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Cook Cove Inlet Pty Ltd

Cooks Cove Planning Proposal (PP-2022-1748) Concept Infrastructure Design

Acoustic Assessment Report

Reference: 252942-AC01

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1. Introduction

This report has been prepared, on behalf of Cook Cove Inlet Pty Ltd, to support the public exhibition and assessment of the Cooks Cove Planning Proposal (PP-2022-1748), which was issued a Gateway Determination by the Department of Planning and Environment on 5 August 2022. The proposal seeks to amend Bayside Local Environmental Plan 2021 (BLEP 2021) to rezone and insert planning controls for certain land known as Cooks Cove within the BLEP 2021.

The Cooks Cove Planning Proposal aims to facilitate the long-planned transformation of 36.2 ha of underutilised and strategically important land at Arncliffe, located to the north of the M5 Motorway and adjacent the western foreshore of the Cooks River. The project seeks a renewed focus on delivering a contemporary logistics and warehousing precinct within a well-connected location, surrounded by enhanced open space provisions. The site forms part of the broader Bayside West 2036 Precincts and generally comprises the footprint of the former Kogarah Golf Club, now in part occupied by a temporary M6 Stage 1 construction compound.

This report applies to the Cooks Cove development zone only and addresses acoustics.

1.1 Cooks Cove Master Plan 2022

The Cooks Cove Master Plan 2022, as prepared by Hassell, represents an optimised and refined reference scheme, to guide best practice design and the preparation of detailed planning controls to achieve an attractive precinct with high amenity. Key features of the Cooks Cove Master Plan are:

- A net development zone of approximately 15ha with up to 343,250 m^2 Gross Floor Area (GFA) comprising
  - 290,000 m^2 of multi-level logistics and warehousing
  - 20,000 m^2 for hotel and visitor accommodation uses
  - 22,350 m^2 for commercial office uses
  - 10,900 m^2 of retail uses.
- Multi-level logistics with building heights generally up to 5 storeys (approx. 48 m).
- A retail podium with commercial office and hotel above, up to a total of 12 storeys (approx. 51 m).
- Built form of a scale and composition which caters for the generation of approximately 3,300 new jobs.
- A surrounding open space precinct including:
  - A highly activated waterfront including the Fig Tree Grove outdoor dining and urban park precinct
  - A regional Bay to Bay Regional cycle link, ‘Foreshore Walk’, including active and passive recreational uses, together with environmental enhancements
  - Master planned and Council-owned ‘Pemulwuy Park’ – with an agreed embellishment outcome of passive open space and environmental enhancements to be delivered in stages post construction of the M6 Stage 1 Motorway.
- Complementary on and off-site infrastructure to be delivered by way of State and Local Voluntary Planning Agreements.

Figure 1: Proposed Cooks Cove Master Plan 2022 – Source: Hassell

1.2 Proposed planning control

The Planning Proposal Justification Report, as prepared by Ethos Urban, details the intention to insert new planning provisions covering the Cooks Cove development zone and adjoining lands, through the amendment of the BLEP 2021, accordingly removing this same area from State Environmental Planning Policy (Precincts—Eastern Harbour City) 2021 (formerly Sydney Regional Environmental Plan No. 33 – Cooks Cove).

Specifically, the Planning Proposal will:

- Seek new land use zones within the development zone, including a primary SP4 Enterprise zone across the majority of the Kogarah Golf Course freehold land, RE1 Public Recreation foreshore and passive open space zones and elements of SP2 Infrastructure.
- Impose an overall maximum building height of RL51 m with appropriate transitions to respond to aviation controls within limited sections of the site.
- Limit gross floor area (GFA) to the south of Marsh Street to 340,000 m^2, with a further 1.25:1 Floor Space Ratio (circa 3,243 m^2 of GFA) to the north of Marsh Street, to achieve the overall intended logistics, commercial, retail and short-term accommodation land uses.
- Other additional permitted uses and site-specific planning provisions.

- Reclassification of Lot 14 DP213314 and Lot 1 DP108492 (Council owned and the subject of Charitable Trusts), initially from 'community' to 'operational' to ensure appropriate access, improve utility of public open space and to create a contiguous boundary. Following rezoning and subdivision it is subsequently intended that Council reclassify residue RE1 parcels as 'community' by resolution.

The proposal is in response to Bayside West Precincts 2036 – Arncliffe, Banksia and Cooks Cove (released August 2018) and the subsequent Ministerial Directions under s9.1 of the EP&A Act, being Local Planning Directions 1.11 Implementation of Bayside West Precincts 2036 Plan and 1.12 Implementation of Planning Principles for the Cooks Cove Precinct.

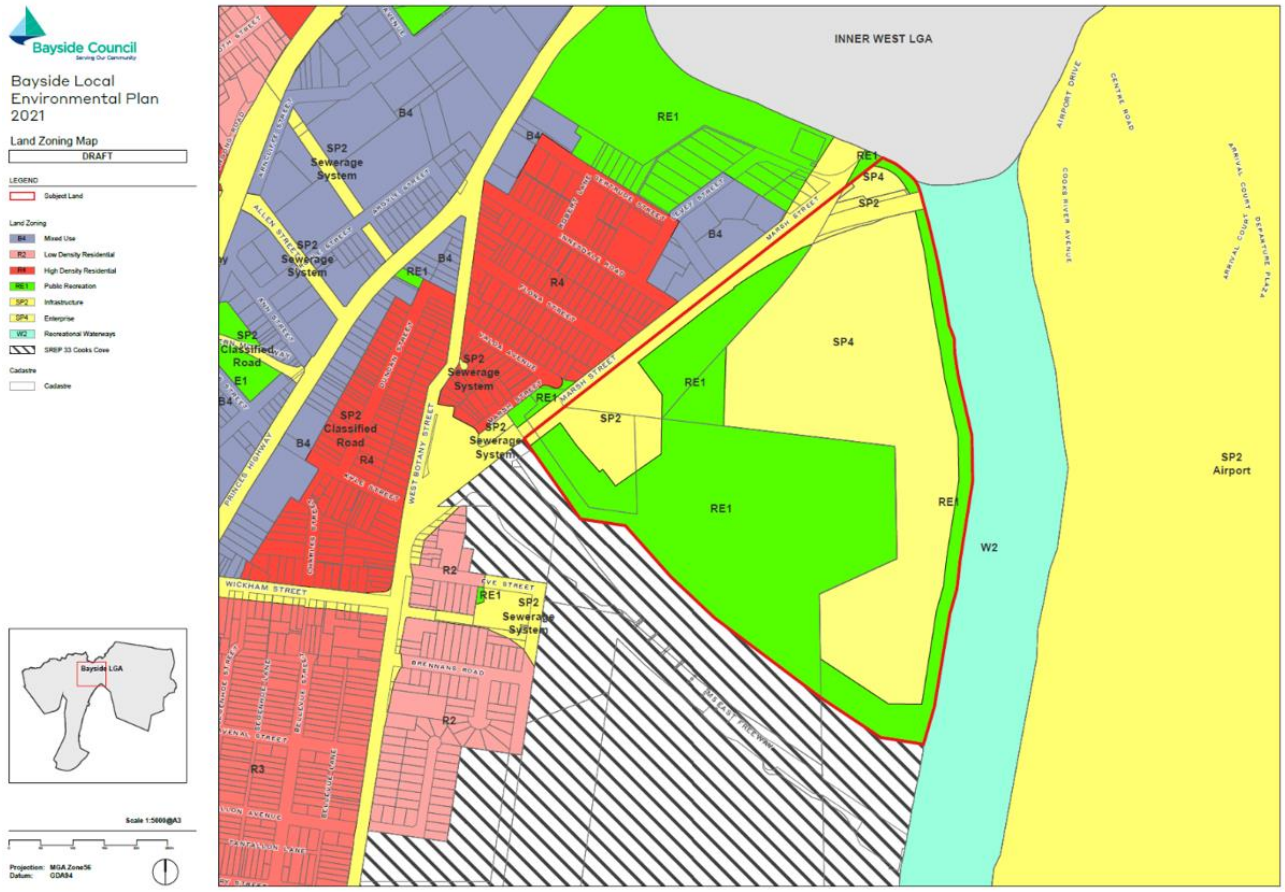


Figure 2: Proposed Draft Bayside LEP 2021 Zoning Map – Source: Ethos Urban

1.3 Site description

1.3.1 Cooks Cove

Cooks Cove is located in the suburb of Arncliffe within the Bayside Council Local Government Area (LGA). The site is located to the west of the Cooks River, approximately 10km south of the Sydney Central Business District (CBD). The site enjoys adjacency to key trade-related infrastructure being immediately west of Sydney Kingsford Smith International Airport and approximately 6km west of Port Botany.

Cooks Cove is strategically located within close proximity to a number of railway stations including Banksia, Arncliffe, Wolli Creek and the International Airport Terminal, which vary in distance from the site between 700m and 1.1km. The M5 Motorway, providing regional connectivity to the Sydney Metropolitan area, runs in an east-west direction immediately to the south of the site. The M8 and M6 Motorways are, and will be, constructed in tunnels approximately 60 metres beneath the adjoining Bayside Council 'Trust' lands. The Sydney Gateway project, presently under construction to the immediate north of Cooks Cove and Sydney Airport, will substantially improve future accessibility to the St Peters interchange and the wider M4/M5 WestConnex network, via toll free connections, as well as the Domestic Airport and Port Botany.

The Cooks Cove Development Zone is located to the north of the Southern and Western Suburbs Ocean Outfall Sewer (SWSOOS), and is generally bound by the Cooks River to the east and Marsh Street to the north and west. The site is approximately 36.2 ha and is owned and managed by a number of landowners,

both public and private. Surrounding development includes the Sydney Airport International Terminal precinct, Mercure Sydney Airport, an area of low-density dwellings presently transitioning to medium-high density residential flat buildings, recreation and open space facilities and road and airport related infrastructure.

Kogarah Golf Club

Kogarah Golf Club was established in 1928, with the Club occupying the land subject to the Planning Proposal boundary since 1955. At this time, the Cooks River was reconfigured to its current alignment to accommodate the expansion of Sydney Airport. The land presents a highly modified environment, with relatively flat topography, gently moulded fairways and greens, separated by strips of vegetation and man-made water bodies. The golf course clubhouse, car park and maintenance facilities are in the northern corner of the site, adjacent the Cooks River. Access is provided via Levey Street. The members of Kogarah Golf Club will relocate from the site in May 2024 to new playing facilities.

Arncliffe Motorway Operations Complex

The temporary construction compound for the WestConnex M8 and M6 Stage 1 Motorway tunnelling works was originally established in June 2016. The temporary construction facility occupies approximately 7.5 ha and is expected to remain until 2025. At this time the facility will reduce to 1.5 ha to accommodate the permanent Arncliffe Motorway Operations Complex, located in the western corner of the site, adjacent Marsh Street. The complex will house ventilation and water treatment plant and maintenance equipment for both the M6 and M8 sub-grade motorways.

Easements and Affectations

The Sydney Desalination Plant pipeline runs through the development zone, north-south adjacent the Cooks River. The pipe has a diameter of 1.8 m and sits within an easement of 6-9 m in width. From south to north the pipeline is constructed in a combination of trench and above ground with mounded cover and then transitions to micro-tunnel and typical depth of circa 11m. The Moomba to Sydney Pipeline, containing ethane gas, follows a similar general alignment north-south adjacent the Cooks River. The pipe has a nominal 225 mm diameter, within an easement generally 5m wide and with the pipe located at a depth of 1.2 m-2.3 m.

2. Acoustic assessment scope

This acoustic assessment has been prepared in support of the proposed rezoning of the site from a Trade & Technology zoning to a mixed-use development. As the Planning Proposal will not provide consent for the construction of buildings, this report does not provide detailed recommendations for individual land uses, but rather assesses the current acoustic environment of the site to determine whether the proposed development can satisfy relevant acoustic criteria. In-principle recommendations are provided for the purpose of demonstrating that criteria can be satisfied; however further detailed assessment and design will be required for subsequent development applications for the construction of specific buildings.

Based on the proposed land uses, site location and surroundings (see Figure 3), the primary acoustic matters relevant to the proposal have been identified as:

- Aircraft noise exposure onto the site
- Industrial/ventilation equipment noise from the Arncliffe Motorway Operations Complex onto the site.
- Future operational noise emission from the land uses to nearby residential development.

Regarding road traffic noise impact upon the site, there are no statutory requirements relevant to the proposed land uses. The *SEPP (Transport and Infrastructure) 2021* [1] is relevant only for residential, educational, hospitals and places of worship. While it is best practice to consider road traffic noise impact during the design of hotel and office developments, there are no mandatory requirement. This aspect is therefore not assessed further in this report.

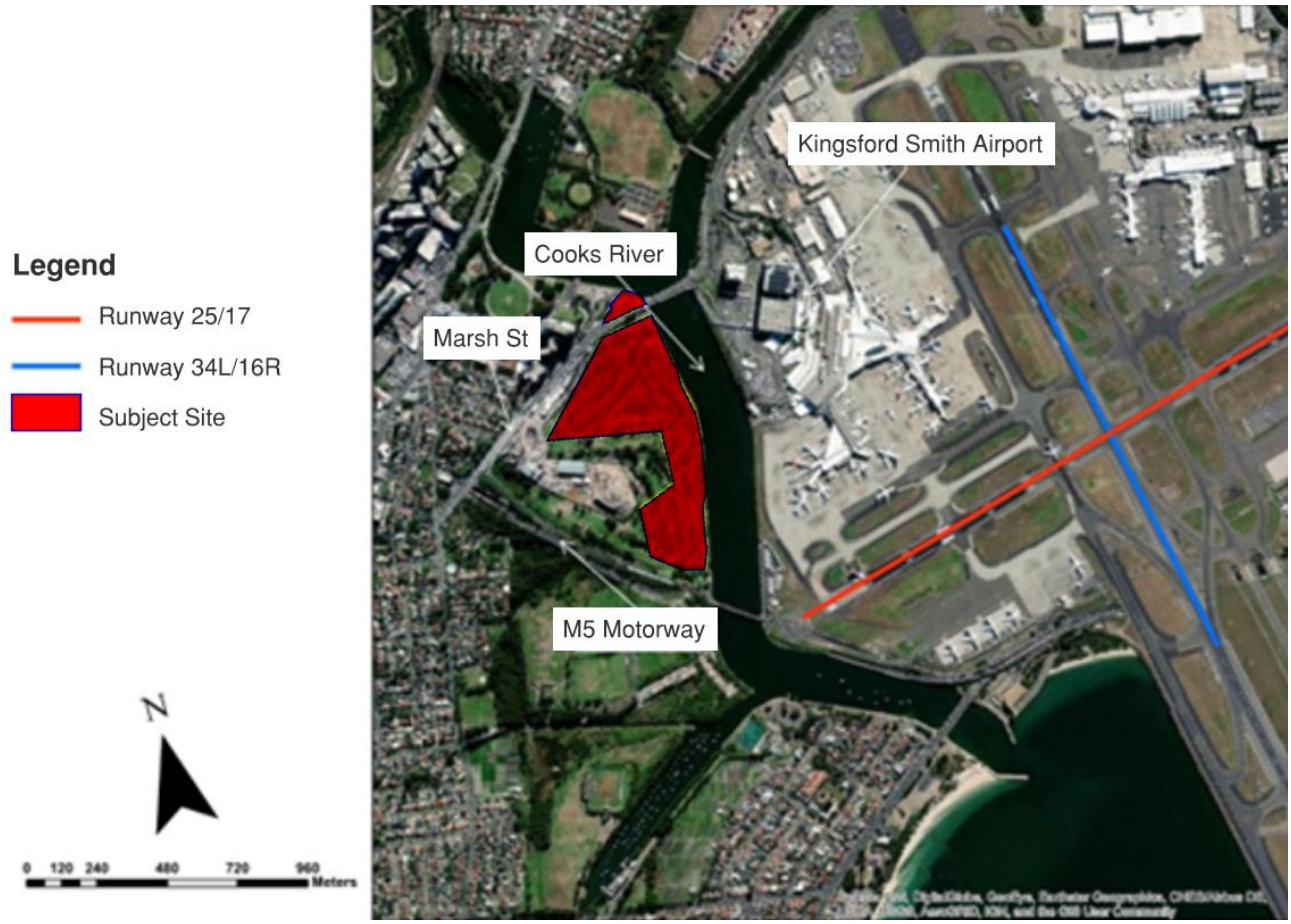


Figure 3: Location map

3. Aircraft noise

Assessment of aircraft noise exposure has been carried out in accordance with the current Australian Standard AS 2021:2015 – *'Acoustics – Aircraft Noise Intrusion – Building Siting and Construction*' [2]. This section of the report also considers:

- *Sydney Airport Masterplan* (2039) [3]
- *National Airports Safeguarding Framework* (NASF) [4]
- Letter from Department of Planning and Infrastructure to Department of Infrastructure and Transport, dated 17 April 2013.

3.1 National Airports Safeguarding Framework

The NASF, was prepared by the National Airports Safeguard Advisory Group (NASAG), which comprises Commonwealth, State and Territory Government planning and transport officials, the Australian Government Department of Defence, the Civil Aviation Safety Authority (CASA), Airservices Australia and the Australian Local Government Association (ALGA). NASF Guideline A provides guidance to planning officials for managing noise impacts when considering the following scenarios:

> *i. rezoning of greenfield areas for noise sensitive uses (i.e. areas that are predominantly rural or non-urban, including specifically identified urban boundary areas around airport sites);*
>
> *ii. rezoning of brown-field areas for noise sensitive uses (i.e. areas that are predominantly urban where changes of land use from industrial, commercial or low-density residential are being considered); and*
>
> *iii. assessment of new developments applications for noise sensitive uses within existing residential areas.* [4, p. 3].

The subject proposal has been categorised as a **rezoning of a brown-field area**. It is not considered a 'rezoning of greenfield areas', as the NASF applies this to areas that are '*predominately rural or non-urban*' [4]. The subject site is in an urban setting and the existing SREP 33 – Trade and Technology Zone allows for urban uses including commercial offices, centre-based childcare centres, educational establishments, community facilities and serviced apartments. Similarly, Commonwealth land (lot 5 /1050923) to the immediate south is zoned 'BD2 Enviro-Business Park', while to the immediate east, the International Terminal Precinct is zoned BD1 Business Development. SAMP2039 zoning allows for a variety of 'noise sensitive uses', including childcare centres, office premises and educational establishments (BD1 only).

The noise sensitivity of the proposed land use also needs to be considered. NASF Guideline A states that 'noise-sensitive uses' include '*residential, education establishments, offices, hospitals, aged care, churches, religious activities, theatres, cinemas, recording studios, court houses, libraries and galleries as specified as a 'noise sensitive developments' in AS2021(see table 2.1 and 3.3)* [4, p. 3]. AS2021:2015 however does not define any uses as 'noise sensitive development' and outlines varying criteria for these uses. It also noted that guidelines and criteria in the NASF centres around residential uses. Guideline A point 19, 20, 21 and 22 under *Rezoning of brownfield areas to permit noise sensitive uses*, all reference residential use rather than other 'noise sensitive uses'. Attachment 1 to NASF Guideline A, which includes further information and justification for the NASF 'Numbers Above' noise metrics, is centred on residential communities and '*residents newly exposed to aircraft noise*' [5, p. 12]. It is concluded that the NASF guideline and the relevant metrics are not derived or necessarily reasonable for non-residential 'sensitive uses', such as the proposed hotels and offices, noting that AS2021:2015 sets different noise criteria for these uses compared with residential uses.

As the proposal does not include residential uses, reliance on AS2021:2015 is deemed appropriate for this assessment, rather than the additional NASF noise descriptors (N70, N65 and N60, defined as 'Number Above', i.e. N70 x 20 is 20 aircraft flights that exceed 70 dB L_{Amax}). If development was otherwise to be restricted where the N70 x 20 was exceeded (point 17(ii) of Guideline A), large portions of Sydney would be sterilised (see Figure 4). As stated in Guideline A Attachment 1 '*NASAG also recognises it is not possible,*

nor desirable to unnecessarily restrict land uses close to airports. The quantum of events nominated for the N70, N65 and N60 event contours respectively, aligns broadly to known areas of sensitivity around existing airports and gives some basis for guidance for areas close to, but outside, existing 20 ANEF contours' [5, p. 13]. The Cooks Cove development primarily falls within the 20-25 ANEF.

Advice from DoPI (now NSW Department of Planning, Industry and Environment - DPIE) is that the 'number above' noise metrics outlined in the NASF are not supported for the regulation of land use or development outcomes in the vicinity of airports until the *'Commonwealth can identify the scientific basis behind the selection of the metrics'* (letter attached in Appendix C [6]). Additionally, DoPI clearly outline that ANEF remains the most useful and appropriate tool for determining land use and development outcomes near airports.

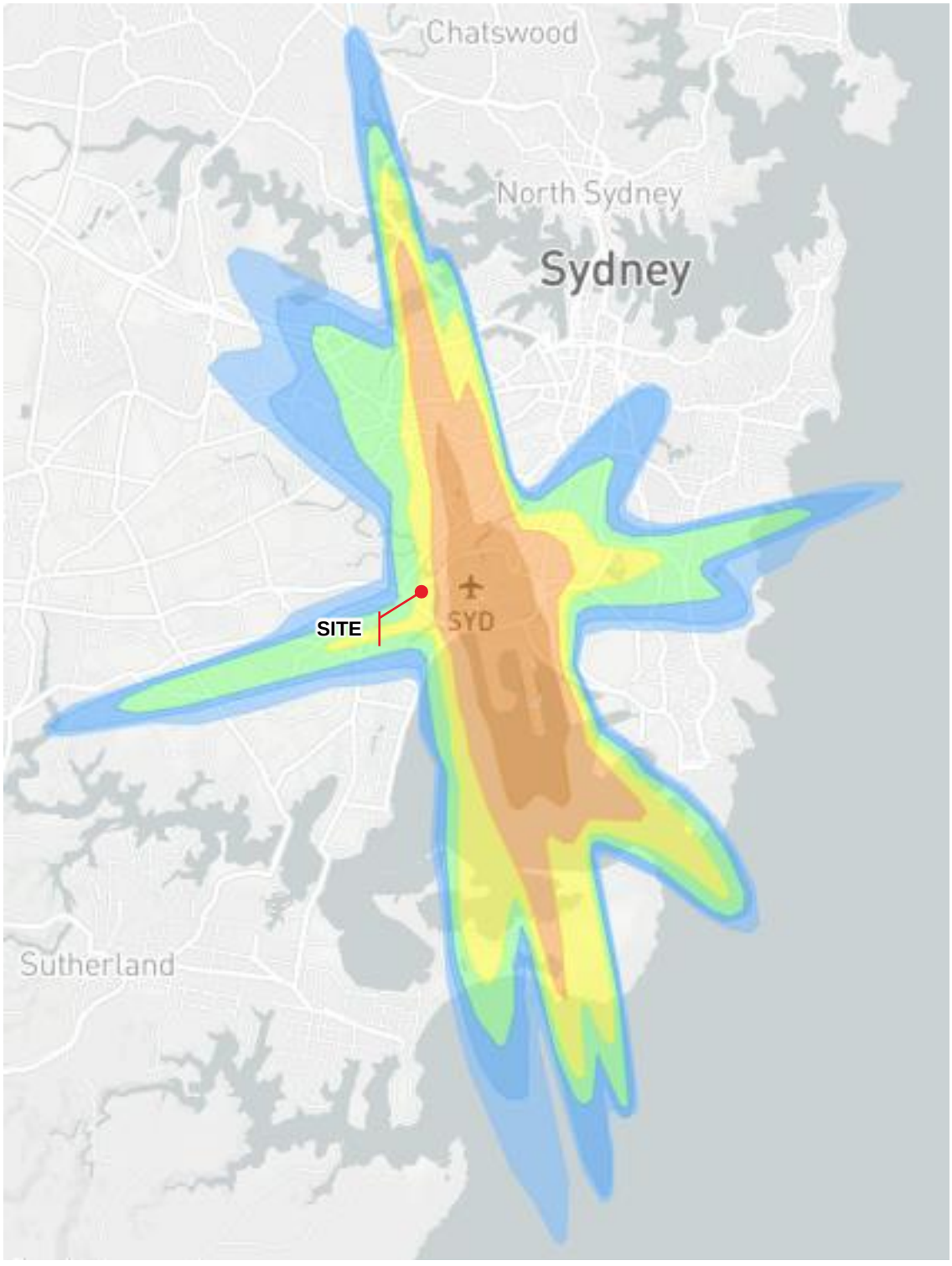


Figure 4: Sydney Airport 2039 N70 contours (Light blue: 5-10, Dark blue: 10-20, Green: 20-50, Yellow: 50-100, Orange: 100-200, Dark orange: 200 +)

Regarding the NASF principle of protecting future operations of the airport, the maximum noise levels resulting from aircraft take-off and landings are not expected to increase in the future for the Cooks Cove site on the basis that:

- Flight paths cannot divert to fly closer to the subject site (see flight paths from SAMP in Appendix D), and
- New aircraft are continually getting quieter, as was outlined in the Proposed Sydney Airport Master Plan 2033 (PDMP), see Figure 5.

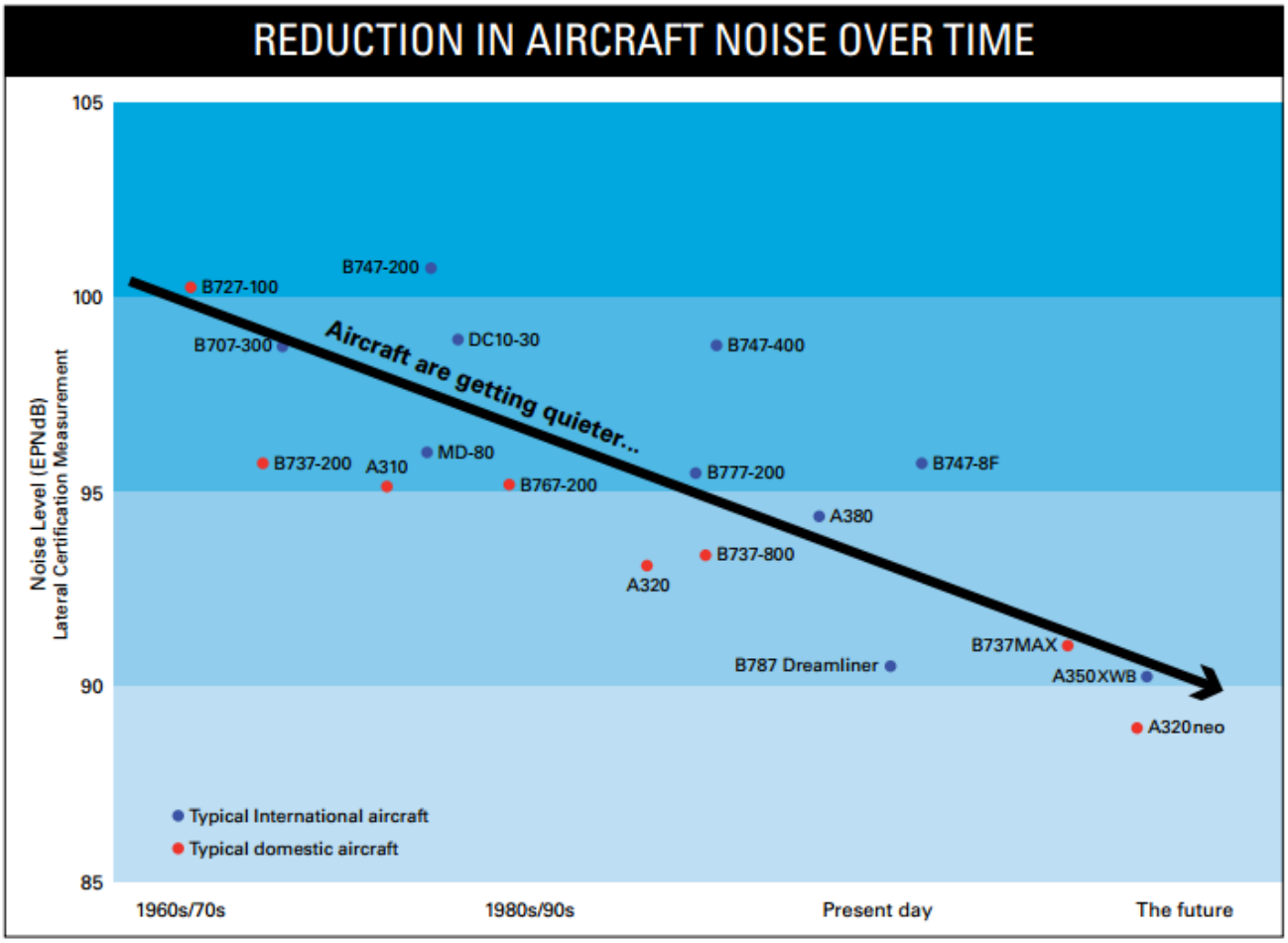


Figure 5: Reduction in aircraft noise over time (Figure 14.2 of PDMP) [3]

Based on the above, the assessment of the Cooks Cove Planning Proposal has adopted the accepted procedures outlined in AS 2021:2015 with reliance on the Sydney Airport Masterplan 2039 [3].

3.2 Sydney Airport Master Plan 2039

This assessment has considered the potential effects of future operations at Sydney Airport. The Sydney Airport Master Plan 2039 (SAMP) outlines Sydney Airport's vision for the operation and development for the period to 2039. Regarding the potential for future increases in noise impact, it is noted that the document states that the SAMP is based on the following principles:

- No change to the curfew
- No change to the aircraft movement cap
- No change to noise sharing arrangements
- No change to access arrangements for regional airlines
- No change to flight paths

- No new runways.

The SAMP also supports the assessment of aircraft noise using AS 2021:2015 and the ANEF contour maps, making the following statement:

> *We support the NASF (in relation to ANEF map) and actively promote its implementation by the NSW Government and local councils. (Page ES-28, SAMP)* [3]
>
> *The provision (in relation to specific controls on developing lands within areas directly affected by aircraft noise) directs council to ensure the guidelines provided in Australian Standard AS 2021:2015 – Acoustics – Aircraft Noise Intrusion – Building Siting and Construction are incorporated in the design and construction of buildings that are affected by noise and vibration associated with airport operations. (Page E-52 of SAMP)* [3].

3.3 AS 2021:2015

Aircraft noise intrusion from take-off, landing and circuit training operations at civil aerodromes or military airfields is assessed using AS 2021:2015. The scope of AS 2021:2015 is stated as [2]:

> *This Standard, together with the relevant Australian Noise Exposure Forecast (ANEF) chart provides guidelines for determining-*
>
> *a) whether the extent of aircraft noise intrusion makes building sites 'acceptable', 'unacceptable' or 'conditionally acceptable' for the types of activity to be, or being, undertaken;*
>
> *b) for 'conditionally acceptable' sites, the extent of noise reduction required to provide acceptable noise levels indoors for the types of activity to be, or being, undertaken; and*
>
> *c) the type of building construction necessary to provide a given noise reduction, provided that external windows and doors are closed.*

3.3.1 Building site acceptability

AS 2021:2015 contains advice on the acceptability of building sites based on Australian Noise Exposure Forecast (ANEF) zones. The ANEF chart provides a predicted cumulative exposure to aircraft flyover noise in communities near aerodromes. The chart presents zones represented by noise contours overlaid on a locality map specific to an airport. The ANEF system was developed as a land use planning tool aimed at controlling encroachment on airports by noise sensitive buildings. The Sydney Airport 2039 ANEF contour map is attached in Appendix B.

Table 2.1 of AS 2021:2015 provides land use zoning information for sites subjected to aircraft noise. The table lists three assessment categories, namely, ‘Acceptable’, ‘Conditionally Acceptable’ and ‘Unacceptable’, and recommends suitable ANEF levels for different types of buildings. Table 2.1 from AS 2021:2015 is reproduced as Table 1 below, as relevant to the proposed uses for Cooks Cove site.

Table 1: Building site acceptability based on ANEF Zones (Table 2.1 of AS 2021:2015)

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
Hotel, motel hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

Table 2: Description of building site acceptability

Zone	Description
Acceptable	In Acceptable zones there is usually no need for the building construction to provide protection specifically against aircraft noise. However, it should not be inferred that aircraft noise will not be noticeable outside the 20 ANEF contour.
Conditionally Acceptable	In Conditionally Acceptable zones the maximum aircraft noise levels for the relevant aircraft and the required noise reduction should be determined from the procedures of Clause 3.1 and 3.2 of AS2021-2015, and the aircraft noise attenuation to be expected from the proposed construction should be determined in accordance with Clause 3.3.
Unacceptable	In Unacceptable zones construction of the proposed development should not normally be considered. In no case should new development take place in 'greenfield' sites deemed unacceptable because such development may impact on airport operations.

3.3.2 Building treatment and maximum internal noise levels

Where a building type is deemed 'conditionally acceptable' in Table 2.1 of AS 2021:2015, the building construction of the proposed development needs to be designed so that the maximum internal noise levels from aircraft flyovers comply with Table 3.3 of the Standard.

The proposed uses/building types on site all fall into the **'Acceptable'** zone; thus, the maximum internal noise levels are only used for a screening assessment in Section 3.5. The indoor design sound level appropriate for the activity or building type under consideration is selected from Table 3.3 of AS 2021:2015, reproduced in Table 3.

Table 3: Indoor design sound levels for determination of aircraft noise reduction (Table 3.3 from AS 2021:2015)

Building type and activity	Indoor design sound level*, dBL_{Asmax}
Hotels, motels, hostels	
Relaxing, sleeping	55
Social activities	70
Service activities	75
Commercial buildings, offices and shops	
Private offices, conference rooms	55
Drafting, open offices	65
Typing, data processing	70
Shops, supermarkets, showrooms	75
Industrial	
Inspection, analysis, precision work	75
Light machinery, assembly, bench work	80

Building type and activity	Indoor design sound level*, dBL_{Asmax}
* These indoor design sound levels are not intended to be used for measurement of adequacy of construction. For measurement of the adequacy of construction against aircraft noise intrusion see Appendix D (of AS 2021:2015). Notes to Table: 1. The indoor design sound levels in Column 2 are hypothesized values based on Australian experience. A design sound level is the maximum level (dB(A)) from an aircraft flyover which, when heard inside a building by the average listener, will be judged as not intrusive or annoying by that listener while carrying out the specified activity. Owing to the variability of subjective responses to aircraft noise, these figures will not provide sufficiently low interior noise levels for occupants who have a particular sensitivity to aircraft noise. 2. Some of these levels, because of the short duration of individual aircraft flyovers, exceed some other criteria published by Standards Australia for indoor background noise levels (see AS 2107). 3. The indoor design sound levels are intended for the sole purpose of designing adequate construction against aircraft noise intrusion and are not intended to be used for assessing the effects of noise. Land use planning authorities may have their own internal noise level requirements which may be used in place of the levels above. 4. (Removed as not relevant to this subject site) 5. (Removed as not relevant to this subject site) 6. The provisions of this Standard relating to different internal design sound levels for different indoor spaces could result in the use of different construction and materials in contiguous spaces, and require the construction of substantial barriers between habitable spaces, e.g. heavy self-closing internal doors, detracting from the amenity of the building. Therefore consideration should be given to a uniform perimeter insulation approach.	

3.4 Airport ground operation

AS 2021:2015 does not specifically address the assessment of noise exposure as a result of ground operations at airports, which includes aircraft taxiing and other associated vehicles and equipment on site. As noise from ground operations is lower than the maximum noise levels generated by aircraft take-off and landings, design of buildings in accordance with the ANR of AS 2021:2015 would result in noise from ground operations also complying with the maximum noise levels in AS 2021:2015. Future developments could however include specific assessment of ground noise at their discretion.

3.5 Aircraft noise assessment

3.5.1 Site assessment - building acceptability

A review of the ANEF 2039 chart in relation to the Cooks Cove site, as shown in Figure 6 reveals that the site is located within the ANEF 20 to 25 contours.

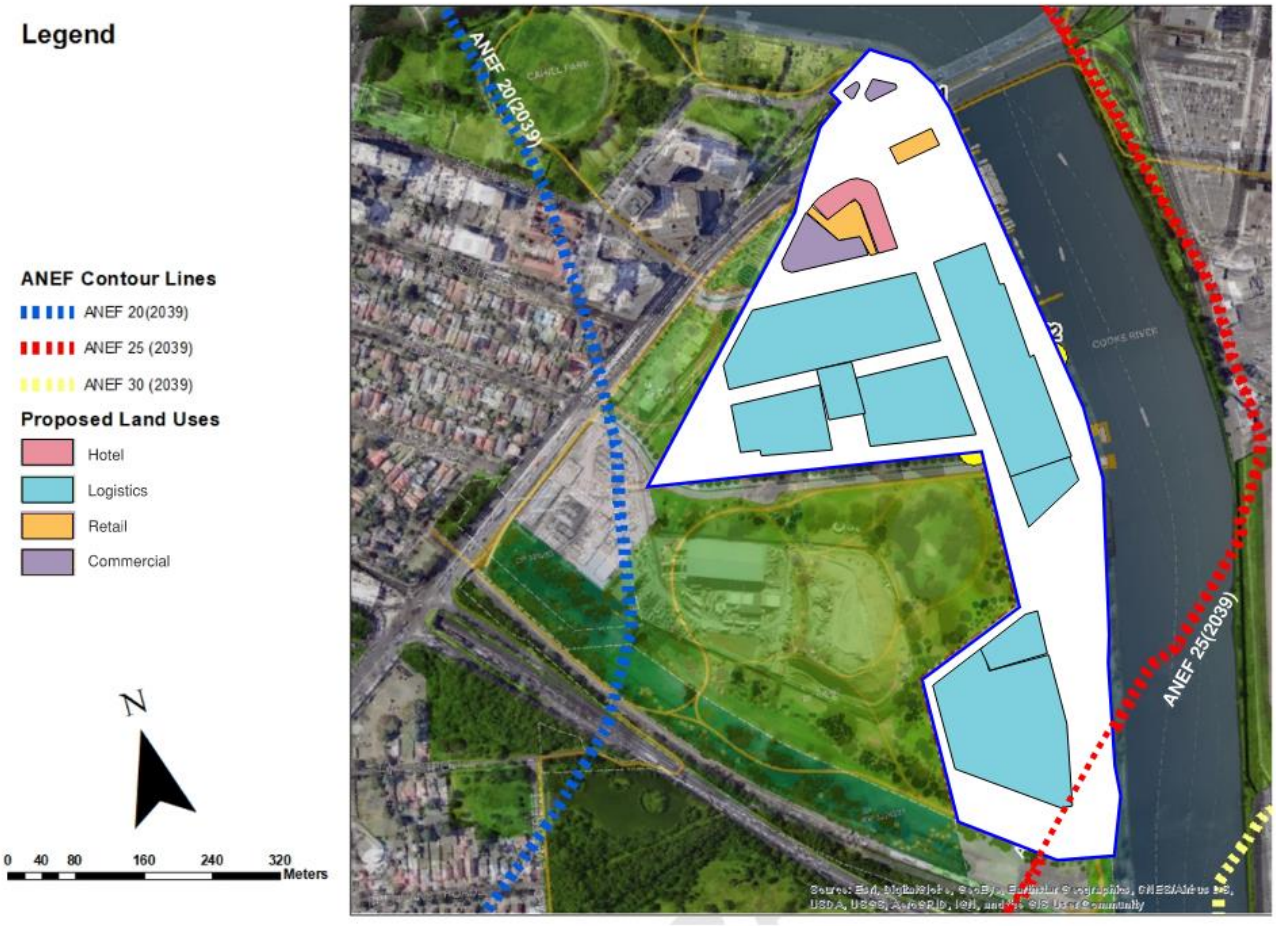


Figure 6: Cooks Cove Proposed Land Use and ANEF overlay

Table 4 summarises the acceptability of the proposed land uses for the Cooks Cove in relation to the ANEF zones. As outlined, the proposed land uses are 'acceptable' in accordance with AS 2021:2015.

Table 4: Acceptability of uses for Cooks Cove Northern Precinct

Cooks Cove land use	AS2021:2015 Building type	20-25 ANEF
Hotel, serviced apartment	Hotel, motel, hostel	Acceptable
Office, Retail	Commercial building	Acceptable
Logistics	Light Industrial	Acceptable

As the proposed uses are **all acceptable** for the subject precinct in accordance with AS2021:2015, no further acoustic assessment is required for AS2021:2015. However, as discussed in Section 3.1, to ease the considerations from NASF for the site between ANEF 20-25, a screening assessment is conducted to demonstrate the feasibility of compliance to the indoor noise levels as AS2021:2015.

3.5.2 Maximum aircraft noise levels

AS 2021:2015 [2] outlines two methods for determining the maximum aircraft noise levels:

a) using the aircraft noise data tables included in AS2021-2015 (Tables 3.4 to 3.24); or

b) undertaking noise measurements of aircraft flyovers at the site.

The methodology for measuring aircraft noise is provided in Appendix C of AS 2021:2015. Due to the close proximity to the airport and the extent of development proposed, a comparison of both assessment methods was undertaken to determine the maximum aircraft noise levels. The results of onsite measurements are presented below with the measured maximum noise levels compared against those set out in AS 2021:2015.

3.5.2.1 Measurement locations

Noise level measurements of aircraft flyovers at the subject site were carried out by Renzo Tonin & Associates for a previous preliminary assessment of the site. Noise logging over a seven-day period was conducted between 2 and 8 August 2013. Aircraft take-offs and landings on both the 34L/16R north-south runway and 25/07 east-west runway were recorded. While these measurement locations were intended to assess a larger planning proposal footprint, it is still relevant, as these locations still help inform assessment at the new proposed development. Measurements were carried out at the following four locations.

Table 5: Summary of noise measurement locations

Location	Description
Location 1	South-eastern area of the site. Exposed to both north/south and east/west runways. The microphone was 1.5m above the ground level and determined to be in the free-field. See location on Figure 7 below.
Location 2	Southern area of the site. Most exposed to the east/west runway. The microphone was 1.5m above the ground level and determined to be in the free-field. See location on Figure 7 below.
Location 3	Northern area of the site. Most exposed to the north/south runway. The microphone was 1.5m above the ground level and determined to be in the free-field. See location on Figure 7 below.
Location 4	Western area of the site. Most exposed to the east/west runway. The microphone was 1.5m above the ground level and determined to be in the free-field. See location on Figure 7 below.
Notes: The equipment used for the noise measurements were NTi Audio Type XL2 precision sound level analysers which are Class 1 instruments having an accuracy suitable for field and laboratory use. The instruments were calibrated prior and subsequent to measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 'Electroacoustics - Sound Level Meters'.	

The measurement locations are shown in Figure 5. \\global.arup.com\australasia\SYD\Projects\276000\276213-00 Cook Cove North\Work\Internal\2_Docs and submissions\01 Planning Proposal\276213-AC01_v3-1_Planning proposal acoustic rpt.docx - page18All measurements are located within the ANEF 20 to 25 area.

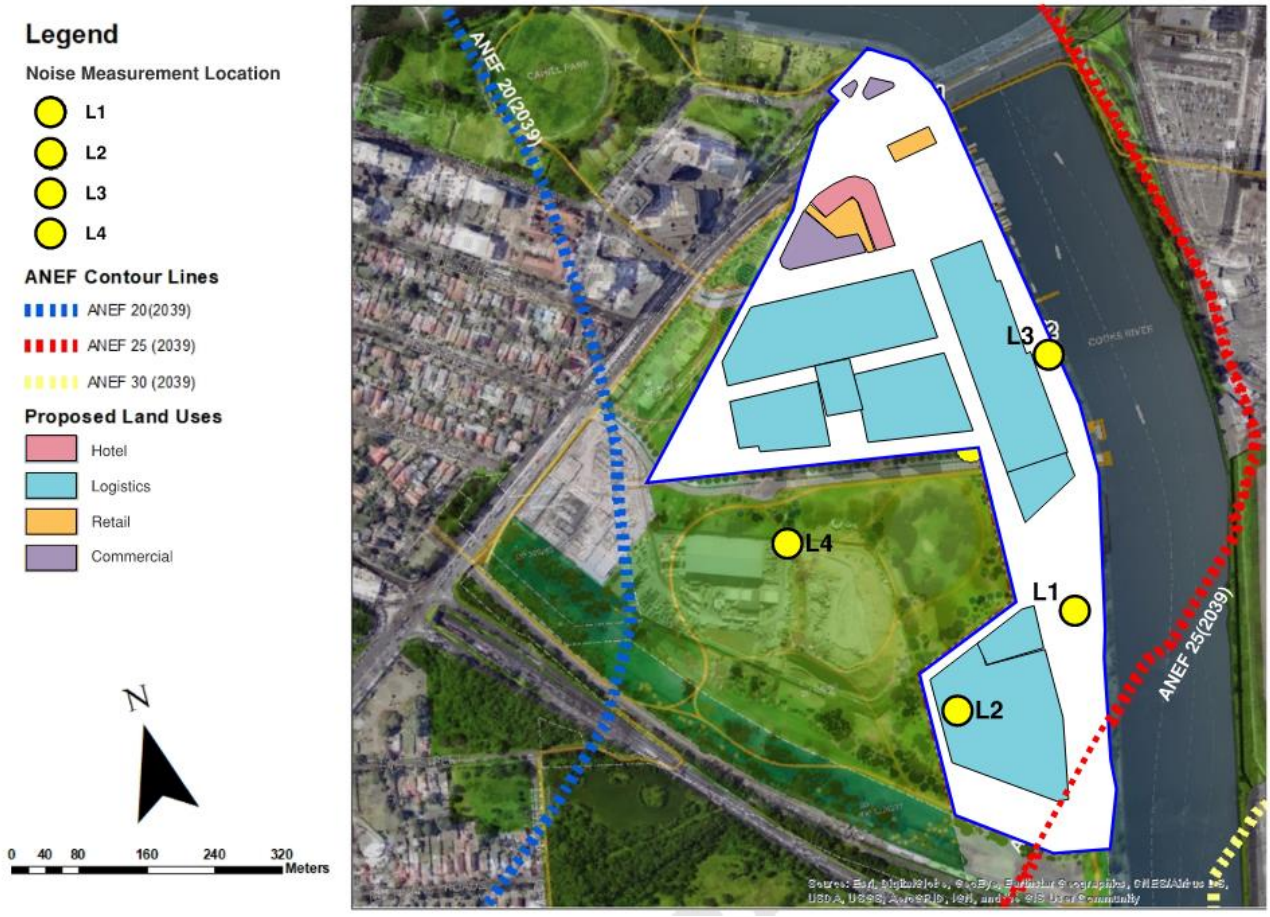


Figure 7: Unattended noise monitoring locations

3.5.2.2 Measured noise levels

The noise monitoring equipment recorded 1-second data, from which single aircraft noise levels were extracted. The aircraft movements and aircraft type were identified using data on Airservices Australia Webtrak service [7].

The flight operations generating the highest $L_{Amax,slow}$ noise levels were found to be departures to the north and departures to the west. Table 6 provides a comparison of the measurement results for the various aircraft types against that set out in AS 2021:2015. Where multiple movements of a single aircraft type was measured, the arithmetic average of the measured levels is reported. Predictions from AS 2021:2015 have also been included for the typical noisiest aircraft types, although relevant data was not necessarily obtained during the measurement survey. The noise levels presented are the maximum A-weighted levels (L_{ASmax}) measured for the respective event.

Table 6: Aircraft noise levels - Measured vs AS 2021:2015 (Departures) East/West Runway

Aircraft type	Data	dBL$_{Asmax}$			
		L1 East	L2 South	L3 North	L4 West
A320/321	Measurement	82	82	77	78
	AS2021 Prediction	*80*	*80*	*75*	*76*
A330-200	Measurement	83	83	79	-
	AS2021 Prediction	*81*	*82*	*75*	-
A330-300	Measurement	85	87	80	81

Aircraft type	Data	dBL_{Asmax}			
		L1 East	L2 South	L3 North	L4 West
	AS2021 Prediction	81	82	75	77
B737-800	Measurement	82	83	77	78
	AS2021 Prediction	*79*	*80*	*74*	*76*
B747-400 Short Range	Measurement	-	-	-	-
	AS2021 Prediction	*86*	*86*	*82*	*82*
B747-400 Long Range	Measurement	-	-	-	-
	AS2021 Prediction	*77*	*77*	*72*	*73*
B767-300	Measurement	82	83	80	78
	AS2021 Prediction	*87*	*87*	*81*	*83*
B777-300ER	Measurement	82	-	-	-
	AS2021 Prediction	*82*	*82*	*74*	*79*
Embraer ERJ-190	Measurement	-	86	78	78
	AS2021 Prediction	*79*	*78*	*75*	*74*
Overall Max	Measurement	85	87	80	81
	AS2021 Prediction	*87*	*87*	*82*	*83*

Table 7: Aircraft noise levels - Measured vs AS 2021:2015 (Departures) North/South Runway

Aircraft type	Data	dBL_{Asmax}			
		L1 East	L2 South	L3 North	L4 West
A330-200	Measurement	74	71	74	69
	AS2021 Prediction	*69*	*67*	*73*	*68*
A330-300	Measurement	74	74	76	71
	AS2021 Prediction	*69*	*67*	*73*	*68*
B737-800	Measurement	-	-	-	-
	AS2021 Prediction	*69*	*66*	*72*	*67*
B747-400 Short Range	Measurement	76	71	74	-
	AS2021 Prediction	*74*	*72*	*75*	*71*
B747-400 Long Range	Measurement	-	-	-	-
	AS2021 Prediction	*67*	*64*	*70*	*66*
B767-300	Measurement	74	73	76	-

Aircraft type	Data	dBL_{Asmax}			
		L1 East	L2 South	L3 North	L4 West
	AS2021 Prediction	*75*	*72*	*78*	*73*
B777-300ER	Measurement	-	69	75	68
	AS2021 Prediction	*71*	*68*	*74*	*69*
Overall Max	Measurement	76	74	76	71
	AS2021 Prediction	*74*	*72*	*78*	*73*

The results presented in Table 6 and Table 7 indicate the following:

- The highest maximum noise levels for all four locations was associated with departures to the west. This is verified by AS 2021:2015. In accordance with Map 25 of the Sydney Airport Draft Master Plan 2039 (see Figure 8 below), the projected average daily jet aircraft movements to the west is indicated to be only 5% of total movements.
- The maximum recorded noise level was 87 dB(A), measured at L2 south location and associated with Airbus A330-300 departures to the west, being higher than that predicted by AS 2021:2015, although this location is removed from the more noise sensitive development.
- The maximum noise event determined using the tabulated noise data in AS 2021:2015 results from the Boeing 767-300 during short-range take-off, measuring 87 dB(A) at the L2 south location. It is noted that the measured results revealed lower levels of 83 dB(A).
- The highest maximum noise levels from departures to the north was 76 dB(A), from both the measured and predicted data. While departures to the north are more frequent (33% of jet movements, as shown in Figure 8) the noise levels are significantly lower than departures to the west.
- Generally, the measurement data shows reasonable alignment, at least from the perspective of the overall maximum noise events. Notwithstanding, it would be expected that future detailed assessment for the design and construction of specific buildings would rely upon site measurements rather than the aircraft noise data tables in AS 2021:2015.

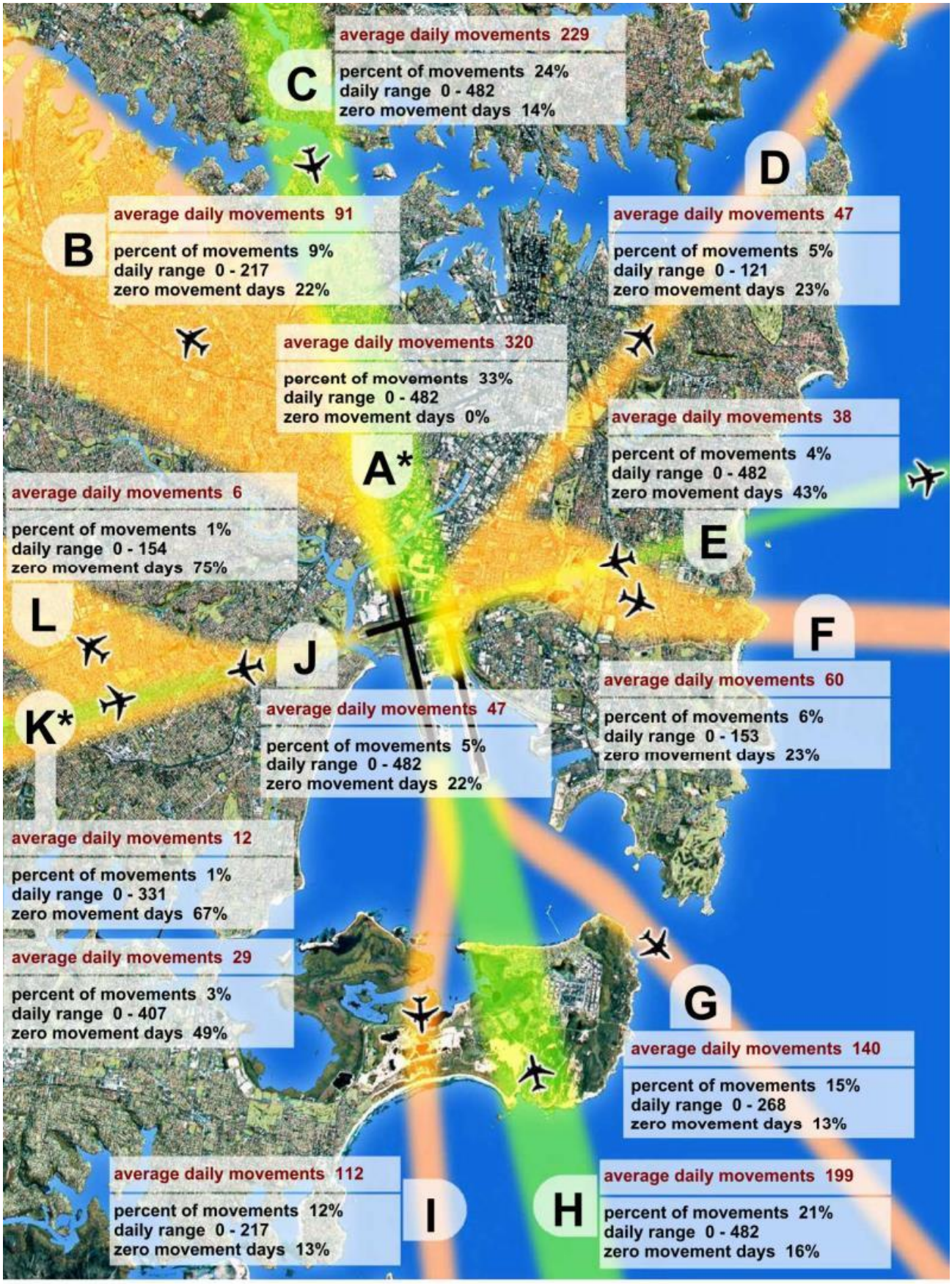


Figure 8: Average Daily Jet Movements 2039 (Map 25 from SAMP)

3.5.3 Aircraft noise reduction

Appendix F of AS 2021:2015 provides a method for determining appropriate building materials and constructions to achieve a required ANR value. While the method is intended to serve only as a guide to construction considerations, it has been used here to demonstrate the ability of proposed building types to satisfy the internal noise levels required of AS 2021:2015. Detailed design of building constructions would nonetheless be required for the site during design development phases.

In general, where a specific ANR is required, buildings require external windows and doors to be kept closed. When windows are opened for the purpose of ventilation, the aircraft noise reduction of the building envelope will be significantly reduced. Where it is necessary to close windows and doors to comply with this Standard, building ventilation should be designed in accordance with the National Construction Code of Australia (NCC) [8] on the assumption that windows and doors are not operable, and mechanical ventilation or air conditioning systems complying with AS 1668.2 [9] may be required. Mechanical ventilation is typical for the types of buildings proposed.

The ANR is calculated by subtracting the indoor design level from the maximum aircraft noise level. The resulting value is an estimate of the extent of aircraft noise reduction (ANR) in dB(A), to be incorporated in the building's envelope. ANRs have been calculated for four locations as indicated in Figure 9, being considered representative of worst-case locations for the most noise sensitive land-use types.

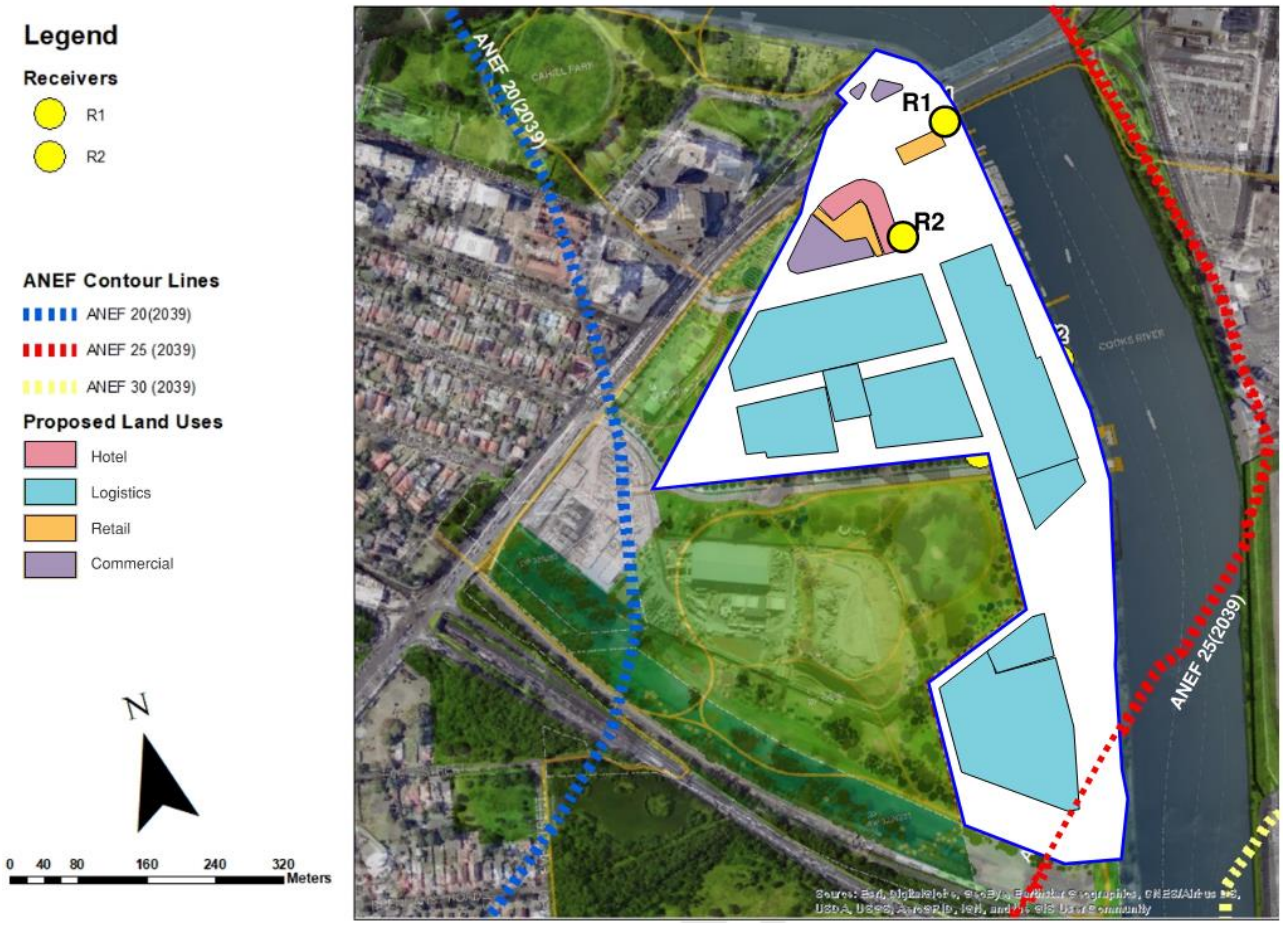


Figure 9: Assessment locations for calculated ANRs

The calculated maximum aircraft noise level in Table 8, used to determine the ANR, is calculated in accordance with AS2021:2015, limited to the aircraft types outlined in the endorsed Sydney Airport ANEF 2039 for 2026 operations. [https://aircraftnoise.sydneyairport.com.au/wp-content/uploads/2018/07/180824-ANEF-A1-Map-ENDORSED.pdf]

Table 8: Calculated ANR Level – Sydney airport standard operational hours

Location	Land-use	Maximum aircraft noise level, dBL_{AMax}	Indoor design level, dBL_{AMax}	ANR, dB(A)
R1	Retail	76	75 (Shops, supermarkets, showrooms)	1
R2	Hotel, Retail, Commercial	76	55 (Relaxing, Sleeping) 55 (Private Office) 70 (Social activities)	21 21 6

3.5.4 In-principle building acoustic treatment

AS 2021:2015 provides guidance on the type of construction necessary to achieve the required ANR. Various rooms in a building may require different indoor design levels and consequently different treatment.

Table 8 outlines the calculated minimum Weighted Sound Reduction Index (R_w) Ratings for windows and doors associated with typical hotel and commercial building design based on the Maximum Aircraft Noise Level of 76 dBL_{Amax}. Details are provided for information only and should not be used for design.

Table 9: In-principle Minimum Façade R_w

Building type and activity	Indoor design sound level, dB L_{Asmax}	Façade/Glazing R_w
Hotel – relaxing, sleeping areas	55	27
Retail, Commercial - Private offices	55	27

The highest acoustic performance of R_w 27 outlined in Table 8 is readily achievable and standard façade systems for hotel and commercial developments typically exceed this performance based on structural and thermal requirements.

As noted, the calculated ANR and acoustic ratings are considered to be based on a worst-case scenario of development. It therefore demonstrates that buildings can be designed to meet the internal maximum noise level requirements of AS2021:2015, noting however that this is not strictly required by AS2021 for land uses in ‘acceptable’ ANEF zones.

4. Industrial noise impact upon development

The following discussion relates to The Arncliffe Motorway Operations Complex and its potential impact upon the proposed land uses. The Arncliffe Motorway Operations Complex, shown in Figure 10 on the following page, is located in the western corner of the site near the intersection of Marsh Street and the M5 Motorway and will include tunnel ventilation equipment for the road tunnel, substations and water treatment facilities. The facility is current under construction as part of the New M5 Motorway and will be fitout by the M6 Stage 1 project.

Information regarding potential noise emission from the facility has been obtained from the New M5 Operational Noise and Vibration Review [10] and M6 Stage 1 EIS Appendix G [11]. Noise emission from the Arncliffe Motorway Operations Complex is required to comply with the NSW *Industrial Noise Policy* (INP) [12] and *Noise Policy for Industry* [13] for the two projects respectively. It is noted that since approval of the New M5, the NSW INP has been superseded by the NSW *Noise Policy for Industry* (NPfI), having been in effect since November 2017 [13]. Table 10 summarises the project noise criteria for the New M5 and M6 Stage 1, along with criteria for Hotel and Commercial receivers proposed for Cooks Cove.

Table 10: Arncliffe Motorway Operations Complex Noise Criteria

Project	Most affected receiver locations	Building type	$L_{Aeq(15minute)}$		
			Day	Evening	Night
New M5	41 Flora Street, Arncliffe 26-32 Marsh Street, Arncliffe	2 storey dwelling 9 to 13 storey apartment building	52	50	44
M6 Stage 1	32 Valda Street, Arncliffe	2 storey dwelling	58	50	47
Cook Cove	-	Hotel	63	53	48
		Commercial	63 (when in use)		

Regarding the established criteria, it is noted that the M6 Stage 1 EIS has not identified the high-rise apartments, which are likely to be more impacted by the ventilation stacks, despite being a greater distance from the site. It is expected that the location will be identified during the detailed design.

Notwithstanding, criteria for residential uses is more stringent than for the proposed hotel and commercial uses, and the existing residential premises are located some 70 to 150 m from the ventilation buildings compared with approximately 300 to 400 m for proposed hotel/commercial development on the Cooks Cove site. Noise emission from the Complex is therefore not expected to impact the proposed land uses within Cooks Cove.

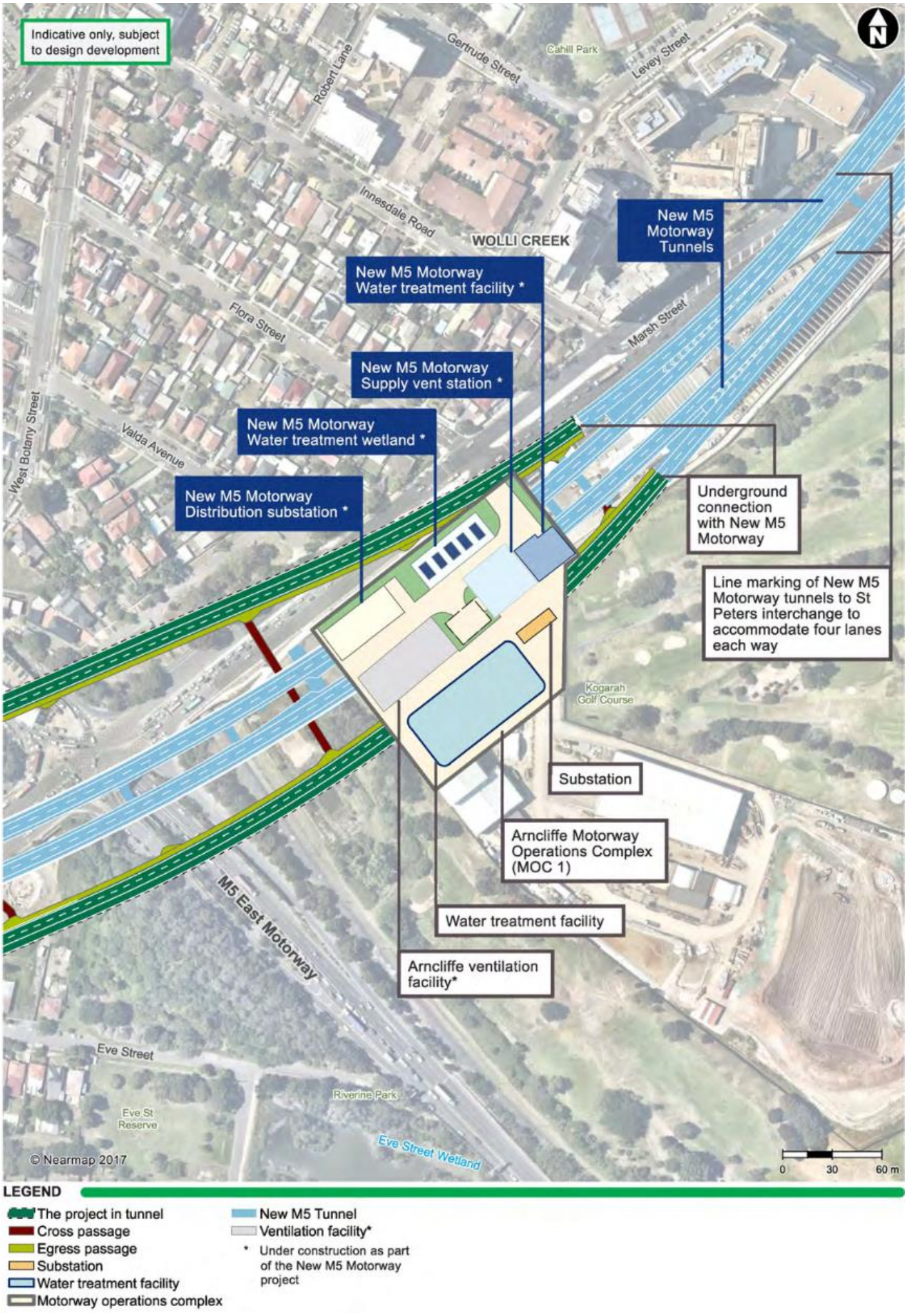


Figure 10: Arncliffe Motorway Operation Complex (Source: TfNSW F6 Extension Stage 1 EIS)

5. Noise emission from the development

Noise emission from future development is not expected to impact the greater surrounding environment and therefore specific assessment or consideration of future noise generating uses is not warranted at this stage of the project.

The future logistics uses are minimum 140 m away from the existing residential receivers on the opposite side of Marsh Street. The logistics developments are proposed to be multi-storey buildings, and the building envelope can be designed to control the operational noise emission. It is expected that building services noise can be controlled with typical acoustic mitigation measures. As such, it is feasible for the logistic developments to comply with relevant noise criteria. It is recommended that acoustic assessment be carried out during the Development Application stage for each development.

Within the site, there is an objective to develop a vibrant mixed-use area around the hotel/commercial and retail developments. Potential noise emission from these uses is not expected to impact upon uses outside of the site due to their distance from other residential development. It is noted that standard NSW noise policy places the onus of noise control on the noise generator, with restaurants, bars, cafes and community events in public spaces etc. required to control or manage noise to meet specific noise criteria outside noise sensitive premises. Use of outdoor areas can be significantly burdened by this approach, due to the limited options for noise control. The principles are otherwise premised on the concept of mitigation and control, rather than the objective of creating or enabling the desired environment to be created. The approach also pays no regard to noise mitigation measures that may be incorporated into the noise sensitive development, such as that adopted to mitigate aircraft or road traffic noise.

To facilitate the development of a vibrant mixed-use development, particularly one where noise sensitive development will already require noise mitigation, an alternative acoustic strategy could be developed for the site. Development of such a strategy is not considered a requisite for the Planning Proposal stage and has otherwise been identified here to initiate early planning prior to detailed development applications being lodged for site. Early planning will enable the greatest opportunity for the site to be realised. It is noted however that the absence of a site-specific acoustic strategy would not preclude development.

6. Conclusion

This assessment addresses the suitability of the Cooks Cove planning proposal with respect to exposure from aircraft, road and industrial noise. The proposal relates to the redevelopment of the site for a mixed-use development inclusive of hotel, retail, office and logistics uses.

Noise exposure from aircraft noise was considered a key consideration in establishing the appropriateness of the site given the proximity to Sydney Kingsford Smith Airport. The noise assessment has been carried out in accordance with current accepted procedures for aircraft noise, namely Australian Standard/New Zealand Standard 2021:2015 '*Acoustics – Aircraft Noise Intrusion – Building Siting and Construction*'**Invalid source specified.**. In this regard, reference has been made to the Sydney Airport Master Plan (SAMP) and ANEF 2039.

In addition, consideration and discussion has been provided in response to the *National Airports Safeguarding Framework.* Further to review of these items, the appropriate assessment for the site was deemed to follow the procedures outlined in the current AS 2021:2015.

The proposed uses for the Cooks Cove – Northern Precinct are appropriate in accordance with AS 2021:2015, being identified as 'acceptable'. A screening assessment of the likely Aircraft Noise Reductions was carried out using both on site measurements and data contained with AS 2021:2015. The assessment concluded that buildings could reasonably be designed to meet the internal noise criteria set out in AS 2021:2015.

Noise emission from the Arncliffe Motorway Operations Complex tunnel ventilation equipment was also considered but deemed not to impact the proposed land uses.

As this assessment only seeks to demonstrate that the site is suitable for the proposed development, by providing preliminary assessment of likely worst-case conditions across the site, detailed acoustic assessment is recommended for subsequent building specific development applications and design development.

Based on this assessment, the site is deemed suitable for the proposed rezoning.

Appendix A

Glossary

Ambient Noise Level

The ambient noise level is the overall noise level measured at a location from multiple noise sources. When assessing noise from a particular development, the ambient noise level is defined as the remaining noise level in the absence of the specific noise source being investigated. For example, if a fan located on a building is being investigated, the ambient noise level is the noise level from all other sources without the fan operating, such as traffic, birds, people talking and other noise from other buildings.

Background Noise Level

The background noise level is the noise level that is generally present at a location at all or most times. Although the background noise may change over the course of a day, over shorter time periods (e.g. 15 minutes) the background noise is almost-constant. Examples of background noise sources include steady traffic (e.g. motorways or arterial roads), constant mechanical or electrical plant and some natural noise sources such as wind, foliage, water and insects.

Assessment Background Level (ABL)

A single-number figure used to characterise the background noise levels from a single day of a noise survey. ABL is derived from the measured noise levels for the day, evening or night time period of a single day of background measurements. The ABL is calculated to be the tenth percentile of the background L_{A90} noise levels – i.e. the measured background noise is above the ABL 90% of the time.

Rating Background Level (RBL / min$L_{A90,1hour}$)

A single-number figure used to characterise the background noise levels from a complete noise survey. The RBL for a day, evening or nighttime period for the overall survey is calculated from the individual Assessment Background Levels (ABL) for each day of the measurement period, and is numerically equal to the median (middle value) of the ABL values for the days in the noise survey. This parameter is denoted RBL in NSW, and min$L_{A90,1hour}$ in QLD.

Decibel

The decibel scale is a logarithmic scale which is used to measure sound and vibration levels. Human hearing is not linear and involves hearing over a large range of sound pressure levels, which would be unwieldy if presented on a linear scale. Therefore a logarithmic scale, the decibel (dB) scale, is used to describe sound levels.

An increase of approximately 10 dB corresponds to a subjective doubling of the loudness of a noise. The minimum increase or decrease in noise level that can be noticed is typically 2 to 3 dB.

dB(A)

dB(A) denotes a single-number sound pressure level that includes a frequency weighting (“A-weighting”) to reflect the subjective loudness of the sound level.

The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A).

Some typical dB(A) levels are shown below.

Sound Pressure Level dB(A)	Example
130	Human threshold of pain
120	Jet aircraft take-off at 100 m
110	Chain saw at 1 m
100	Inside nightclub

Sound Pressure Level dB(A)	Example
90	Heavy trucks at 5 m
80	Kerbside of busy street
70	Loud stereo in living room
60	Office or restaurant with people present
50	Domestic fan heater at 1m
40	Living room (without TV, stereo, etc)
30	Background noise in a theatre
20	Remote rural area on still night
10	Acoustic laboratory test chamber
0	Threshold of hearing

L_1

The L_1 statistical level is often used to represent the maximum level of a sound level that varies with time.

Mathematically, the L_1 level is the sound level exceeded for 1% of the measurement duration. As an example, 87 dB $L_{A1,15min}$ is a sound level of 87 dB(A) or higher for 1% of the 15 minute measurement period.

L_{10}

The L_{10} statistical level is often used as the "average maximum" level of a sound level that varies with time.

Mathematically, the L_{10} level is the sound level exceeded for 10% of the measurement duration. L_{10} is often used for road traffic noise assessment. As an example, 63 dB $L_{A10,18hr}$ is a sound level of 63 dB(A) or higher for 10% of the 18 hour measurement period.

L_{90}

The L_{90} statistical level is often used as the "average minimum" or "background" level of a sound level that varies with time.

Mathematically, L_{90} is the sound level exceeded for 90% of the measurement duration. As an example, 45 dB $L_{A90,15min}$ is a sound level of 45 dB(A) or higher for 90% of the 15 minute measurement period.

L_{eq}

The 'equivalent continuous sound level', L_{eq}, is used to describe the level of a time-varying sound or vibration measurement.

L_{eq} is often used as the "average" level for a measurement where the level is fluctuating over time. Mathematically, it is the energy-average level over a period of time (i.e. the constant sound level that contains the same sound energy as the measured level). When the dB(A) weighting is applied, the level is denoted dB $L_{Aeq.}$ Often the measurement duration is quoted, thus $L_{Aeq,15\ min}$ represents the dB(A) weighted energy-average level of a 15 minute measurement.

L_{max}

The L_{max} statistical level can be used to describe the "absolute maximum" level of a sound or vibration level that varies with time.

Mathematically, L_{max} is the highest value recorded during the measurement period. As an example, 94 dB L_{Amax} is a highest value of 94 dB(A) during the measurement period.

Since L_{max} is often caused by an instantaneous event, L_{max} levels often vary significantly between measurements.

Frequency

Frequency is the number of cycles per second of a sound or vibration wave. In musical terms, frequency is described as “pitch”. Sounds towards the lower end of the human hearing frequency range are perceived as “bass” or “low-pitched” and sounds with a higher frequency are perceived as “treble” or “high pitched”.

Sound Power and Sound Pressure

The sound power level (L_w) of a source is a measure of the total acoustic power radiated by a source. The sound pressure level (L_p) varies as a function of distance from a source. However, the sound power level is an intrinsic characteristic of a source (analogous to its mass), which is not affected by the environment within which the source is located.

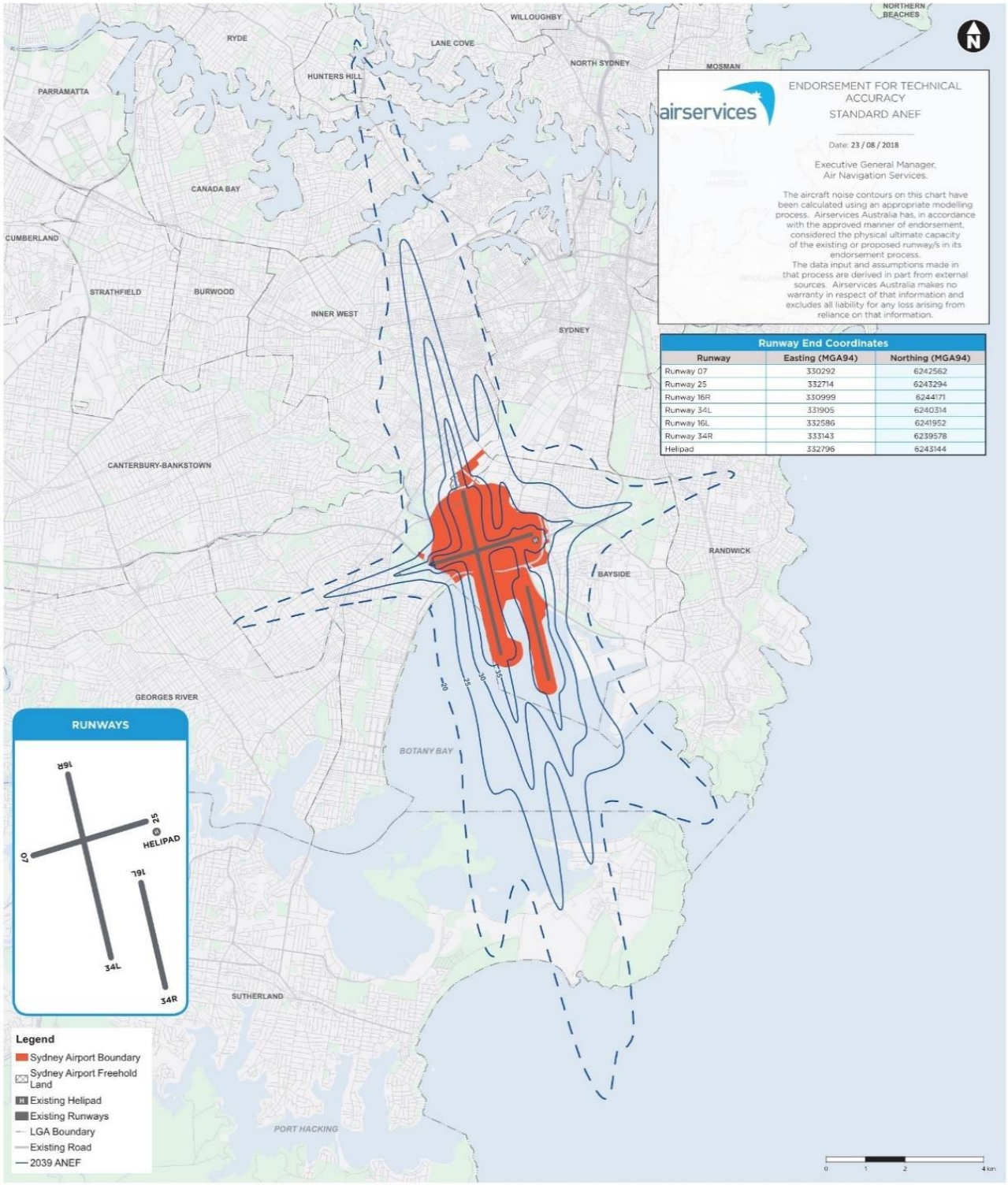
Sound Reduction Index (R)

The sound reduction index (or transmission loss) of a building element is a measure of the loss of sound through the material, i.e. its sound attenuation properties. It is a property of the component, unlike the sound level difference, which is affected by the common area between the rooms and the acoustics of the receiving room. R is the ratio (expressed in decibels) of the sound energy transmitted through the building element to the sound energy incident on the building element for a particular frequency.

The weighted sound reduction index, R_w, is a single figure description of sound reduction index across a wider frequency range and is defined in BS EN ISO 717-1: 1997. R_w values are calculated from measurements in an acoustic laboratory. Sound insulation ratings derived from site measurements (which are invariably lower than the laboratory figures) are referred to as apparent sound reduction index (R'_w) ratings.

Appendix B

Sydney Airport ANEF 2039


WILLOUGHBY
NORTHERN BEACHES
RYDE
LANE COVE
NORTH SYDNEY
MOSMAN
HUNTERS HILL
PARRAMATTA
CANADA BAY
CUMBERLAND
STRATHFIELD
BURWOOD
INNER WEST
SYDNEY
CANTERBURY-BANKSTOWN
RANDWICK
BAYSIDE
GEORGES RIVER
BOTANY BAY
SUTHERLAND
PORT HACKING
N
airservices
ENDORSEMENT FOR TECHNICAL ACCURACY
STANDARD ANEF
Date: 23 / 08 / 2018
Executive General Manager,
Air Navigation Services.
The aircraft noise contours on this chart have been calculated using an appropriate modelling process. Airservices Australia has, in accordance with the approved manner of endorsement, considered the physical ultimate capacity of the existing or proposed runway/s in its endorsement process.
The data input and assumptions made in that process are derived in part from external sources. Airservices Australia makes no warranty in respect of that information and excludes all liability for any loss arising from reliance on that information.
Runway End Coordinates
Runway | Easting (MGA94) | Northing (MGA94)
Runway 07 | 330292 | 6242562
Runway 25 | 332714 | 6243294
Runway 16R | 330999 | 6244171
Runway 34L | 331905 | 6240314
Runway 16L | 332586 | 6241952
Runway 34R | 333143 | 6239578
Helipad | 332796 | 6243144
RUNWAYS
16R
25
HELIPAD
07
16L
34L
34R
Legend
Sydney Airport Boundary
Sydney Airport Freehold Land
Existing Helipad
Existing Runways
LGA Boundary
Existing Road
2039 ANEF
0
1
2
4 km

Appendix C

NSW Planning & Infrastructure Letter (17/4/2013)

Shona Rosengren. HO

NSW GOVERNMENT Planning & Infrastructure

RECEIVED
24 APR 2013
BY: JD321

RECEIVED
Deputy Secretary Wilson
22 APR 2013
Ref: 214

John Dot

M. Stone 26/4

Mr Andrew Wilson
Deputy Secretary
Department of Infrastructure and Transport
PO Box 594
CANBERRA ACT 2601

13/05101

RECEIVED
23 APR 2013
SS227

Attention: Scott Stone

Dear Mr Wilson,

I refer to your letter of 8 March 2013 requesting comments on the proposed Project Plan developed by the Commonwealth for the review of Australian Standard *AS2021-2000 Acoustics- Aircraft noise intrusion- Building siting and information (AS2021).*

As advised in recent correspondence to Mr Scott Stone (8 March 2013), the NSW Department of Planning and Infrastructure does not support the use of alternative noise metrics to regulate land use or development outcomes in the vicinity of airports. The Department only considers these metrics useful for the purposes of community information.

Accordingly, the current draft Project Plan is not supported for the review of the Standard. The draft Project Plan continues to suggest new metrics should be developed to regulate land use and development decisions. As such, the Department will continue to express concern with the Project Plan until these references are removed, or the Commonwealth can identify the scientific basis behind the selection of the metrics. I understand that this position is consistent with the views expressed by agencies in Victoria, South Australia and Western Australia.

At the recent forum in Sydney on 25 February 2013, there was clear recognition that Australian Noise Exposure Forecasts (ANEFs) remained the most useful and appropriate tools for determining land use and development outcomes near airports. It was also generally agreed that alternative noise metrics provide little guidance for this purpose, and were most suitable for the purposes of community information only.

The current draft Project Proposal is not considered to be consistent with the outcomes of the recent forum, and accordingly, is not supported.

Should you have any further enquiries about this matter, please contact Neil McGaffin, Executive Director, Rural and Regional Planning on telephone number (02) 9228 6565.

Yours sincerely

17/4/13

Richard Pearson
Deputy Director General
Planning Operations & Regional Delivery

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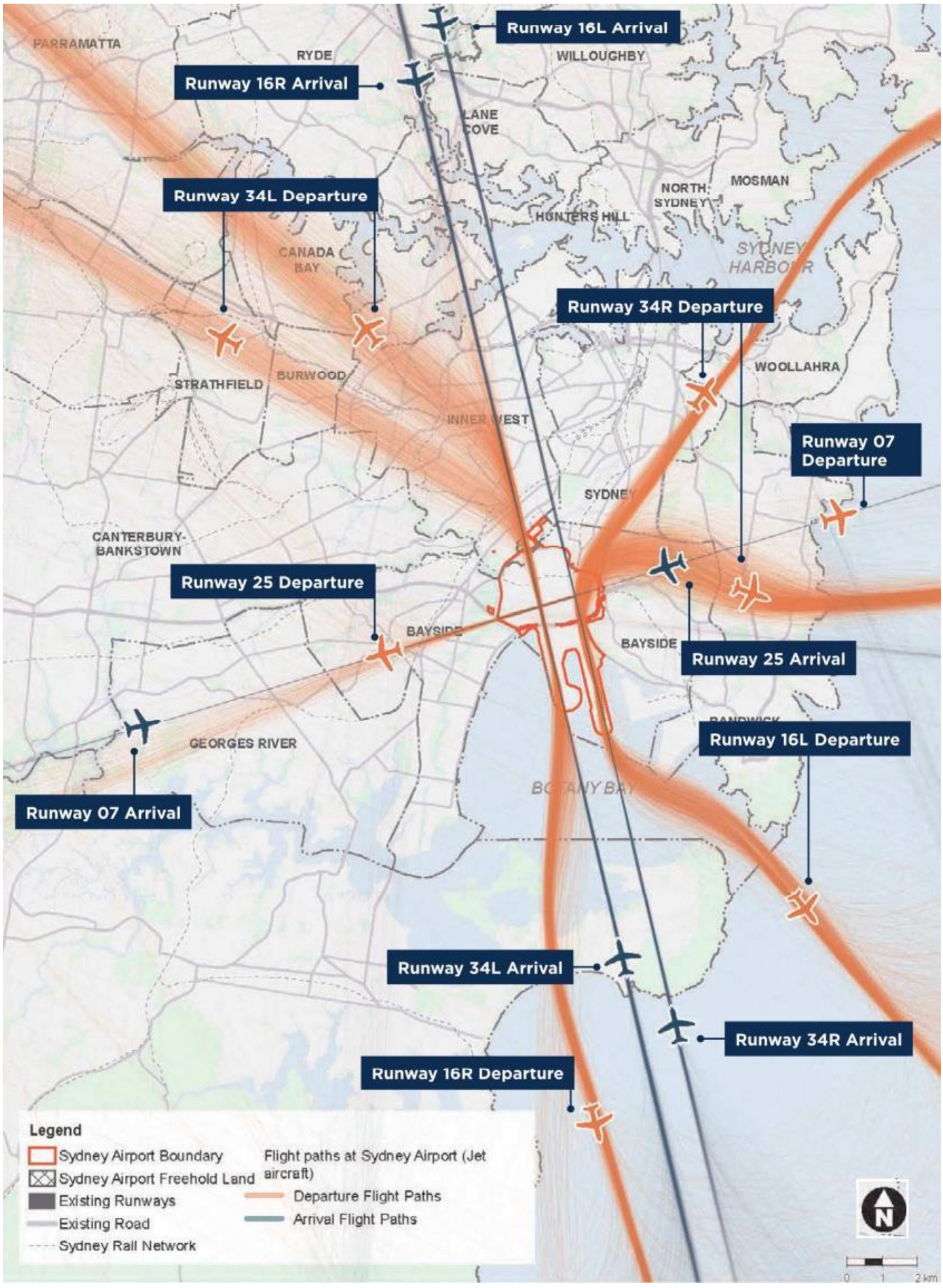
Telephone: (02) 9228 6111 Facsimile: (02) 9228 6191 Website planning.nsw.gov.au

Appendix D

Sydney Airport Flight Paths

D.1 SAMP, Flight Paths for Jet Aircraft



D.2 SAMP, Flight Paths for Non-Jet Aircraft