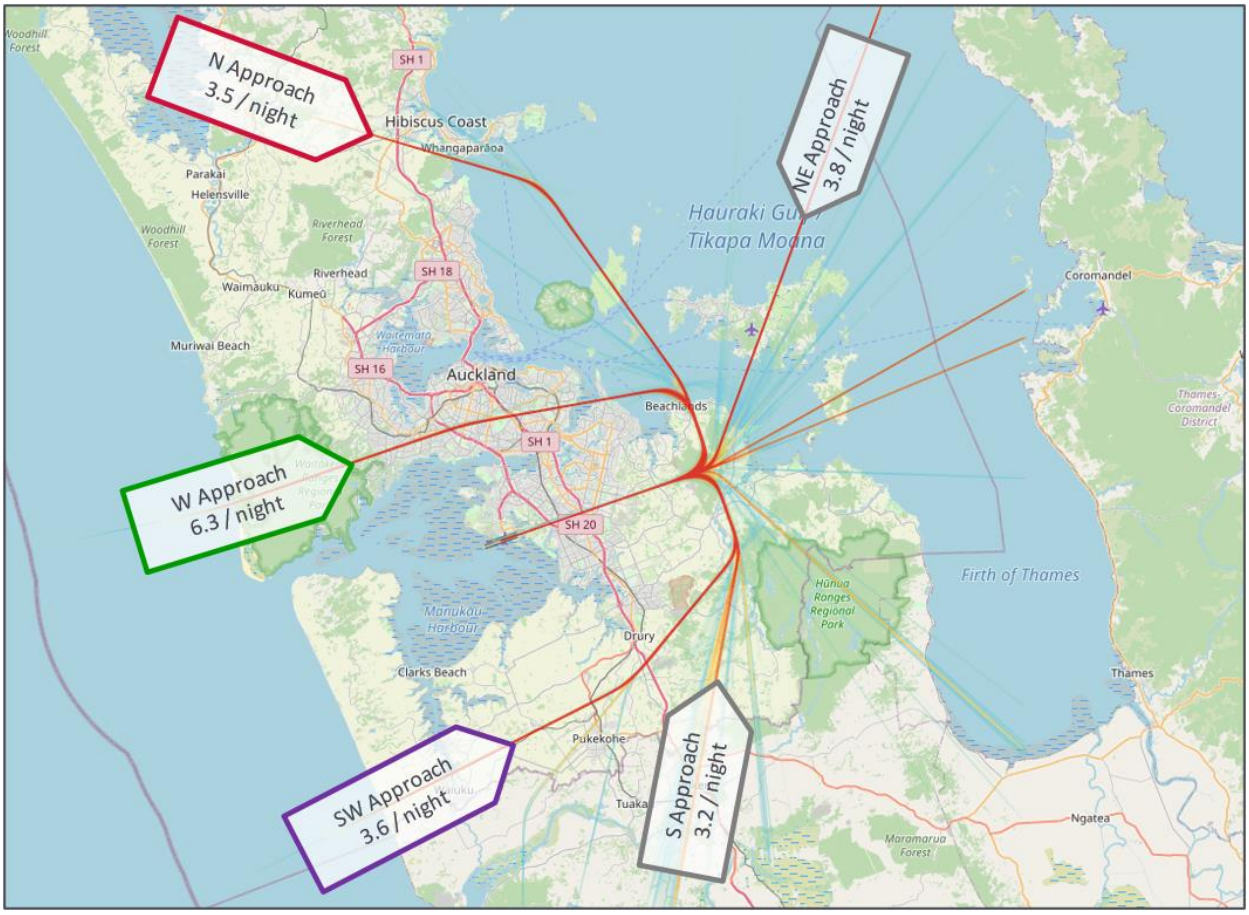
2. HISTORY OF NIGHT STARS AND NOISE ABATEMENT PROCEDURES

During 2018, Airways, AIAL and industry worked to develop alternative routing for night flights arriving from Brisbane/North Australia and Melbourne/South Australia, called Night STARS (standard arrivals routes). Lower domestic traffic volumes at night enabled these routes to be safely developed for night-time use, finishing at 6am. These routes were consulted with the community and implemented 1 September 2018. Together these new Night Stars removed two thirds of night time traffic off the standard central Western route onto new Southern and Northern Night Stars. Sydney night arrivals on Runway 23 continued to use the standard central Western route.

In December 2021 a Night Star for North Amercian and Pacific Island flights arriving on Runway 05 in Easterly wind conditions was introduced so that these flights did not cross central Auckland either.

In addition, a long standing noise abatement procedure exists in CAR Part 93.65 that at night-time (between the hours of 11pm and 6am) runway 23 shall be used for take-off (ie taking off over the Manukau Harbour) and runway 05 for landing (ie approaching over the Manukau Harbour) unless the tailwind is greater than 5 knots, aircraft operating limitations exclude this or the aircraft was otherwise instructed by ATC.

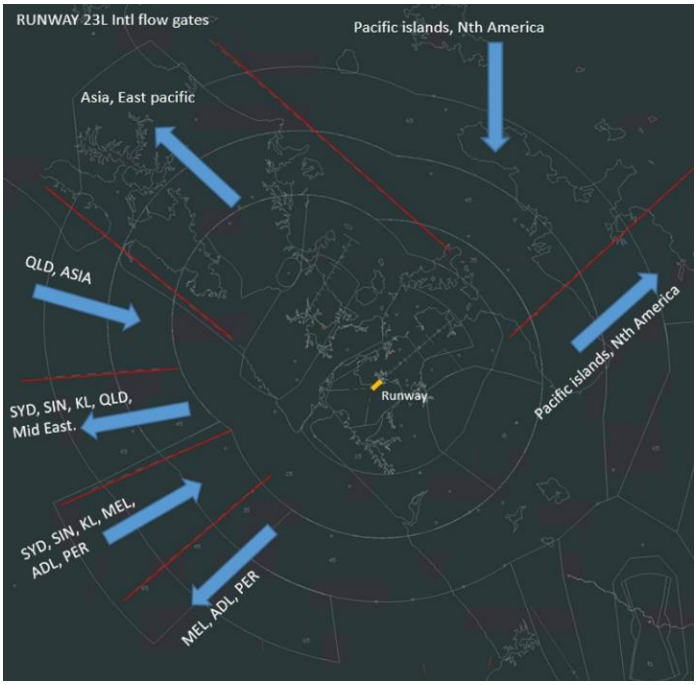
A map showing the distribution of approaches used by all night[1] flights landing on Runway 23 in 2019 is set out below.



[1] Night for these purposes is defined as 10pm to 7am – based on definition in NZS6805

3. EXPLANATION OF RISK OF FLIGHT PATHS CROSSING

Air traffic is managed through various 'gates' being allocated to different regional areas that flights are arriving from or departing towards. Flight paths are designed to reflect these 'gates'. These 'gates' enable safety critical Air Traffic Control management of airspace outcomes, as well as increasing the efficient operation of the airspace. The 'gate' system reduces risk of flight paths crossing and aircraft passing too close to one another, or even colliding. The gates used by Air Traffic Control, for aircraft arriving and departing from Auckland Airport, are shown on an image from the ATC Radar to the right.



Flight paths for air traffic arriving from Sydney (as well as Singapore, Kuala Lumpur, Adelaide and Perth) approach directly towards the airport. The flight paths for flights departing to Sydney (as well as Singapore, Kuala Lumpur, Queensland and the Middle East) use a 'gate' above (ie to the North of) the 'gate' used for arriving Sydney flights. The flight paths for flights departing to South Australia cities use a 'gate' below (ie to the South of) the 'gate' used for arriving Sydney flights.

Moving Sydney night flights to the Southern Night Star used by South Australian flights therefore would have the arriving Sydney flights cross through the 'gate' used by flights departing to South Australia cities. Moving Sydney night flights to the Northern Night Star used by Brisbane/North Australian flights would have arriving Sydney flights cross through the 'gate' used by flights departing to flights departing to Sydney (as well as Singapore, Kuala Lumpur, Queensland and the Middle East).

One of the core principles of flight design is safety. Removing flight paths crossing reduces risk of an in air event. Airways has therefore advised that, from a risk reduction or management perspective, it considers that the Night Flights from Sydney remaining on the current standard arrivals is optimal. If a change was to be made, then the Southern Night Star would be preferable from a risk perspective, as it has fewer flights needing to be managed from a 'cross over perspective' than the Northern Night Star (which would have the arriving Sydney night flights need to cross the busy 'gate' for flights departing to Sydney, Singapore, Kuala Lumpur, Queensland and the Middle East).

4. ASSESSMENT OF VOLUMES AFFECTED

Auckland Airport requested Marshall Day Acoustics (MDA) to provide an assessment of the people affected by the flight path concepts under consideration. MDA has undertaken this analysis using two complementary approaches, being analysis of the number of persons experiencing a single event sleep disturbance from aircraft noise, and a Person Event Index (PEI).

Single Event Sleep Disturbance Event

MDA has assessed a single event sleep disturbance event as a noise level of an aircraft overflight of 60 dB L_{Amax} or greater. This is a method which looks at the number of people exposed to this noise level, and the number of flights experienced to identify potential noise effects for people outside the 55 dB Ldn area.

MDA have undertaken this calculation for two types of representative aircraft: the A320 and the B777. These two aircraft types represent the range of aircraft noise produced by 86% of aircraft movements landing on Runway 23 from Sydney in 2019. The A320 is one of the quieter aircraft to fly from Sydney at night, representing 12% of movements, whereas the B777 is one of the louder, at 3 – 5 dB louder, and

(with all 777 variants) represented approximately 20% of aircraft movements in 2019. The most commonly used aircraft in 2019 was the B737-800, representing 32% of aircraft movements from Sydney in 2019, which produce a noise volume greater than an A320, but significantly less than a 777. Modern B789 (representing 12% of aircraft movements from Sydney in 2019) produce noise levels greater than an A320, but less than a 777, and so fit within this noise range. The A320 analysis therefore represents a 'typical best-case' for Sydney night arrivals on RW23, and the B777 represents a 'typical worst-case'.

Using current publicly available GIS information on households, combined with 2018 Statistics NZ data on the number of persons per household, and modelling of flight paths using the FAA Integrated Noise Model, MDA model that the number of people exposed to a single event sleep disturbance of 60 dB L_{Amax} or greater is as follows under the existing Sydney approach, the Northern Night Star and the Southern Night Star for the A320 aircraft and 777 aircraft.

	Existing Western Approach Over Central Suburbs	Proposed Northern Approach Over Stillwater	Proposed South-western Approach Over Clevedon - Drury
Airbus A320	40,776	40,776	40,008
Boeing 777	77,406	64,755	61,230

The volume of total people exposed to a single event sleep disturbance of an aircraft overflight of 60 dB LAmax or greater is very similar for an Airbus A320 on either of the three routes (at approximately 40 000 to 41 000 persons).

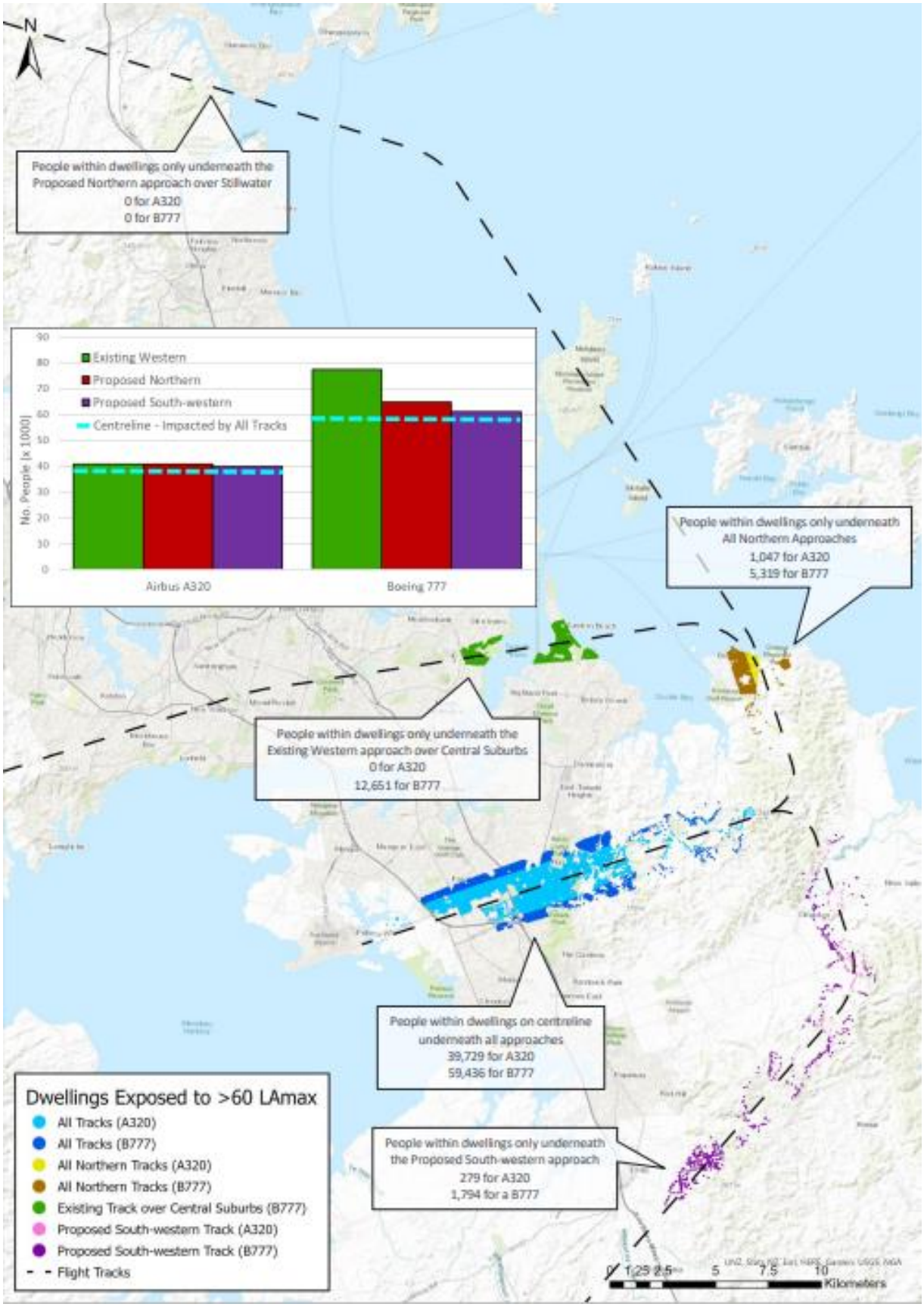
However, when the analysis is undertaken for a Boeing 777 aircraft, then more people are exposed to a sleep disturbing event under the current Sydney night flight path. The existing Standard Arrivals Track (ie the Western approach crossing the central suburbs of Auckland) is assessed as having 77 406 people within the 60 dB L_{Amax} contour for a Boeing 777 aircraft (i.e. 77 406 people are within the potential sleep disturbance threshold for each Boeing 777 arrival on this track). This reduces to 61 230 persons if the Southern Night STAR is used or 64 755 if the Northern Night STAR is used. Compared to the existing Standard Arrivals Track, using the Northern STAR would expose 16% fewer people to a sleep disturbance event each time a Boeing 777 flies overhead, and using the Southern Night STAR would expose 21% fewer people. In terms of the number of people who experience 60 dB L_{Amax} or higher from an arrival, MDA conclude this is lowest if the Southern Night STAR is used, and highest if the existing standard arrivals route (the Western approach) continues to be used.

It is worth observing that the vast majority of people under the approaches discussed that are exposed to 60 dB L_{Amax} or greater (meeting the potential sleep disturbance threshold) during an aircraft overflight of live beneath the centre runway approach. For an A320 this is 39 729 people and for a Boeing 777 this is some 59 436 people. Changes to the flight tracks at night to use a Northern or Southern Night STAR would not reduce the noise levels for persons living beneath the centre runway approach. The number of persons exposed to a sleep disturbing event from an A 320 passing overhead is relatively low (being between zero and approximately 1000) outside of persons living under the Centre Runway Approach. It is only larger aircraft such as the B777 or A380 that create sleep disturbing events (an aircraft overflight of 60 dB L_{Amax} or greater) for significant volumes of people living outside of the Centre Runway Approach.

Exposure to a sleep disturbing event of an aircraft overflight of 60 dB L_{Amax} or greater

	Persons affected under Centre Runway Approach	+	Persons affected under the Western Approach	Persons affected if Northern Night STAR used	Persons affected if Southern Night STAR used
A 320	39 729	+	1047	1047	279
B 777	59 436	+	(12 651 + 5319) = 17 970	5319	1794

The map below plots where in Auckland the people who would be exposed to a sleep disturbing event from an aircraft overflight of 60 dB L_{Amax} or greater under the three flight path concepts are located. There are no sleep disturbing events under the Waitakere Heritage Area.



Person Event Index (PEI)

The Person Event Index (PEI) multiplies the number of people experiencing a Sleep Disturbing Event for each aircraft overflight the number of aircraft overflights (ie how many aircraft would pass by at night-time) for both the existing flight paths, and the concepts being examined in these two Discussion Documents. The result is expressed as the number of million persons affected. The results from this analysis are shown for the Boeing 777-300ER. Using a 777 for this calculation represents a worst case assessment as it assumes all Sydney flights use the B777, whereas only 20% are B777 flights (and only 9% are the B 777-300ER variant). The A320 and other aircraft that more commonly fly from Sydney are quieter.

Person Event Index for Alternative Flight Path Concepts for Sydney Night Flights Arriving on Runway 23

	Central Suburbs	Stillwater	Clevedon - Drury	Centreline	PEI
No. People (B777)	17,970	5,319	1,794	59,436	
Existing Overflights	7.2 overflights	3.6 overflights	4.8 overflights	15.6 (total)*	
Existing PEI (millions)	0.13	0.02	0.01	0.93	**1.08**
Sydney moved to Northern Approach					
Future Overflights	2.9 overflights	7.9 overflights	4.8 overflights	15.6 (total)*	
Future PEI (millions)	0.05	0.04	0.01	0.93	**1.03**
Sydney moved to South-Western Approach					
Future Overflights	2.9 overflights	3.6 overflights	9.1 overflights	15.6 (total)*	
Future PEI (millions)	0.05	0.02	0.02	0.93	**1.01**

* This is the total of all approaches discussed as all flights overfly centreline

Overall the PEI for the Northern and South-western concepts reduces by 5 – 7% compared to the existing Western Central approach. The change in PEI is small due to the large majority of affected persons living under the extended runway centreline, so not affected by potential adjustments to the earlier portion of the arrivals flight path.

5. CALCULATION OF CARBON IMPACT

Airlines are continually investing in carbon-reduction technology, including purchasing more efficient aircraft, reducing average fleet age, investigating alternative means of fuel and use of battery power, looking to use electric based ground power units rather than fuel based ground power units or auxilary engines. Airways, airlines and airports in New Zealand have also invested millions developing performance-based navigation (PBN) arrival and departure procedures. Utilising satellite-based navigation technology, aircraft fly more optimal flight paths with continuous ascent or descent, reducing track miles flown and the associated kilograms of carbon emissions, along with reducing noise by avoiding populated areas. Adding track miles runs counter to the strong focus on fuel efficiency and reduced carbon footprint from air travel.

Section 4.2 of the March Discussion paper noted that the Southern Night STAR concept outlined in that paper would add an additional 8 track miles to the current standard arrivals route for Sydney flights landing on Runway 23. At the 2019 levels of 1231 night flights arriving from Sydney on Runway 23, this represents an additional 10 000 track miles per annum. It was calculated that this would represent an additional 200 to 300 tonnes of carbon per annum at 2019 flight volumes if this change was made for all Sydney night flights arriving on Runway 23. These calculations were undertaken individually for the different types of aircraft servicing the Syndey route.

Further information on the carbon calculations used in the March Discussion Document was requested by the ANCCG.

As an alternative to endeavouring to undertake calculations by individual aircraft types, the ICAO Carbon Emissions Calculator has instead been used as an independent objective tool to estimate the additional carbon burned if longer flight tracks were adopted to avoid flying over the central Auckland suburbs. This can be found at ICAO Carbon Emissions Calculator. The ICAO web site notes that the methodology applies the best publicly available industry data to account for various factors such as aircraft types, route specific data, passenger load factors and cargo carried.

One Way/Round Trip	Cabin Class	Number of Passengers
One Way	Economy	1

Leg	From City/Airport	To City/Airport
1	AKL	SYD

Delete All Location(s) | Delete Leg | Add New Leg

Reset | Compute

Metric (KG / KM) | Standard (LBS / MI)

Total

Dep Airport	Arr Airport	Number of passengers	Cabin Class	Trip	Aircraft Fuel Burn/journey (KG)[ab]	Total passengers' CO2/journey (KG)[c]
AKL	SYD	1	Economy	One Way	13061.1	141.4

Flight Stage Detail

Dep Airport	Arr Airport	Distance (KM)	Aircraft	Aircraft Fuel Burn/leg (KG)[a]	Passenger CO_2/pax/leg (KG)
AKL	SYD	2158.0	320, 332, 333, 73H, 77W, 789	13061.1	141.4

a. Fuel Burn information provided are for 1 aircraft per leg

b. Aircraft Fuel Burn/journey = ∑Aircraft Fuel Burn/leg

c. Total passengers' CO2/journey = ∑Passenger CO2/pax/leg×Number of pax

A representative[2] one way flight from Auckland to Sydney is indicated by the ICAO Emissions Calculator to burn:

- 13 061 kg of fuel per leg
- 6 kg of fuel per km
- 141.4 kg of carbon per passenger per leg.

The Southern Night STAR concept would add 8 nautical miles to the flight or 12.9km. The ICAO calculator indicates this represents 78 kg of additional fuel per representative arriving flight, or 96 tonnes of additional fuel per annum (at the 2019 volume of 1231[3] night time arrivals from Sydney on Runway 23L). In terms of carbon from fuel burn[4], this represents an additional 245kg of CO_2 per arriving flight, or 302 tonnes of additional CO_2 per annum.

The Northern Night STAR concept would add 15 nautical miles to the flight or 24.1km. The ICAO calculator indicates this represents 146 kg of additional fuel per representative arriving flight, or 180 tonnes of additional fuel per annum (at the 2019 volume of 1231 night time arrivals from Sydney on Runway 23L). In terms of carbon from fuel burn, this represents an additional 460kg of CO_2 per arriving flight, or 568 tonnes of additional CO_2 per annum.

6. CONCEPT FOR A NORTHERN NIGHT STAR FOR SYDNEY FLIGHTS

This section should be read in conjunction with the March 2022 Discussion paper, which:

- Explained current arrivals paths from Australia in section 3.1
- Outlined the current Night Stars developed and introduced in 2018 and 2021 in section 3.2
- Summarised the volume of Sydney Night Flights using Runway 23L in section 4.1
- Provided complaints data regarding Sydney night flights using Runway 23L in section 4.2
- Outlined a concept Southern Night STAR for Sydney night flights using Runway 23L in section 5

[2] Note this is a representative flight using the ICAO methodology that averages out aircraft types flown on this sector and average load factors. Different results will be obtained if calculations are undertaken for individual aircraft types and different assumptions regarding load factors.

[3] Note the volume of night-time arrivals from Sydney has been considerably lower in 2020, 2021 and 2022 due to reduction in aircraft volumes as a result of COVID-19, with 2021 night flights being only 26% of 2019 volumes. It is widely estimated that 2019 aircraft traffic levels will not be reached again until approximately 2024.

[4] The ICAO calculator emission factor of multiplying fuel weight by 3.16 was applied to calculate the CO_2 emissions.

As requested by the ANCCG members at their meeting on 14 March 2022, Airways has examined possible concepts for a Northern based alternative arrivals routes for night flights from Sydney on Runway 23. Airways advises that it still considers the existing route the most effective and direct from an airspace management perspective.

The possibility of routing Sydney flights onto the same Northern Night STAR used by Brisbane/North Australia flights has been considered as an untested concept. Two concepts were considered.

Discounted Shorter Northern Concept

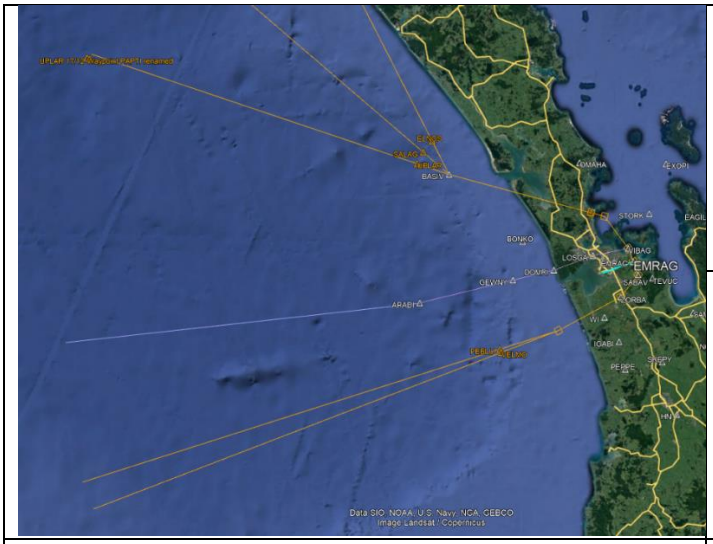
The first concept considered would add 8 nautical miles to the flight length but has been ruled out and not been put forward. It is assessed by Airways as creating too greater a risk of cross-over between arriving and departing flights, as the point at which arriving and departing flight paths would cross is very close to a RADAR sector boundary where aircraft are transferred from the Oceanic Radar sector to the Auckland Approach Radar sector. For safety reasons, any crossover of traffic or conflictions should be designed to occur within one controller's airspace as opposed to near a sector boundary or edge of RADAR viewing.

To reduce (although not eliminate) this risk it would be necessary to have the arriving Sydney aircraft join the Brisbane/North Australia Night STAR earlier. This would mean that the cross-over with departing flights does not occur at the sector boundary or edge of RADAR viewing, thus providing clearer visibility of potential cross-over risks, and therefore more time for the Air Traffic Controller to manage these. This need for human intervention and management is what is referred to Human Factors risk. Managing these cross-overs during night shifts, when natural circadeum ryhthms are low, and fatigue risks are present, is not ideal, and is why Airways looks to minimise such risks where-ever possible.

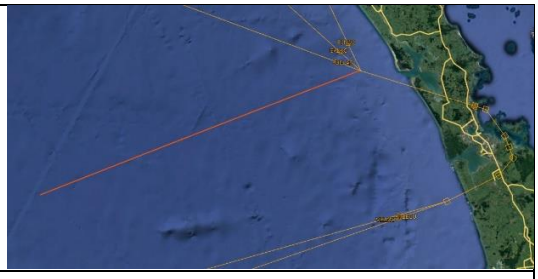
Longer Northern Concept

A Northern concept has been developed which has the inbound Sydney night flight join the Brisbane/North Australia Night STAR earlier before the sector boundary or edge of RADAR viewing. This route would add an additional 15 nautical miles to the flight length on the standard central-western approach. Note, this untested concept has not yet been subject to a safety test or to flight simulation or technical consultation with airlines, all of which would be necessary as part of its development.

The concept route is set out below. In short, Sydney arriving flights in westerly conditions (historically 70%) using Runway 23 would divert Northward approximately 200 nautical miles west of Auckland Airport to join the Brisbane Night STAR (shown below) at BASIV approximately 65 nautical miles North West of Auckland Airport. Once aircraft have joined the Brisbane/North Australia track they would fly the same arrival as Brisbane traffic to waypoints BAYES then VIBAG (over Beachlands) before joining the centre-line of the instrument approach at EMRAG and from there flying directly in a straight line on the standard centre-line approach over Flatbush, Manukau and Mangere to land at Auckland Airport. This route would need to cease being used by 6am, and possibly earlier, depending upon the volumes of domestic traffic.

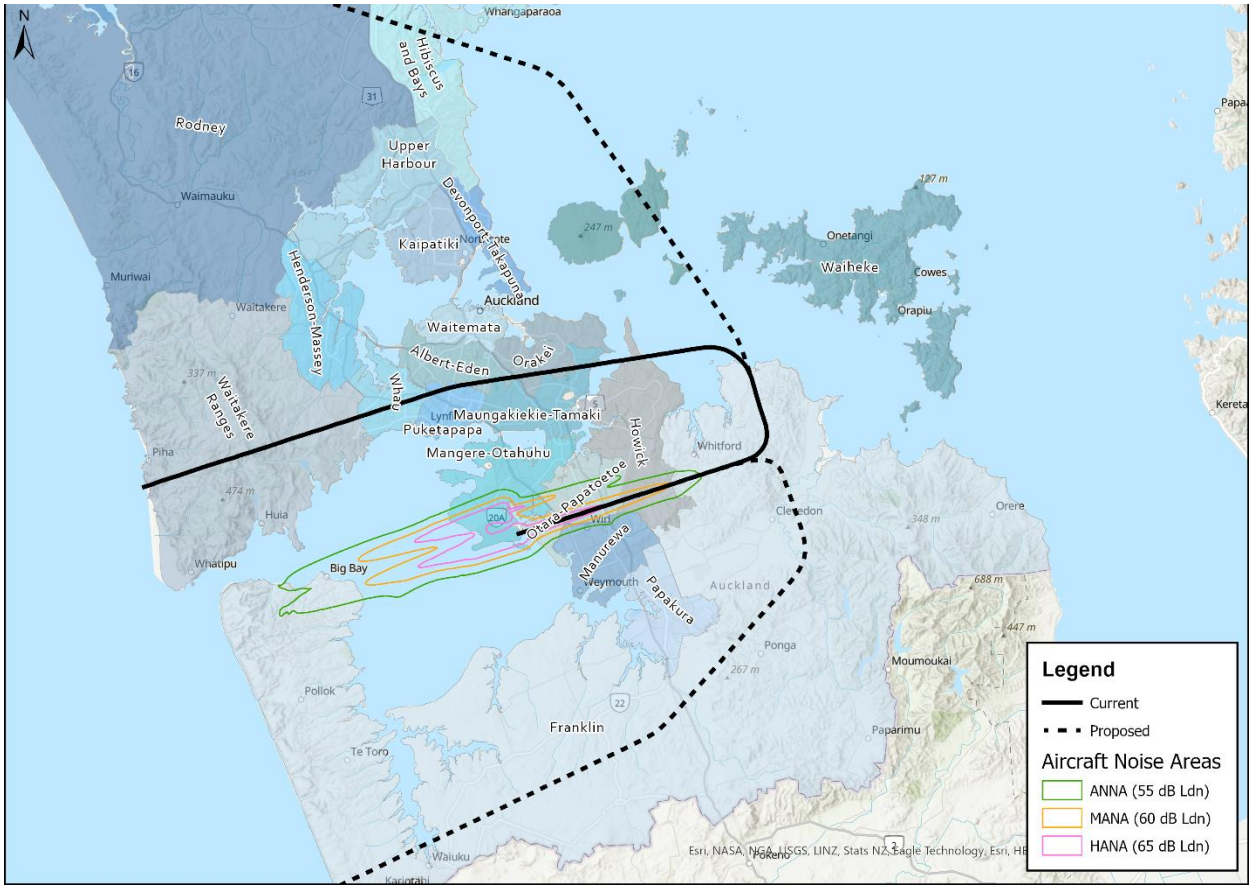


All existing Night STARS/standard arrivals routes for flights from Australia landing on Runway 23L

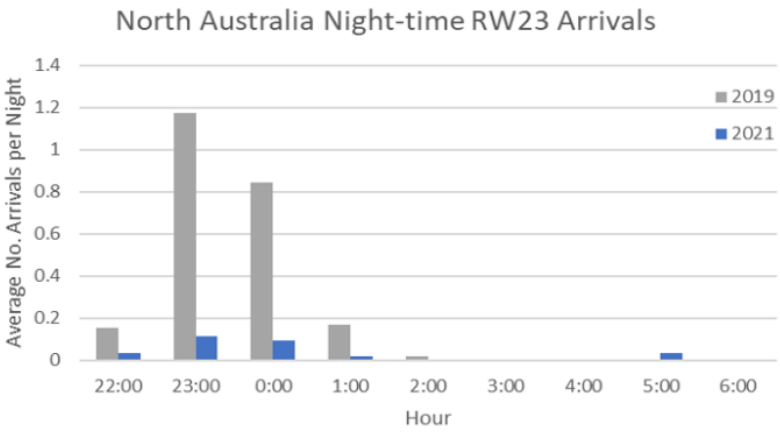


Concept for Sydney flights arriving on Runway 23L to join the Brisbane/North Australia Night STAR at BASIV, crossing North Auckland from the Southern Kaipara Harbour to Silverdale/Stillwater, then flying North to VIBAG at Beachlands, before joining the centre approach line at EMRAG.

An illustration of both the Northern and Southern alternative concept routes, and illustration of current standard night approach for Sydney flights using runway 23L, plotted against Local Board areas is shown below:



Moving Sydney flights to a Northern STAR will transfer overflights from central suburbs to Northern suburbs. Currently, the Northern STAR receives barely any flights after midnight (on either current flight volumes or pre-COVID-19 2019 volumes). This does create a risk that these residents, not currently exposed to very much aircraft noise post midnight, become attuned and sensitive to noise from flights passing overhead after midnight.



However, advice from MDA outlined in section 4 above, observes that there would not be any sleep disturbing noise events greater than 60 dB L_{Amax} experienced at the Stillwater area, which aircraft using the Northern STAR fly over. Historically, noise complaints relating to the Brisbane/North Australia Night STAR are comparatively low, with three noise complaints received in 2019 regarding such flights, representing 2% of the 131 complaints relating to night time use of Runway 23L received in 2019. No noise complaints were received in 2021 relating to flights using the Brisbane/North Australia Night STAR.

7. POTENTIAL MODIFICATION TO AIRCRAFT HEIGHT AT LOSGA

Airways has identified that it may be possible to increase aircraft height by 1000 feet at LOSGA at night, which would reduce aircraft noise over the Central suburbs as aircraft follow the Western Approach (ie crossing Auckland via Green Bay, the LOSGA waypoint at Mt Eden, to Point England and Beachlands).

Before development of this option can occur for the AIP, it does need to be reviewed to verify aircraft performance, particularly in tail wind conditions. This is needed to ensure there would not be any unintended consequence of increasing aircraft noise by causing 'air-braking' or speed flaps to be deployed in tail wind conditions when approaching VIBAG at Beachlands where the aircraft needs to turn to join EMRAG and the centre approach. The ANCCG will be updated as to the results of this review and whether increasing the height of LOSGA at night is able to occur.

8. DISCUSSION OF OPTIONS

This Supplementary Discussion Paper, together with the earlier Discussion Paper from March 2022, examinines concepts for Sydney Night flights landing on Runway 23. The concepts or options identified range from:

- No change to the current flight path (although the possibility of raising the height of LOSGA is under examination by Airways and airlines)
- A new Southern flight path joining the Melborne/South Australia Night STAR
- A new Northern flight path joining the Brisbane/North Australia Night STAR
- Staged or blended options such as using the alternative Night STARS after a certain time of day (eg 0100 onwards) or developing the Night STARS but deferring their introduction until flight volumes reach a trigger point (eg 70% of 2019 Sydney Night flight volumes).

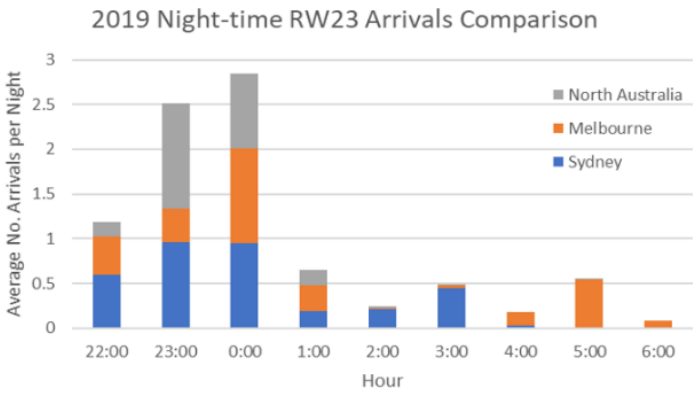
It should be noted that these concepts are provided for the purposes of facilitating discussion and seeking feedback only. These suggestions do not represent any concluded views by Auckland Airport. They have not been the subject of concluded community, industry or aviation feedback. In addition, the concepts are as yet untested and untrialled, and would need testing, development and publication in the the Aeronautical Information Publication (AIP) before they could be implemented.

Air space safety favours the continuation of the current arrivals path

Airways advises that it still considers the existing Western central route the most effective and direct from an airspace management perspective. Moving the Sydney night flights onto either the Brisbane/North Australia STAR or the Melbourne/South Australia STAR causes flight paths of arriving and departing aircraft to cross. The fundamental first principle of flight design is always safety. Avoiding flight paths crossing reduces risk of an 'in air' event. Airways has therefore advised that, from a risk reduction or management perspective, it considers that the night flights landing on runway 23 from Sydney remaining on the current standard arrivals route crossing central Auckland is optimal. If a change is to be made, then the Southern Night STAR would be preferable from a risk perspective, as it has fewer flights needing to be managed from a 'cross over perspective' than the Northern Night STAR (which would have the arriving Sydney night flights need to cross the busy 'gate' for flights departing to Sydney, Singapore, Kuala Lumpur, Queensland and the Middle East).

Changes to flight paths have already shared aircraft noise

Noise from night flights arriving from Australia is currently spread across greater Auckland, with flights from Brisbane/North Australia crossing Auckland at the Stillwater/Silverdale area, flights from Melbourne/South Australia flying a southern route crossing Waiuku/Drury and flights from Sydney remaining on the standard arrivals day-time route (the Western approach) crossing Auckland from Green Bay via LOSGA at Mt Eden, Point



England and Eastern Beach to Beachlands. This distribution of flights can be seen in the graph to the right showing the route flown by Australian flights arriving on Runway 23 in 2019.

Moving Sydney flights to another part of Auckland will transfer noise from one group of residents to another.

With the removal of Brisbane/North Australia/Asia flights and Melbourne/South Australia flights in 2018, it could be considered that noise from night flights is spread equitably across North Auckland, Central Auckland and South Auckland, and the remaining Sydney flights that fly over the central Auckland suburbs and represent 15% of arrivals on Runway 23 is an equitable share to remain over central Auckland.

Changes to the Sydney arrivals path will increase track miles and carbon

Moving Sydney flights to another part of Auckland will result in increased carbon emmissions which runs counter to the strong focus on fuel efficiency and reduced carbon footprint from air travel:

- The Southern Night STAR concept would add 8 nautical files per arriving flight representing 78 kg of additional fuel or 96 tonnes per annum[5]. In terms of carbon from fuel burn, this represents an additional 245kg of CO_2 per arriving flight, or 302 tonnes of additional CO_2 per annum.
- The Northern Night STAR concept would add 15 nautical files to the flight representing 146 kg of additional fuel per representative arriving flight, or 180 tonnes per annum (at the 2019 volume of 1231 night time arrivals from Sydney on Runway 23L). In terms of carbon from fuel burn, this represents an additional 460kg of CO_2 per arriving flight, or 568 tonnes of additional CO_2 per annum.[6]

Airlines are continually looking to reduce carbon useage through means such as investing in carbon-reduction technology, purchasing more efficient aircraft, investigating alternative means of fuel and use of battery power, looking to use electric based ground power units rather than fuel based ground power units or auxilary engines. Airways, airlines and airports in New Zealand have also invested millions developing more efficient approaches and departure using performance-based navigation arrival and departure procedures and utilising satellite-based navigation technology to enable aircraft to fly more optimal flight paths with continuous ascent or descent reducing track miles flown.

The Southern Night STAR exposes the lowest volume of people to a sleep disturbing event

Work undertaken by MDA, as outlined in section 4 above, indicates that the number of people exposed to a sleep disturbing event of 60 dB L_{Amax} or higher from an arriving aircraft is lowest if the Southern Night STAR concept is used, and highest if the existing standard arrivals route (the Western approach) continues to be used.

For larger aircraft such as the 777, which has a greater noise profile than smaller narrow body aircraft like the A320, the volume of people experiencing a sleep disturbing event from an aircraft overflight of 60 dB LAmax or greater is higher for flights under the Western Approach (17 970 additional persons exposed) than the Brisbane/North Australia Night STAR (5319 additional persons exposed) or the Melbourne/South Australia Night STAR (1794 additional persons exposed). Note, for all concepts, 59 436 persons under the Centre Runway Approach are also exposed to a sleep disturbing event from an aircraft overflight of 60 dB L_{Amax} or greater. This figure does not change under the three concepts being examined, as all routes have the arriving flight join the centre runway approach at EMRAG and fly to the airport over the Flatbush/Manukau/Papatoetoe areas.

For smaller aircraft like the A320, the volume of people experiencing a sleep disturbing event is relatively similar under all three approaches, being less than 1000 persons above the 39 729 persons under the centre runway approach experiencing a sleep disturbing event.

[5] Using the 2019 flight volumes of 1231 night time flights from Sydney arriving on Runway 23. Note current flight volumes are considerably lower with night flight volumes in 2021 only being at 26% of 2019 volumes and not forecast to return to 2019 levels until approximately 2024.

[6] Calculations undertaken using the ICAO Carbon Emissions Calculator available at ICAO Carbon Emissions Calculator.

Exposure to a sleep disturbing event of an aircraft overflight of 60 dB L_{Amax} or greater

	Persons affected under Centre Runway Approach	+	Persons affected under the Western Approach	Persons affected if Northern Night STAR used	Persons affected if Southern Night STAR used
A 320	39 729	+	1047	1047	279
B 777	59 436	+	(12 651 + 5319) = 17 970	5319	1794

9. FEEDBACK SOUGHT

The March 2022 Discussion Document and this June 2022 Supplementary Discussion Document explore options available regarding the approach path used by Sydney Night flights arriving on Runway 23. These documents have been prepared in response to requests from the Orakei Local Board Representative on the ANCCG for a Sydney Night STAR to be developed which removes these flights from over-flying central Auckland. At its March 2022 meeting ANCCG representatives asked for further information on a number of aspects, as well as a Northern concept to be put before the ANCCG. No decisions have been reached by Auckland Airport at this point in time.

Final feedback is requested by 20 June 2022. A Microsoft FORMS survey is still available at https://forms.office.com/r/T6ApwqXVU5 . Alternatively feedback can be provided directly at the 13 June ANCCG meeting or emailed to ANCCG_Secretariat@aucklandairport.co.nz .

In summary, the questions on which feedback is sought are:

Question 1: Is the current distribution of night flights equitable, such that the 15% of Runway 23 night arrivals represented by Sydney flights should remain on the standard arrivals route crossing Auckland via Titarangi, Mt Eden (LOSGA), Point England, Eastern Beaches and Beachlands before turning to join the centre-line at EMRAG?

Question 2A-1: What is your view on a Southern Sydney Night Star being developed (as set out in section 4 of the March 2022 Discussion Paper) that diverts Sydney flights approximately 200 nautical miles off-shore from Auckland Airport and has them join the Melbourne/South Australia Night STAR flying over South Auckland rural areas in the vicinity of Pukekohe and Drury (via waypoints ZORBA[7] then SABAV) then joining the centre-line the instrument approach at EMRAG and from there fly directly in a straight line on the standard centre-line approach over Flatbush, Manukau and Mangere to land at Auckland Airport on Runway 23.

Question 2A-2: What is your view on a Northern Sydney Night Star being developed (as set out in section 5 of this June 2022 Discussion Paper) that diverts Sydney flights approximately 200 nautical miles off-shore from Auckland Airport and has them join the Brisbane/North Australia Night STAR flying over North Auckland (predominantly) rural areas and the Silverdale/Stillwater area to the VIBAG waypoint at Beachlands, before joining the centre-line the instrument approach at EMRAG, and from there fly directly in a straight line on the standard centre-line approach over Flatbush, Manukau and Mangere to land at Auckland Airport on Runway 23.

Question 2B: If either new Sydney Night STAR was developed, do you consider the additional carbon emissions from the new routes are justified and proportional to the reduction in noise complaints?

Question 2C: If either new Sydney Night STAR was developed, do you consider it should be trialed initially for one year like the SMART approaches, with monitoring of the fly-ability of the route and public feedback taken into account before any final decision is made? Or do you consider it should be developed and confirmed immediately, with just industry and

[7] ZORBA is an existing point North East of Pukekohe and is used on the night STAR from Melbourne as well as by all jets during the day flying either the RNAV S (orange) or the ILS approach into Auckland.

ANCCG feedback (as was the case with the Brisbane/North Australia, Melbourne/South Australia and North American Night STARS?)

Question 2D If either new Sydney Night STAR was developed, what hours do you consider it should be operational? Should it operate from 11pm to 6am like other Night STARS; or should it apply for a shorter period such as from 1am only, with the more direct standard arrivals route flown over central Auckland up until 1am.

Question 2E Should a distinction be made between older noisier aircraft and more modern quieter aircraft, with older aircraft required to fly the longer Melbourne/South Australia Night STAR over the predominantly rural areas, and modern aircraft only able to fly the central standard arrivals route at night?

Question 3A: If either Sydney Night Star is developed, when should its use commence?

Question 3B What is your view on the option of developing a Sydney Night Star, but not implementing it until traffic reaches a certain trigger?

Question 3C: If you support a trigger based approach, what do you consider the appropriate trigger point to be, ie X% of 2019 Sydney night flights.

APPENDIX

Below is the existing chart from the NZ AIP showing the Brisbane Night STAR as currently published.