Aeronautical Impact Assessment

Aspect Industrial Estate,
Mamre Road, Kemps Creek, NSW.

Client

MIRVAC Projects Pty Ltd

LB00402

Final V3

13 October 2020

Version No.	Basis of issue	Author	Date
Draft v001	Draft report for submission to Client	PWW	15 May 2020
Draft v002	Draft report for submission to Client	PWW	15 May 2020
Draft v003	Inclusion of ANEC location and future approach procedures	PWW	21 May 2020
Final V1	Final Report for Submission	PWW	23 September 2020
Final V2	Addresses Final SEPP Details	PWW	12 October 2020
Final V3	Updated titles and drawing	PWW	13 October 2020

Contents

1 Introduction

1.1 The Development

Mirvac Projects Pty Ltd has tasked Landrum & Brown Worldwide (Australia) Pty Ltd to prepare an Aeronautical Impact Assessment (AIA) for the proposed Aspect Industrial Estate, Lots 54 – 58, Mamre Road, Kemps Creek, within the Penrith Local Government Area.

The development comprises 11 industrial and office sites with associated internal road infrastructure connected to Mamre Road.

Initial planning of the buildings within the Aspect Industrial Estate indicate a maximum height of between 63 m AHD and 100 m AHD including construction cranes.

It is located approximately 7 km north east of the Aerodrome Reference Point for Western Sydney Airport (WSA) as per Figure 1.

This report considers:

- the likely impact of the development upon:
  - Obstacle Limitation Surfaces;
  - Draft PANS OPS Surfaces – Basic ILS;
  - Possible impact upon air traffic control (ATC) communications facilities, navigation aids and surveillance system coverage;

in accordance with National Airspace Safeguarding Framework Guidelines (NASF);

- the impact of the development upon the aviation requirements of The Planning Secretary's Environmental Assessment Requirements (SEARS) under Section 4.12(8) of the Environmental Planning and Assessment Act 1979; and
- the Western Sydney Aerotropolis State Environment Planning Policy 2020.

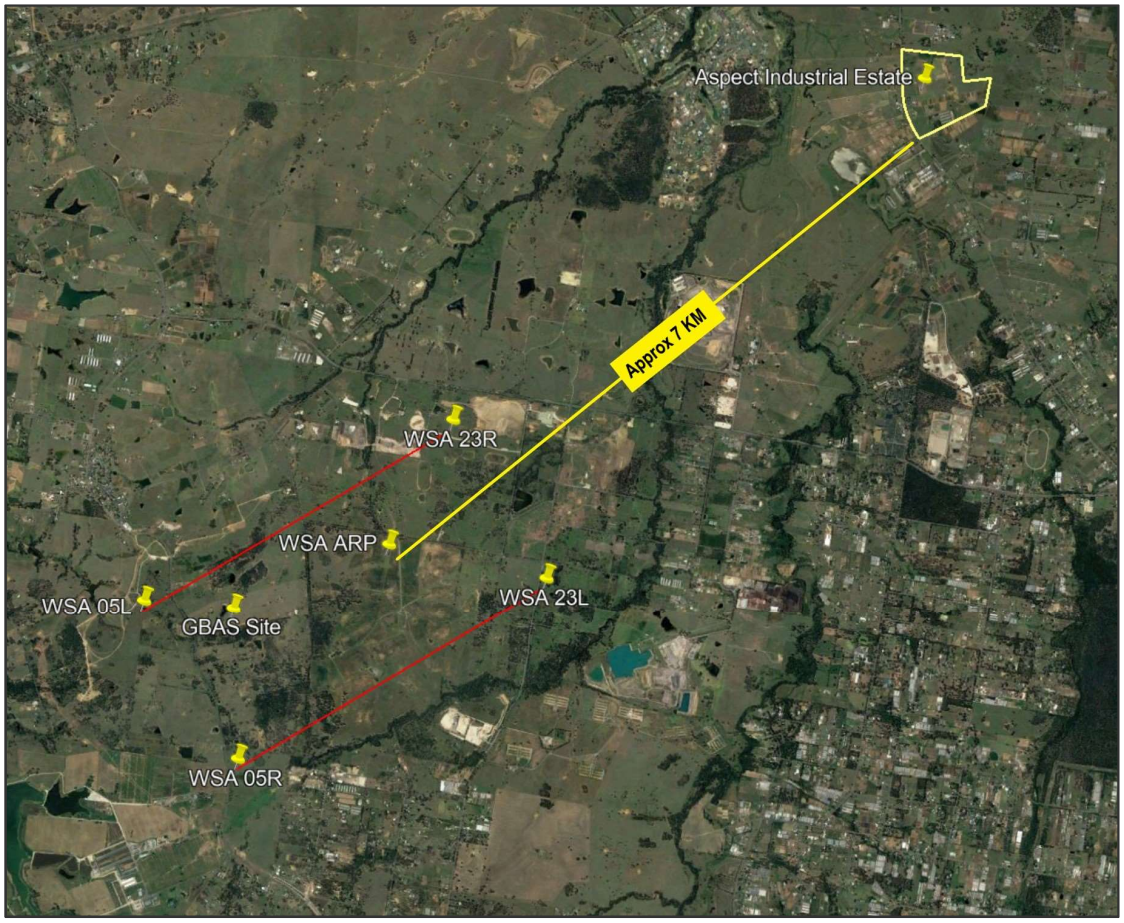


Figure 1: Location in relation to Western Sydney Airport (Google Earth)

Figure 2: Site Layout (MIRVAC)

This document has been prepared in consideration of the Planning Secretary's Environmental Assessment Requirements (SEARs) issued for the proposal (SSD-10448) issued on 30 April 2020. Table 1 summaries all key issues relevant to this report and how they have been responded to.

Key Issue	Requirements	Response/Reference
Airport Safeguarding	A risk assessment of the proposed development on airport operations and addressing related matters in the Western Sydney Aerotropolis State Environment Planning Policy 2020.	Section 7 of this report shows that the proposed industrial estate does not impact on the safety of flight operations, does not infringe Prescribed Airspace and is within the criteria for noise exposure within such a development.

Table 1: SEARS Compliance

2 Western Sydney Airport Airspace

Whilst the Runway locations have been planned, Obstacle Limitation Surfaces have been declared and provisional Instrument Landing System (Basic ILS) PANS OPS surfaces have been declared for WSA there is still the possibility that they may change slightly as the construction program progresses and consequently, the airport's Prescribed Airspace may also change slightly.

WSA data used to determine the probable Prescribed Airspace above the Aspect Industrial Estate was determined from information published on WSA's website - https://westernsydney.com.au/

Major reports referenced are:

- Western Sydney Airport – Airport Plan 2016;
- Western Sydney Aerotropolis State Environmental Planning Policy 2020;
- Airservices Australia – Western Sydney Airport Preliminary Airspace Management Analysis – 10 April 2015.

Airspace Overview

The Airports (Protection of Airspace Regulations) 1996 specifies volumes of Prescribed Airspace related to Federally leased airports such as Western Sydney Airport that protect them from uncontrolled obstacle growth that may have an adverse impact upon flight safety or the regularity of flight operations at those airports.

Prescribed Airspace for an airport is the airspace above any facet of the Obstacle Limitation Surfaces (OLS) or the PANS OPS (Procedures for Air Navigation Services – Aircraft Operations) surfaces for an airport, or the Radar Terrain Clearance Chart (RTCC) protection surfaces. Flight operations at an airport are protected from uncontrolled obstacle intrusion by Obstacle Limitation Surfaces (OLS) and the PANS OPS (Procedures for Air Navigation Services – Aircraft Operations) surfaces which are published in Airport Master Planning Documents for the use of local planning authorities to show areas where building activity requires consideration of aviation requirements and in Aeronautical Publications for the use of pilots during pre-flight planning processes and in-flight operations to ensure that the airport is capable of supporting their planned operation.

The OLS are conceptual surfaces associated with runways that are designed to protect aircraft operations from unrestricted obstacle growth. Intrusions into some areas of the OLS can be approved subject to an aeronautical study that shows that the obstacle does not impact upon flight safety or the regularity of operations at the airport.

The PANS OPS surfaces are designed beneath instrument approach and departure flight paths with a prescribed minimum obstacle clearance above the obstacles or terrain. They provide an obstacle free flight path to enable safe and efficient aircraft operations in Instrument Meteorological Conditions (IMC) during which flight crews cannot necessarily see the ground or obstacles and they must rely upon aircraft instrumentation to determine their position in relation to navigation aids and runways.

Infringements into Prescribed Airspace requires the approval of the Department of Infrastructure, Transport, Regional Development and Cities (DITRDC), following an application to the aerodrome operator which is then referred to the Civil Aviation Safety Authority (CASA) and Airservices Australia (AsA). DITRDC will then assess the information from CASA and AsA to determine the matter.

Permanent infringement of PANS OPS protection surfaces are not supported by the aviation authorities, however, temporary activities such as construction cranes may be able to be approved subject to support from the airport, Airservices Australia and CASA for limited periods of time.

If the infringement is shown to impact on aviation safety or regularity of aircraft operations, it is unlikely to be approved.

2.1 Obstacle Limitation Surfaces

The OLS at Western Sydney Airport comprises:

- conical surface;
- inner horizontal surface (IHS);
- approach surface for each runway;
- inner approach surface for each runway;
- transitional surface for each runway;
- inner transitional surface;
- baulked landing surface; and
- take-off climb surface for each runway.

The Aspect Industrial Estate is located beneath the Approach Surface to Runway 23R and the Take-Off Surface for Runway 05L.

The height of the lowest of these surfaces above the site ranges from approximately 188 m AHD at Mamre Road to approximately 205 m AHD at the north eastern edge of the industrial estate. Figure 3 is an inset from MIRVACs OLS diagram based on the final DPIE SEPP OLS Map, that shows the location of the industrial estate and the relevant OLS.

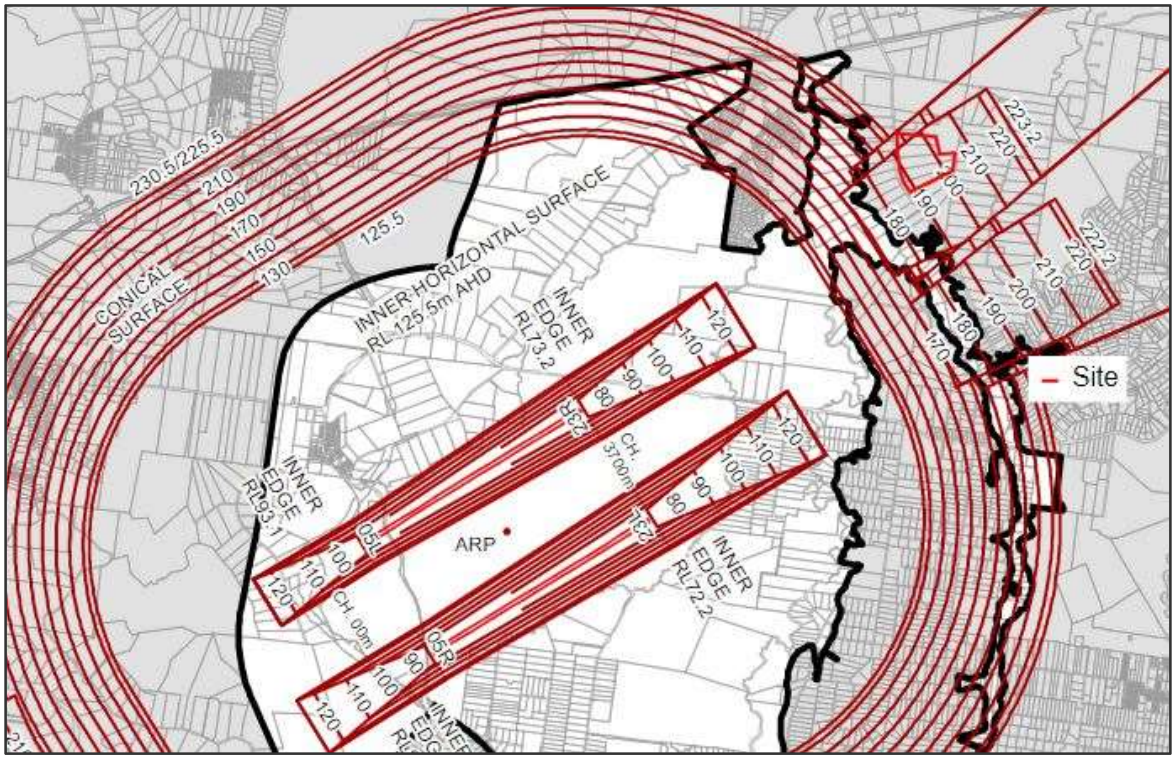


Figure 3: Obstacle Limitation Surfaces Map (Source: State Environmental Planning Policy (Western Sydney Aerotropolis) 2020)

With building heights projected to be beneath 100 m AHD there will not be any infringements of the OLS for Western Sydney Airport.

2.2 PANS OPS Surfaces

Draft PANS OPS surfaces related to the Basic ILS surfaces and the Standard Instrument Departures (SID) for each runway have been declared for the preliminary phase of the construction and operation of the airport.

The Basic ILS surfaces are very conservative and may be infringed if an assessment of the Obstacle Assessment Surfaces (OAS) or application of the Collision Risk Model determines a safe result for the overall obstacle environment surrounding the airport.

The lowest Basic ILS surfaces above the industrial estate is related to the Runway 23 ILS and is at a height of 197 m AHD.

The SID procedures have PANS OPS surface determined by the Procedure Design Gradient (PDG) that is the minimum climb gradient that aircraft are required to perform to in order to ensure obstacle clearance during the initial climb after take-off.

The lowest SID PANS OPS surface above Mamre road is 192 m AHD increasing to approximately 195 m at the north eastern boundary of the industrial estate.

With building heights projected to be beneath 100 m AHD there will not be any infringements of the PANS OPS for Western Sydney Airport.

Other instrument approach procedures will be promulgated for WSA once construction of the first runway, Runway 05L/23R nears completion. RNAV (GNSS) and RNP-AR (see Appendix C) approached are likely to be implemented for both runways. Obstacle clearance in the area over the Aspect Industrial Estate is likely to be in the order of 75 m above any part of the highest structure within the estate, providing adequate clearance to not impact on the efficiency of future approach procedures.

It is highly likely that any industrial estate activities, including construction crane activity to a height of approximately 15 m above any building within the estate, will not infringe either the OLS or the PANS OPS surfaces above the estate due to the large margin above the proposed buildings.

3 ATC Surveillance System Performance

The nearest ATC Surveillance equipment (Terminal Area Radar - TAR) is located at Cecil Park, approximately 5.7 km to the south east of the development site.

Surveillance System	Distance from development	Antenna Elevation (AHD)	Clearance Plane Elevation at development site Distance x Tan 0.5° + TAR elevation
Cecil Park TAR	5700 m	200.5 m	249 m

Table 2: Surveillance System Clearance Plane

It is likely that a surveillance system will be installed on the WSA site to monitor and control aircraft and vehicular traffic on the surface of the airport. The Aspect Industrial Estate will be located well beyond the airport boundary and will not impact the operation of such a surveillance system.

The building and the cranes will not impact on ATC Surveillance systems.

4 Navigation Aid Performance

Instrument Landing System (ILS), Distance Measuring Equipment (DME) and Ground Based Augmentation System (GBAS) are planned at Western Sydney Airport.

It is unlikely that any other ground-based navigation system will be installed at the airport.

Airservices Australia operates these navigation systems and protects their signal integrity by applying Building Restricted Area (BRA) criteria to the critical areas around the navigation aid antenna.

The ILS BRA extend to 1000 m from the facility, part of which is located close to the runway end.

The GBAS BRA extend to 3 km from the facility which is planned to be based in the middle of the airport but will move to the north side of the airport as the second runway is developed.

The DME BRA extend to 1500 m from the facility which is planned in the middle of the airport.

The closest part of the industrial estate at Mamre Rd is located approximately 5.7 km from the nearest of the navigation systems at the airport and is therefore beyond the BRA associated with all of them.

The Aspect Industrial Estate will not have any impact upon the performance of navigation aids installed at Western Sydney Airport.

5 ATC Communications

Reliable ATC communications require a clear line-of-sight path between the base station and aircraft and vehicles using the facilities.

The Area of Interest for the ATC Communication facilities includes all developments between 100 m and 2000 m that exceed a height of 10 m above ground level at the base of the VHF/UHF antenna.

The closest part of the industrial estate at Mamre Rd is located approximately 6 km from the likely location of ATC Communication facilities on the airport.

The Aspect Industrial Estate will not have any impact upon the performance of ATC Communications systems installed at Western Sydney Airport.

6 Roof Top Exhaust Plumes

Exhaust plumes in excess of 4.3 m/s which exist in either OLS or PANS OPS surfaces can create sufficient turbulence to upset the stability of aircraft during take-off and landing operations.

Part 139 of the Civil Aviation Safety Regulations 1988 (CASR 1988) provides that CASA may determine that a gaseous efflux having a velocity in excess of 4.3 m/s is, or will be, a hazard to aircraft operations because of the velocity of the efflux.

In this case, any exhaust plume with a velocity in excess of 4.3 m/s from any vent on top of the building is unlikely to reach the height of the lowest PANS OPS or OLS to be referred to CASA.

7 The Planning Secretary's Environmental Assessment Requirements (SEARS)

The NSW Planning Secretary's Environmental Assessment Requirements issued to Mirvac Projects Pty Ltd requires a risk assessment of the proposed development on airport operations and addressing related matters in the Western Sydney Aerotropolis State Environmental Planning Policy 2020.

This report has assessed the probable impacts caused by the proposed Aspect Industrial Estate development upon the operation of Western Sydney Airport, associated flight paths and Prescribed Airspace.

The report clearly shows that the development of the Aspect Industrial Estate will not have any impact upon Western Sydney Airport's Prescribed Airspace and will not affect flight safety or the regularity of operations at the airport.

7.1 Australian Noise Exposure Forecast (ANEF) Contours

Australian Standard AS 2021:2015 – Acoustics – Aircraft Noise Intrusion – Building Siting and Construction provides guidance on the siting and construction of buildings in the vicinity of airports to minimise aircraft noise intrusion. It describes the process that should be followed in producing ANEF charts for use in applying this standard,

The projected ANEF contours for Western Sydney Airport are described in the Western Sydney Airport Plan section 2.3.3 and Figures 14 and 15.

DITRDC provides a Noise Modelling Tool on its Western Sydney Airport website. Table 4 and the associated figures shows the ANEC contour levels for each particular stage of development of the airport and the particular runway in use. The highest ANEC contour is 25 < 30 which allows a "Light Industrial" or "Other Industrial" building type to be "Acceptable" shown in Table 3 from AA 2021-2015

Building type	ANEF zone site		
	Acceptable	Conditional	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
Hostel, school, university	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF (Note 1)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1)	20 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 3: Building Type Acceptability Table (AS2021-2015)

Runway -Year	ANEC Contour
Runway 05 – Stage 1, 2030	< 20
Runway 23 – Stage 1, 2030	20 < 25
Runway 05 - 2050	20 < 25
Runway 23 - 2050	25 < 30
Runway 05 - 2063	20 < 25
Runway 23 - 2063	25 < 30

Table 4: ANEC Contours

The following noise contour diagrams are sourced from The Department of Infrastructure, Transport, Regional Development and Communications noise modelling tool for Western Sydney Airport.

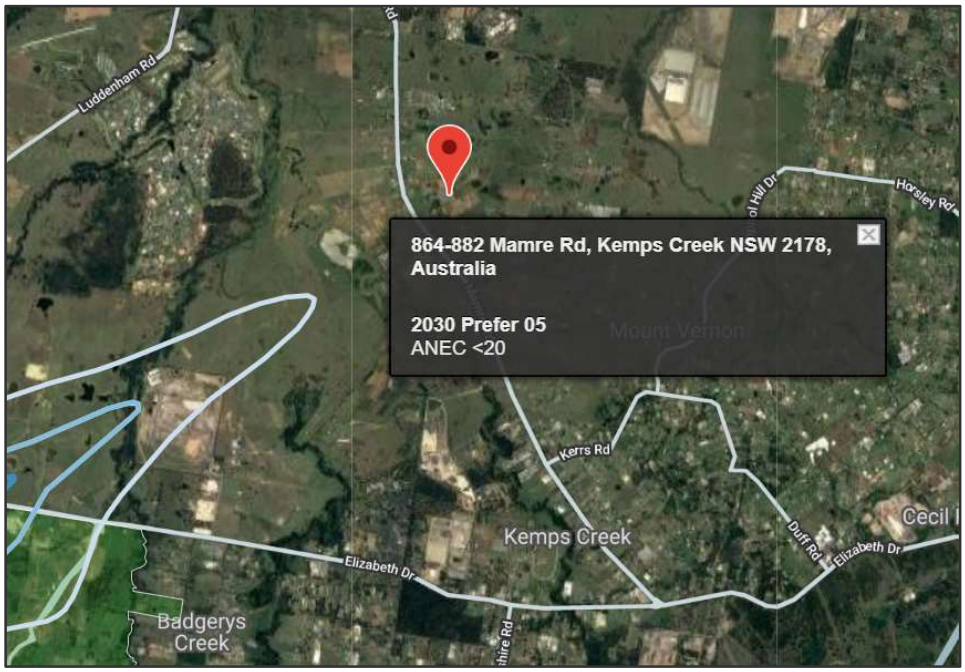


Figure 4: Runway 05 – 2030 Contour

Figure 5: Runway 23 – 2030 Contour

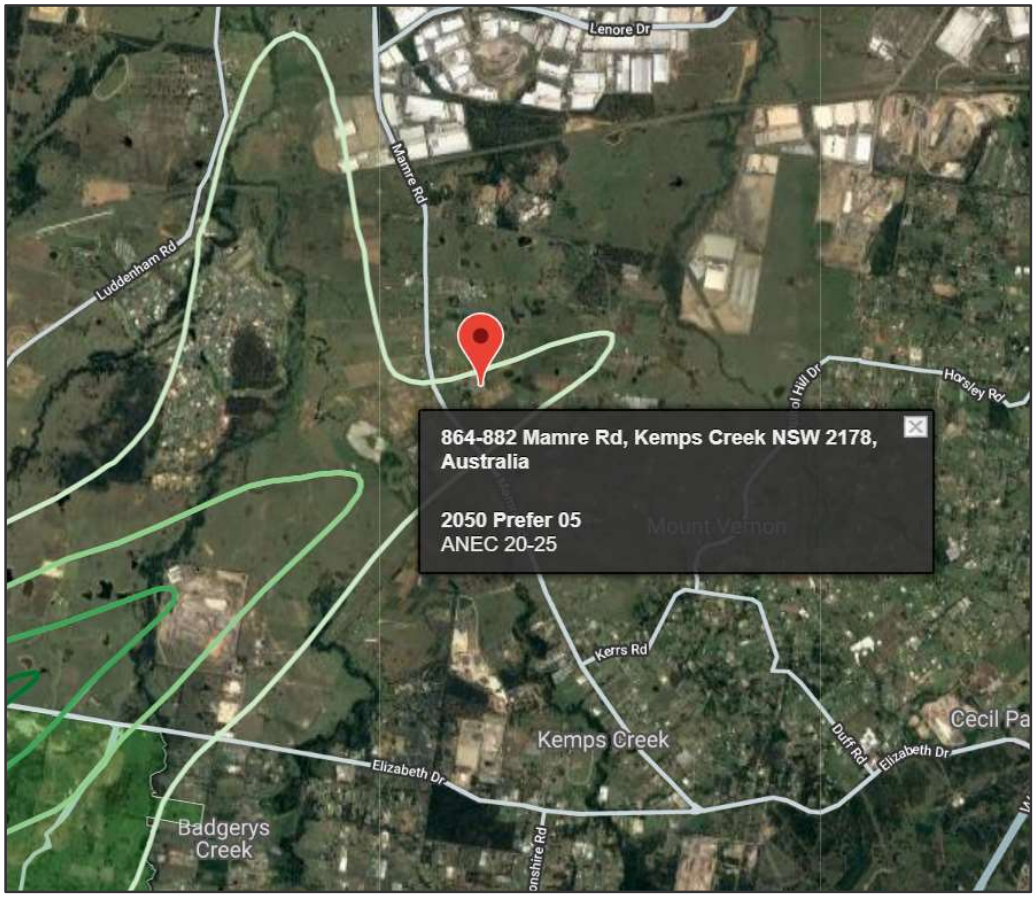


Figure 6: Runway 05 – 2050 Contour

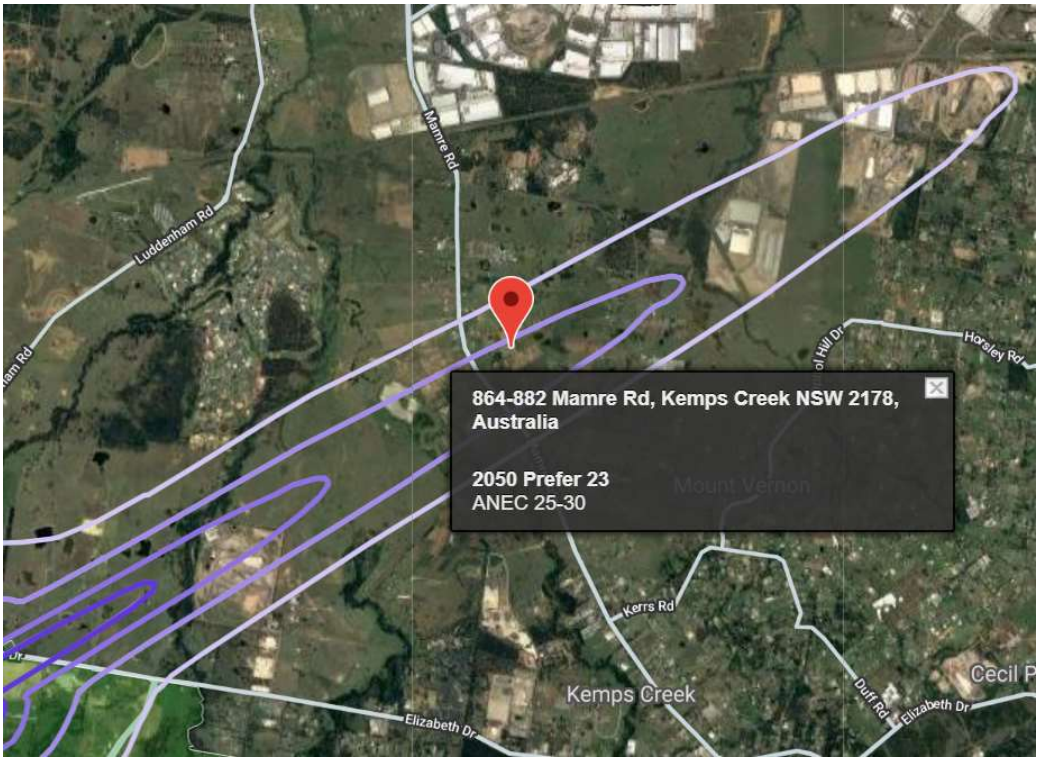


Figure 7: Runway 23 -2050 Contour

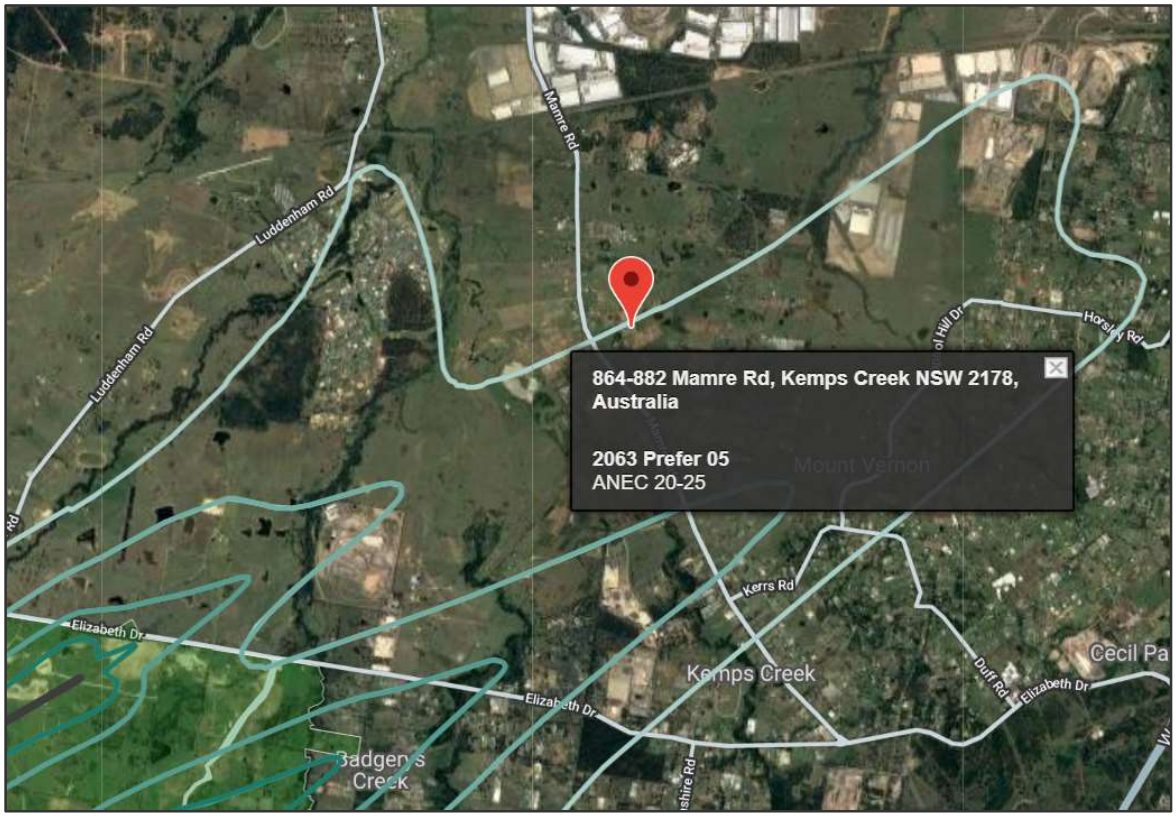


Figure 8: Runway 05 – 2063

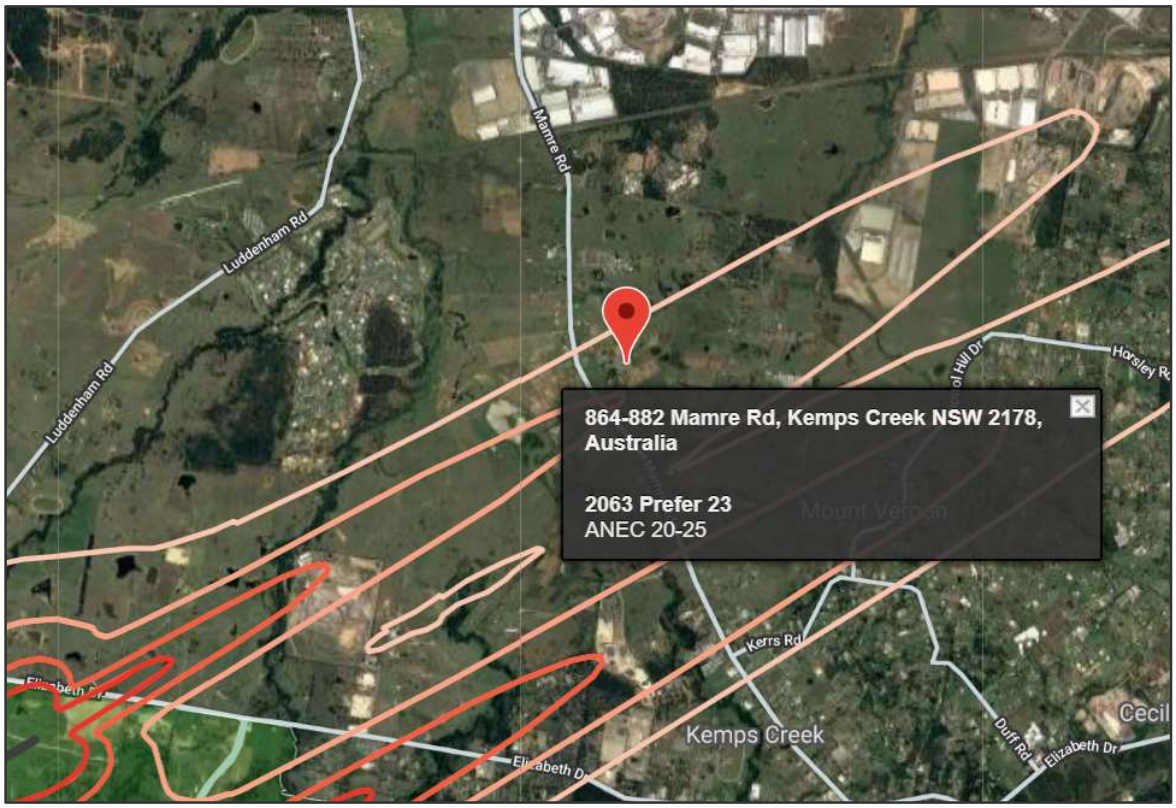


Figure 9: Runway 23 - 2063

7.2 SEARS Conclusion

The Airport Safeguarding aspects of the SEARS have been assessed as outlined in this report.

The result is that the proposed Aspect Industrial Estate does not have any impact upon Western Sydney Airport operations, on the safety of flight operations to/from the airport, on the regularity of flight operation at the airport and does not intrude into its Prescribed Airspace.

An assessment of the ANEF and ANEC noise contours shows that the projected noise levels above the Aspect Industrial Estate do not inhibit the development of the estate.

8 Lighting and Reflectivity

8.1 Lighting

NASF Guideline E – Managing the Risk of Distraction to Pilots from Lighting in the Vicinity of Airports, provides guidance to address the risk of distractions to pilots from lighting and light fixtures near airports.

The guideline relates to lighting intensity within four light control zones all of which are within 6 kilometres of the centre of each runway.

The Mamre Road side of the Aspect Industrial Estate, the closest points to the Western Sydney Airport is 7.5 km from the centre of Runway 05L/23R and 7.7 km from the centre of Runway 05R/23L.

The Aspect Industrial Estate does not lie within any of the light zones and therefore no special lighting requirements apply.

8.2 Reflectivity

There are no requirements in any Australian aviation regulations regarding the reflectivity of building surfaces in the vicinity of airports.

The movement of the sun causes reflections from many surfaces including roads, lakes, cars, aircraft and even wet grass paddocks.

CASA often requires airports operators to assess solar farm installations for glint and glare impacts to pilots using a USA Federal Aviation Administration approved software tool but as the Aspect Industrial Estate is located 7 km from the airport, any such glint and glare is unlikely to have an adverse effect on pilot eyesight to the extent that would potentially cause a hazard.

Pilots, airline operators and airline manufacturers are well aware of glare both within the atmosphere when the sun is low or reflecting off clouds or mist and from ground-based man-made and natural objects.

There are many potential sources of sun reflections in the area surrounding the proposed Aspect Industrial Estate including large sheds and dams.

The location of the proposed Aspect Industrial Estate is not in the immediate vicinity of any of the proposed runways at Western Sydney Airport and therefore any reflections from the estate are unlikely to cause a hazard greater than what already exists today.

9 Public Safety Areas

NASF Guideline I – Managing the Risk in Public Safety Areas (PSA) at the Ends of Runway provides guidance on the assessment and treatment of potential increases in risk to public safety which could result from an aircraft accident near the ends of runways.

This guideline does not prescribe any detail about the extent of any PSA and leaves it up to local planning authorities to determine suitable dimensions relating to each individual airport operations.

Queensland has a state planning policy that includes guidelines addressing public safety risks. It includes a Public Safety Area that extends for 1000 m from the end of the runway, commencing at 350 m wide at the runway end and reducing to 250 m wide at 1000 m from the runway end.

Western Sydney Airport has adopted the Queensland Government PSA template approach. (NASF Guideline I page 16)

At 5.7 km from the end of Runway 05L the Aspect Industrial Estate is well beyond the end of this PSA. Consequently, it is unlikely that the proposed estate will increase the risk to public safety from an aircraft accident near the ends of airport runways.

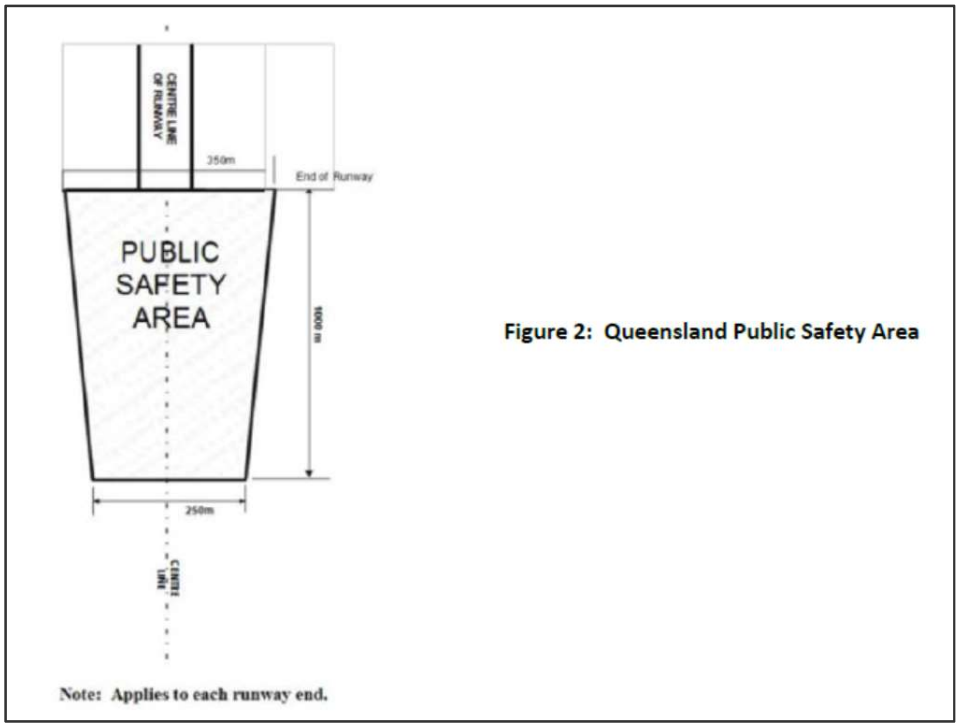


Figure 10: Queensland Public Safety Area (NASF Guideline I)

10 Wildlife Strikes

NASF Guideline C – Managing the Risks of Wildlife Strikes in the Vicinity of Airports provides guidelines to manage the risk of collisions between wildlife and aircraft at or near airports where that risk may be increased by the presence of wildlife-attracting land uses.

The nature of the proposed Aspect Industrial Estate does not include dams, waterbodies, wastewater treatment plants parks or biodiversity conservation sites and as such is not considered to be an attractor to wildlife likely to increase the collision risk with aircraft overflying the estate.

The land where the Aspect Industrial Estate is planned to be located is currently farm allotments and open vegetation paddocks. The industrial estate will consume a significant amount of this grassland and farming activity, effectively reducing the amount of wildlife present in the area that could cause a hazard to overflying aircraft.

11 New South Wales State Environment Planning Policy (Western Sydney Aerotropolis) 2020

This Policy commenced on 1 October 2020 and is published on the NSW legislation website.

This section addressed Part 3 – Development Controls – Airports Safeguards.

11.1 Clause 19: Aircraft Noise

The objectives of this clause are:

- To prevent certain noise sensitive development on land near the airport; and
- To minimise the impact of aircraft noise for other noise sensitive development; and
- To ensure that land use and development near the airport do not hinder or have other adverse impacts on the ongoing, safe and efficient 24 hours a day operation of the airport.

The Aspect Industrial Estate is located within ANEF/ANEC contours that allow for the development of non-noise sensitive areas as shown in section 7.1 of this report.

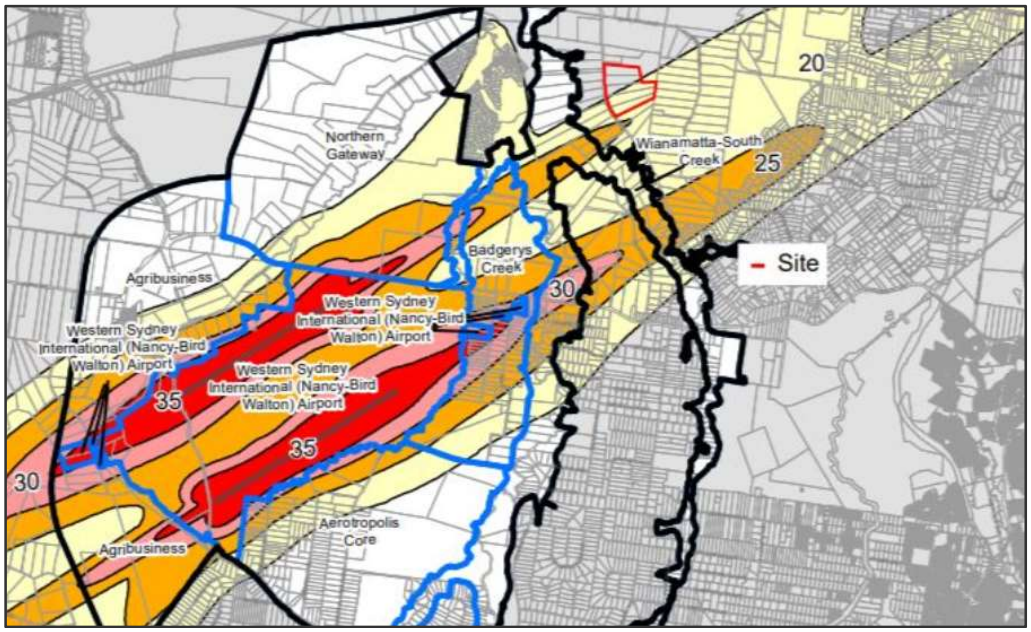


Figure 11: Noise Exposure Contour Map Inset (Source: State Environmental Planning Policy (Western Sydney Aerotropolis) 2020)

11.2 Clause 20: Building Wind Shear and Turbulence

The objective of this clause is to safeguard Airport operations from wind shear and turbulence generated by buildings.

The development site is located outside of the Windshear Assessment Trigger Area and will not have any impact on turbulence at Western Sydney Airport.

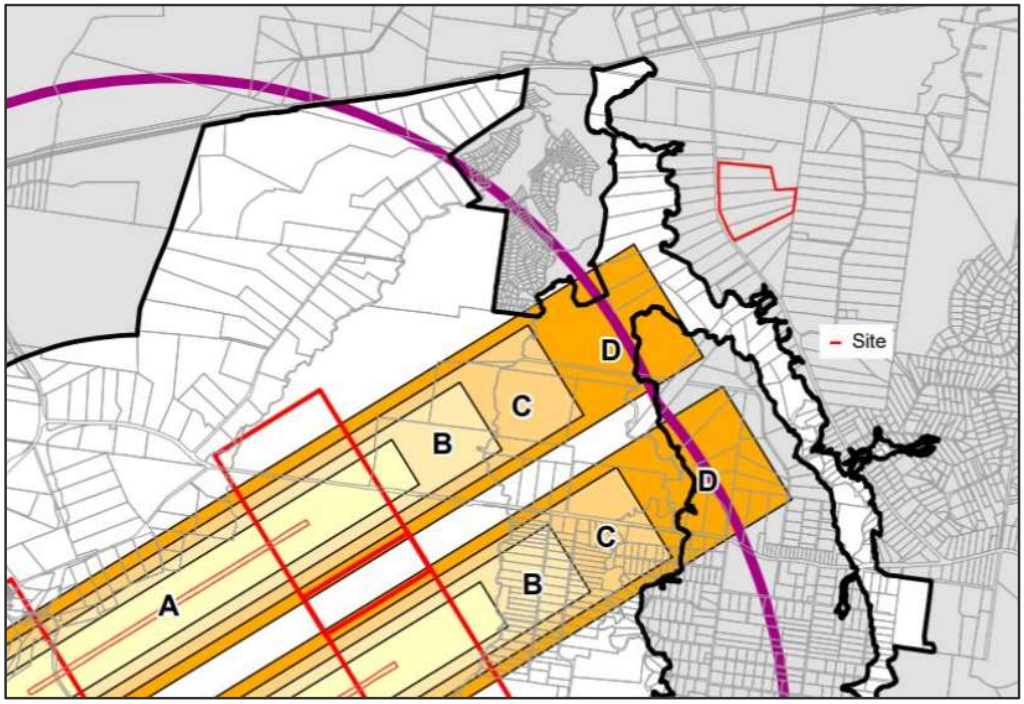


Figure 12: Lighting Intensity and Wind Shear Map Inset (Source: State Environmental Planning Policy (Western Sydney Aerotropolis) 2020)

11.3 Clause 21 Wildlife Hazards

The objective of this clause is to regulate development on land surrounding the Airport where wildlife may present a risk to the operation of the Airport.

The clause specifies relevant developments that must be approved by the consent authority within a “13 km wildlife buffer zone.

These include:

- agricultural produce industries;
- aquaculture;
- camping grounds;
- eco-tourist facilities;
- garden centres;
- intensive livestock agriculture;
- intensive plant agriculture;
- livestock processing industries;
- plant nurseries;
- recreation facilities (major);
- recreation facilities (outdoor);
- sewage treatment plants;
- waste or resource management facilities that consist of outdoor processing, storage or handling of organic or putrescible waste;
- water storage facilities.

The Aspect Industrial Estate lies within an 8 km wildlife buffer zone as shown in **Figure 13.**

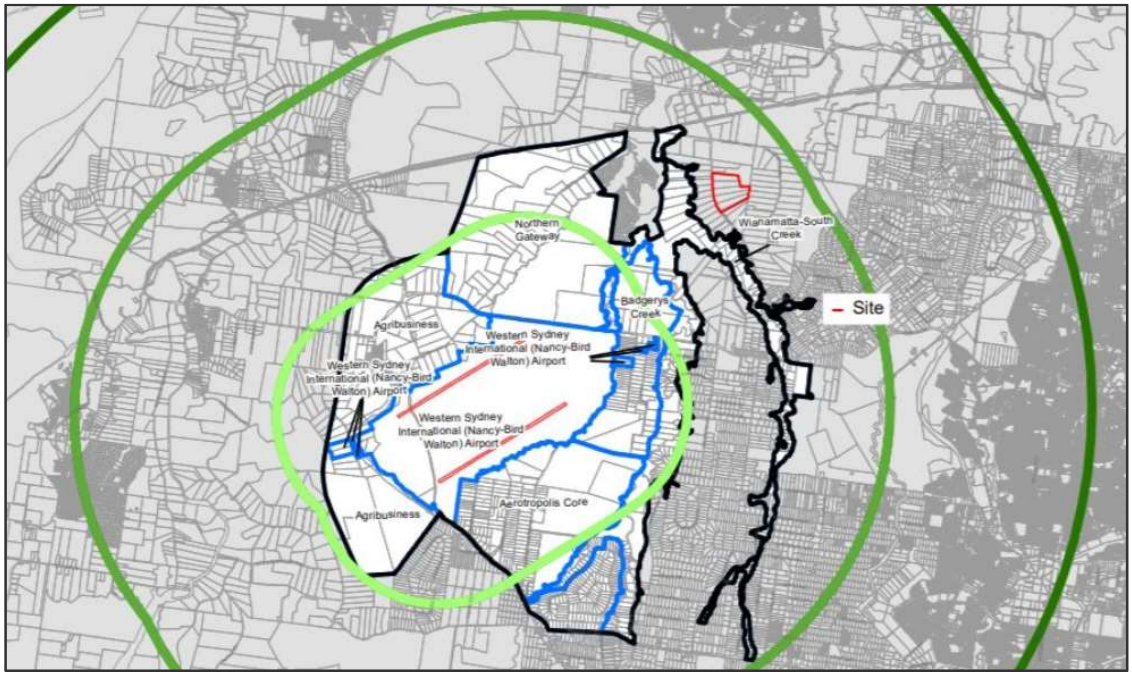


Figure 13: Wildlife Buffer Zones (Source: State Environmental Planning Policy (Western Sydney Aerotropolis) 2020)

11.4 Clause 22 Wind Turbines

The objective of this clause is to regulate the construction of wind turbines and wind monitoring towers on land within 30 kilometres of the Airport.

Development consent must not be granted to development for the purposes of a large wind monitoring tower in the 3–30 km zone unless the consent authority has consulted the relevant Commonwealth body.

The Aspect Industrial Estate is located in the 3-30 kilometre zone.

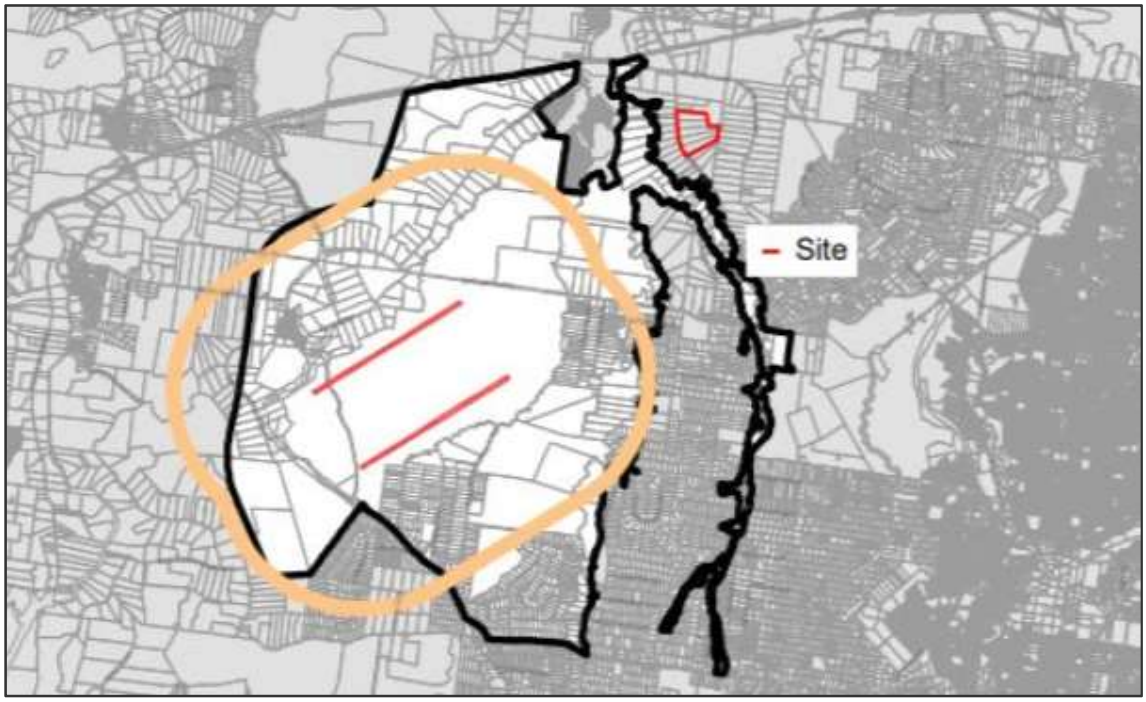


Figure 14: Wind Turbine Buffer Zone Map Inset (Source: State Environmental Planning Policy (Western Sydney Aerotropolis) 2020)

11.5 Clause 23 Lighting

The objective of this clause is to safeguard Airport operations from the risk of lighting and reflectivity distractions for pilots.

The Aspect Industrial Estate is located outside of the Lighting Intensity assessment areas shown on **Figure 14** above.

11.6 Clause 24: Airspace Operations

The objectives of this clause are:

- to provide for the effective and ongoing operation of the Airport by ensuring that its operation is not compromised by development that penetrates the prescribed airspace for the Airport, and
- to protect the community from undue risk from the operation of the Airport.

The content of this Aeronautical Impact Assessment clearly shows that the Aspect Industrial Estate does not penetrate the prescribed airspace for Western Sydney Airport, or any other airport.

11.7 Clause 25: Public Safety

The objective of this clause is to regulate development on land on which there is an appreciable risk to public safety from the operation of the Airport.

Section 9 of this report describes applicable Public Safety Areas and shows that the Aspect Industrial Estate is located outside of the Public Safety.

This is confirmed in the SEPP Public Safety Area Map inset at **Figure 15**.

Figure 10: Public Safety Areas Map Inset (Source: State Environmental Planning Policy (Western Sydney Aerotropolis) 2020)

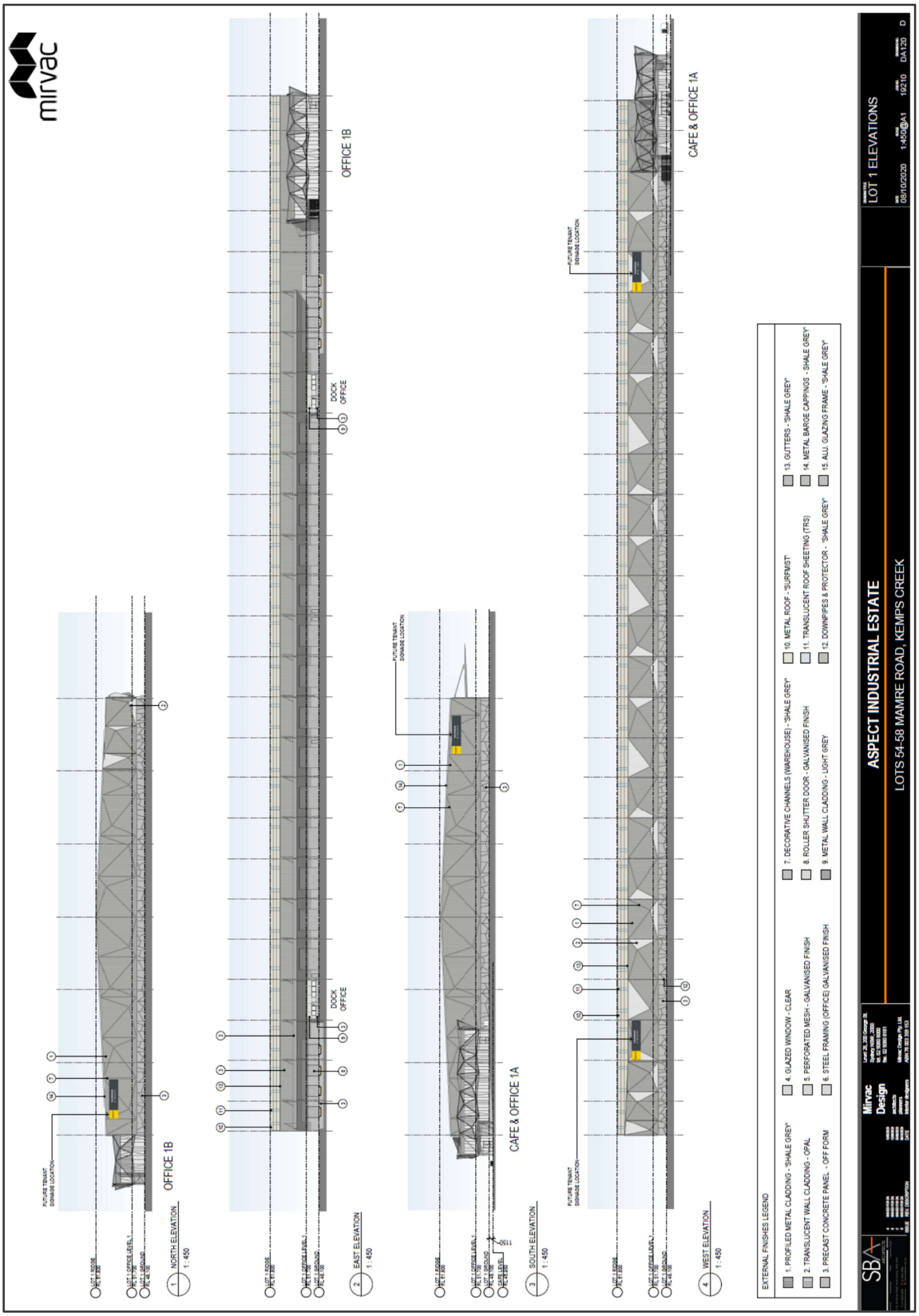
12 Conclusion

The Aspect Industrial Estate proposal, with buildings to a proposed height of 63 m AHD and temporary associated construction crane activity to approximately 80 to 100 m AHD:

- Will not infringe the Prescribed Airspace of Western Sydney Airport comprising:
  - the OLS surface of approximately 188m AHD;
  - the Basic ILS PANS OPS surfaces of approximately 197 m AHD nor the SID PANS OPS surface of approximately 192 m AHD;
- will not inhibit the development of other instrument approach procedures;
- will not infringe any BRA for navigation aids;
- will not adversely impact upon ATC Surveillance systems;
- will not adversely impact the safe operation of Western Sydney Airport;
- is located outside of the:
  - lighting zones surrounding the airport and unlikely to cause any hazard from sunlight reflections;
  - the adopted PSA template;
  - building wind shear assessment area;
- is unlikely to increase the potential for wildlife collisions with aircraft;
- is located within acceptable ANEF contours; and
- is unlikely to impact on any future aviation developments in the area.

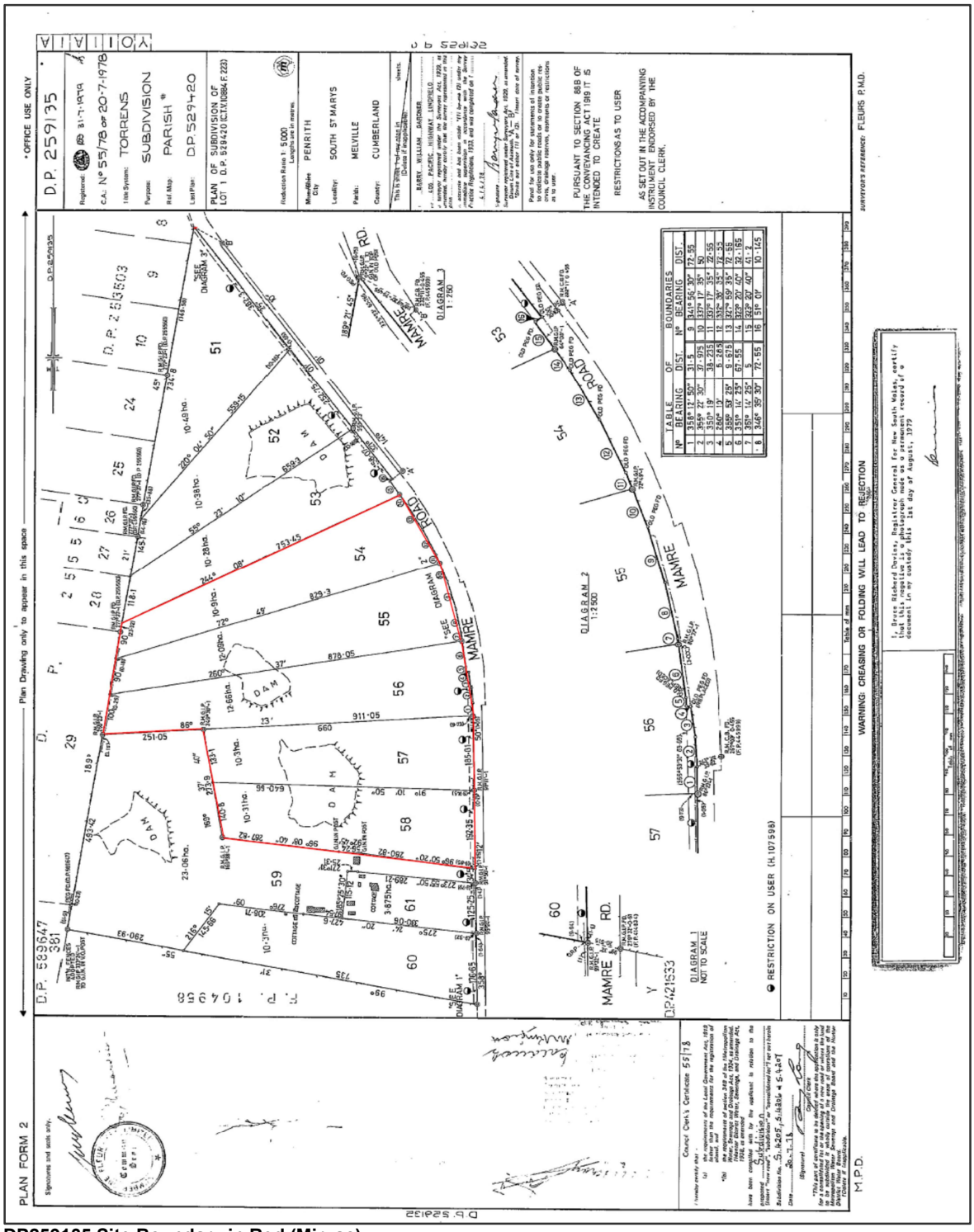
The proposed Aspect Industrial Estate is consistent with the Western Sydney Aerotropolis State Environmental Planning Policy 2020.

Appendix A – Building Height and Site Layout Diagrams



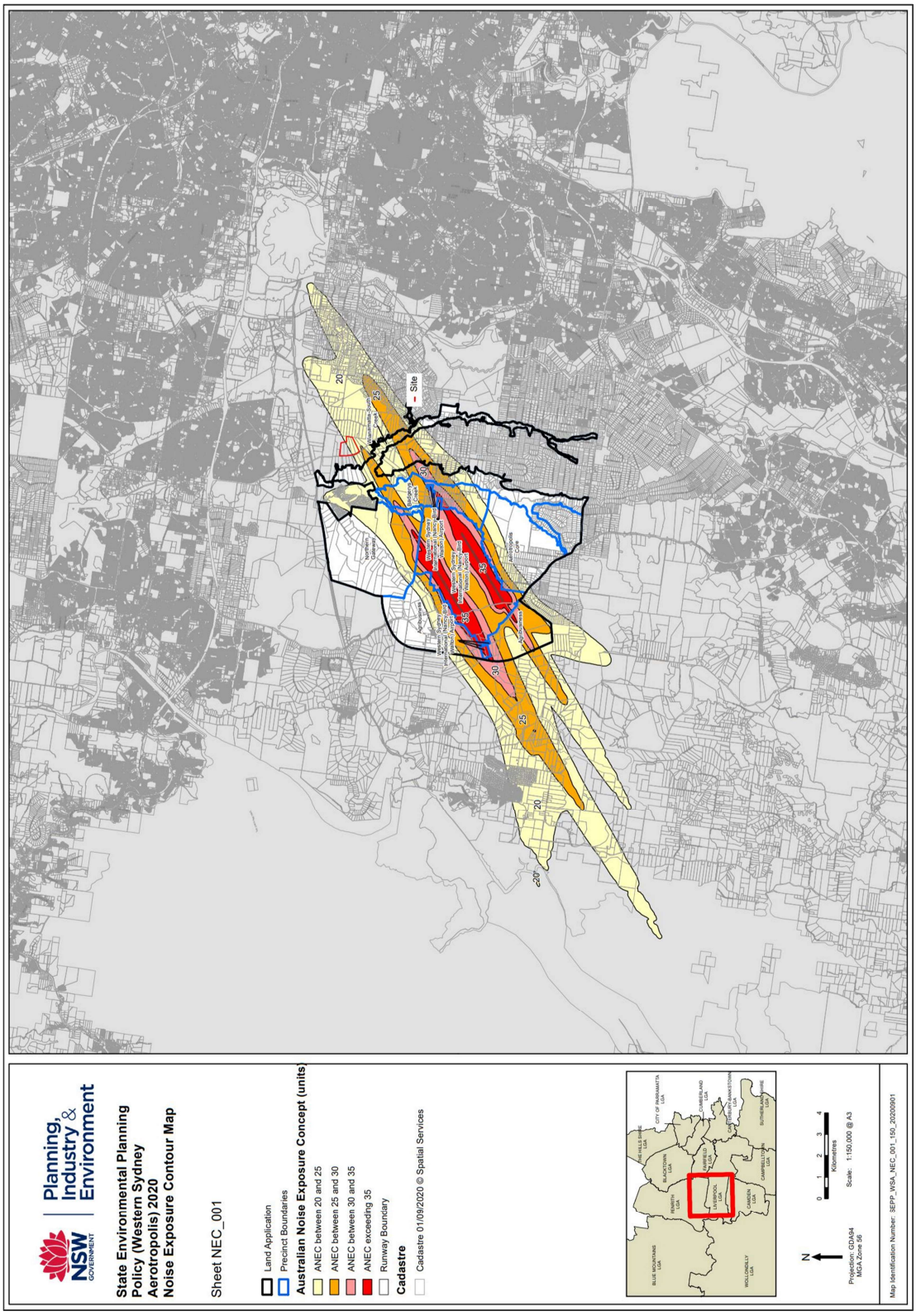
Preliminary Site Elevations (Mirvac Design)

Site Layout (Mirvac)

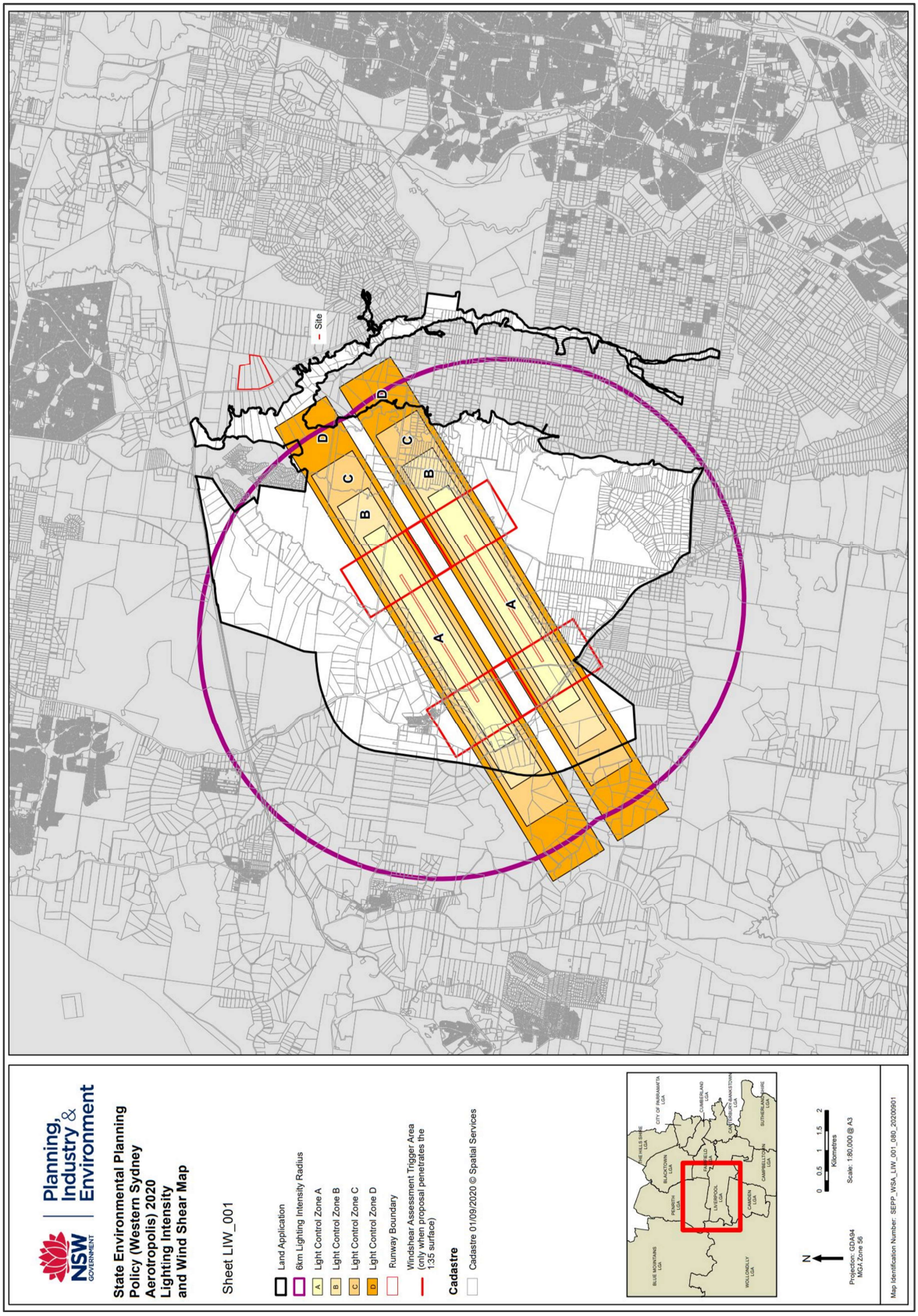


DP259135 Site Boundary in Red (Mirvac)

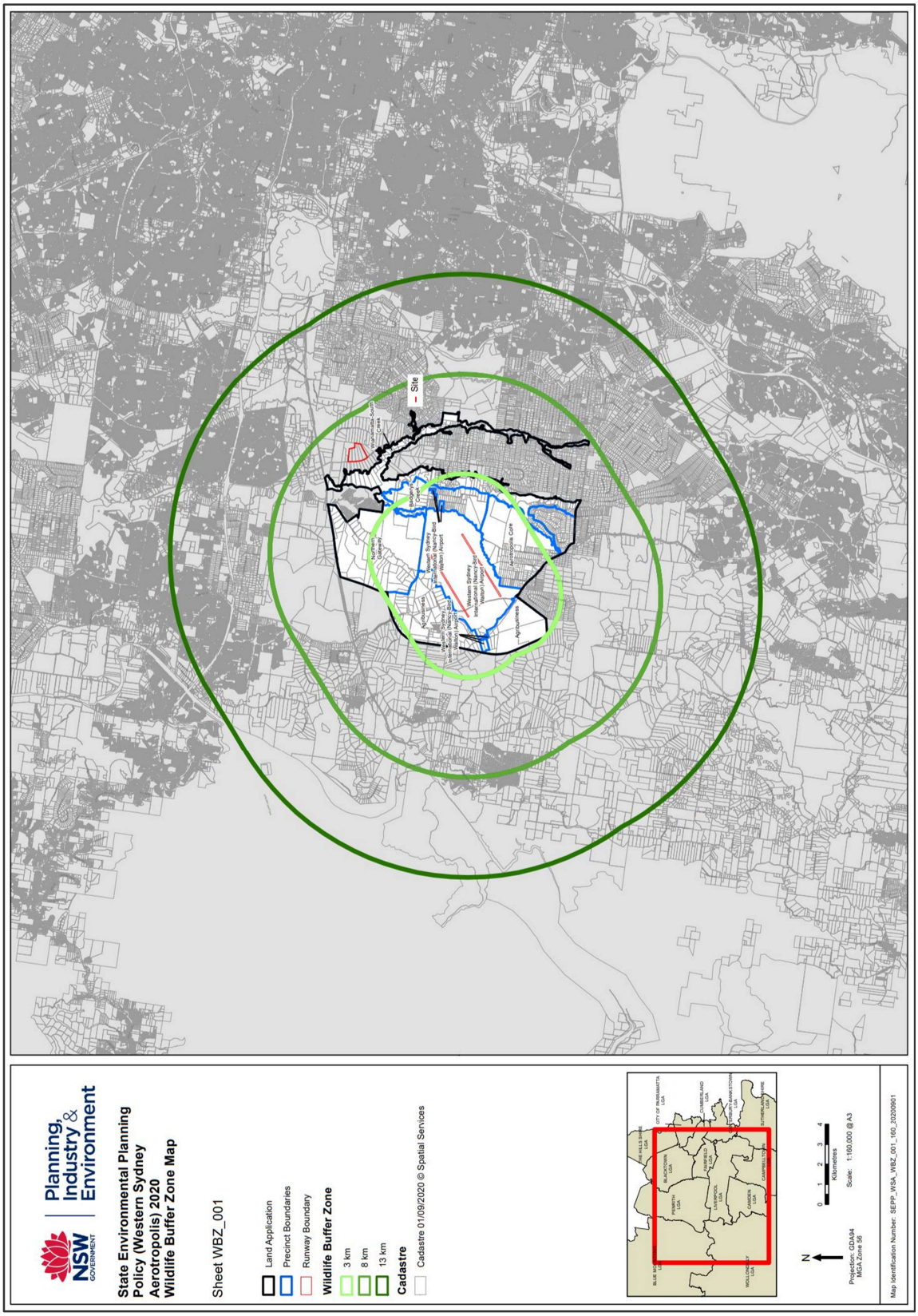
Appendix B – State Environmental Planning Policy Maps



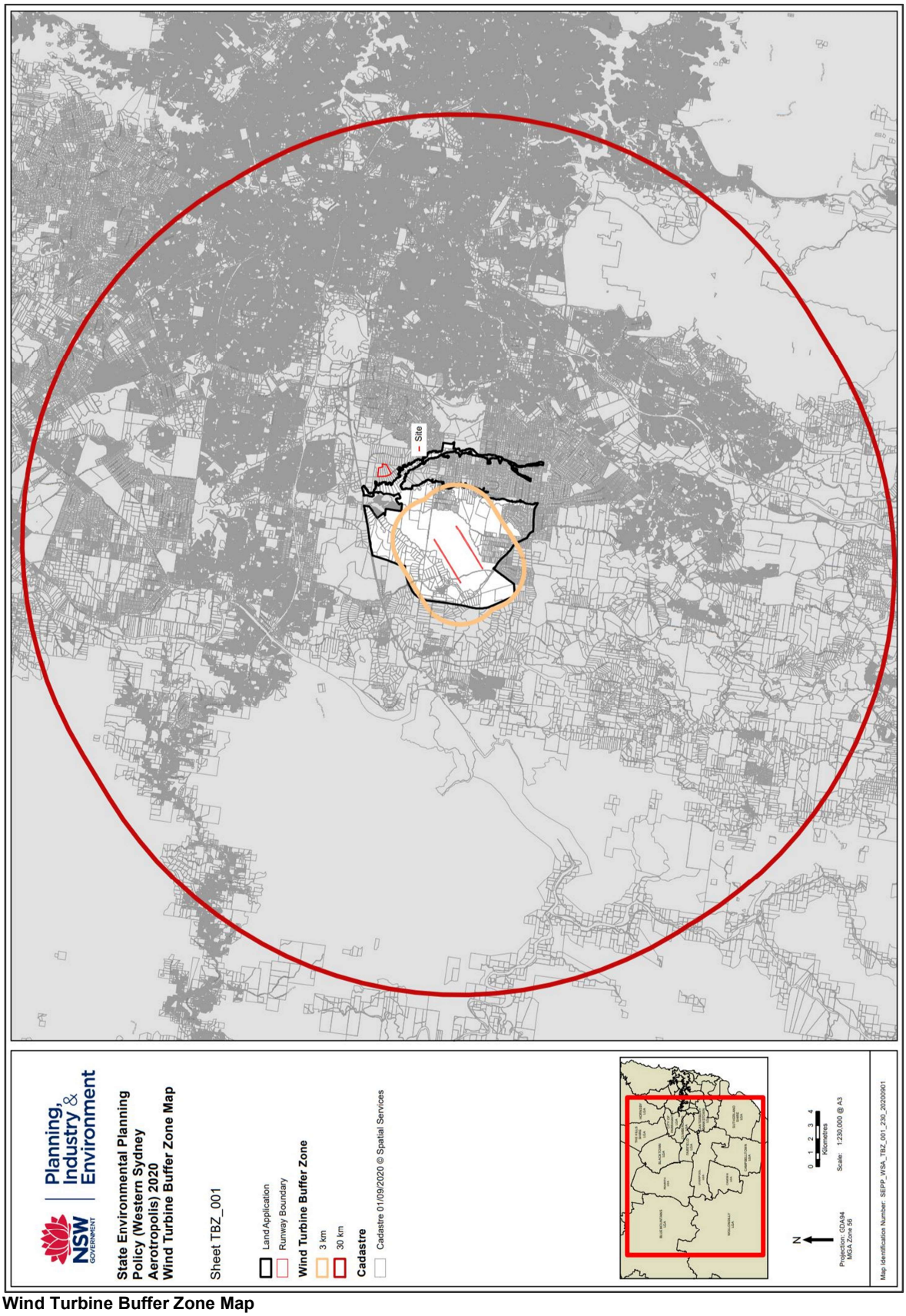
Noise Contour Map



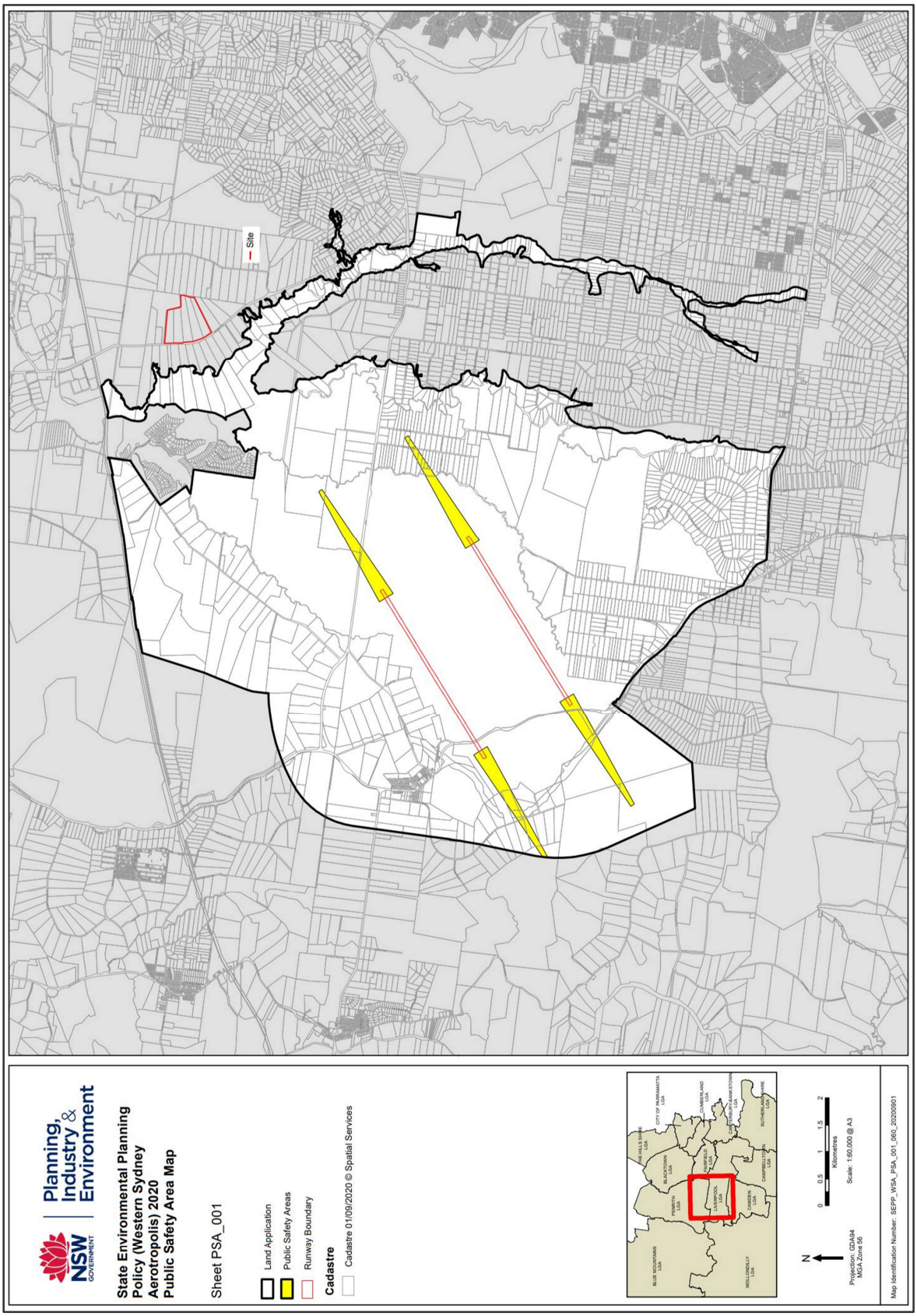
Lighting Intensity and Wind Shear Map



Wildlife Buffer Zone Map



Wind Turbine Buffer Zone Map



Public Safety Area Map

Appendix C – Assessment Methodology

In preparing aeronautical impact assessments associated with airport safeguarding and protection, it is necessary to observe the requirements of the relevant aviation authorities including:

- The Department of Infrastructure, Regional Development and Cities (DIRDC);
- The Civil Aviation Safety Authority of Australia (CASA);
- Airservices Australia (ASA);
- Airport Operators; and
- Department of Defence where appropriate.

Relevant Acts and Regulations applicable to developments near airports and air traffic routes were referenced during this assessment.

The major relevant documents include:

- Civil Aviation Safety Regulation (CASR) Part 139 Manual of Standards – Aerodromes;
- Aeronautical Information Publication (AIP);
- Airservices Australia's Airways Engineering Instruction – Navigation Aid Building Restricted Areas and Siting Guidance (BRA);
- International Civil Aviation Organisation (ICAO) DOC 8168 Procedures for Air Navigation – Aircraft Operations (PANS OPS);
- The Planning Secretary's Environmental Assessment Requirements (SEARS);
- Western Sydney Airport – Airport Plan 2016;
- Western Sydney Aerotropolis State Environmental Planning Policy 2020;
- Airservices Australia – Western Sydney Airport Preliminary Airspace Management Analysis – 10 April 2015.

A Glossary of Aeronautical Terms and Abbreviations is shown at Appendix D.

Appendix D – Glossary of Aeronautical Terms and Abbreviations

To facilitate the understanding of aviation terminology used in this report, the following is a glossary of terms and acronyms that are commonly used in aeronautical impact assessments and similar aeronautical studies.

AC (Advisory Circulars) are issued by CASA and are intended to provide recommendations and guidance to illustrate a means, but not necessarily the only means, of complying with the *Regulations*.

Aeronautical study is a tool used to review aerodrome and airspace processes and procedures to ensure that safety criteria are appropriate.

AIPs (Aeronautical Information Publications) are publications promulgated to provide operators with aeronautical information of a lasting character essential to air navigation. They contain details of regulations, procedures and other information pertinent to flying and operation of aircraft. In Australia, AIP is issued by Airservices Australia on behalf of CASA.

Air routes exist between navigation aid equipped aerodromes or waypoints to facilitate the regular and safe flow of aircraft operating under IFR.

Airservices Australia is the Australian government-owned corporation providing safe and environmentally sound air traffic management and related airside services to the aviation industry.

Altitude is the vertical distance of a level, a point or an object, considered as a point, measured from mean sea level.

ATC (Air Traffic Control) service is a service provided for the purpose of:

a. preventing collisions:
    1. between aircraft; and
    2. on the manoeuvring area between aircraft and obstructions; and
b. expediting and maintaining an orderly flow of air traffic.

CASA (Civil Aviation Safety Authority) is the Australian government authority responsible under the *Civil Aviation Act 1988* for developing and promulgating appropriate, clear and concise aviation safety standards. As Australia is a signatory to the ICAO *Chicago Convention,* CASA adopts the standards and recommended practices established by ICAO, except where a difference has been notified.

CASR (Civil Aviation Safety Regulations) are promulgated by CASA and establish the regulatory framework *(Regulations)* within which all service providers must operate.

Civil Aviation Act 1988 (the Act) establishes the CASA with functions relating to civil aviation, in particular the safety of civil aviation and for related purposes.

ICAO (International Civil Aviation Organization) is an agency of the United Nations which codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth. The ICAO Council adopts standards and recommended practices concerning air navigation, its infrastructure, flight inspection, prevention of unlawful interference, and facilitation of border-crossing procedures for international civil aviation. In addition, the ICAO defines the protocols for air accident investigation followed by transport safety authorities in countries signatory to the Convention on International Civil Aviation, commonly known as the *Chicago Convention*. Australia is a signatory to the *Chicago Convention.*

IFR (Instrument Flight Rules) are rules applicable to the conduct of flight under IMC. IFR are established to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals. It is also referred to as, “a term used by pilots and controllers to indicate the type of flight plan an aircraft is flying,” such as an IFR or VFR flight plan. Pilots must hold IFR qualifications and aircraft must be suitably equipped with appropriate instruments and navigation aids to enable flight in IMC.

IMC (Instrument Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, less than the minimum specified for visual meteorological conditions.

LSALT (Lowest Safe Altitudes) are published for each low level air route segment. Their purpose is to allow pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in IMC where the pilot cannot see the terrain or obstacles due to cloud or poor visibility conditions. It is an

altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly.

MDA (Minimum Descent Altitude) is the lowest altitude that can be used during a non-precision approach in IMC. Flight below the MDA reduces the clearance above obstacles and is not permitted in IMC.

MOS (Manual of Standards) comprises specifications (Standards) prescribed by CASA, of uniform application, determined to be necessary for the safety of air navigation.

NOTAMs (Notices to Airmen) are notices issued by the NOTAM office containing information or instruction concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to persons concerned with flight operations.

Obstacles. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

OLS (Obstacle Limitation Surfaces) are a series of planes associated with each runway at an aerodrome that defines the desirable limits to which objects may project into the airspace around the aerodrome so that aircraft operations may be conducted safely.

PANS OPS (Procedures for Air Navigation Services – Aircraft Operations) is an Air Traffic Control term denominating rules for designing instrument approach and departure procedures. Such procedures are used to allow aircraft to land and take off under Instrument Meteorological Conditions (IMC) or Instrument Flight Rules (IFR). ICAO document 8168-OPS/611 (volumes 1 and 2) outlines the principles for airspace protection and procedure design which all ICAO signatory states must adhere to. The regulatory material surrounding PANS OPS may vary from country to country.

PANS OPS Surfaces. Similar to an Obstacle Limitation Surface, the PANS OPS protection surfaces are imaginary surfaces in space which guarantee the aircraft a certain minimum obstacle clearance. These surfaces may be used as a tool for local governments in assessing building development. Where buildings may (under certain circumstances) be permitted to infringe the OLS, they cannot be permitted to infringe any PANS OPS surface, because the purpose of these surfaces is to guarantee pilots operating under IMC an obstacle free descent path for a given approach.

Prescribed airspace is an airspace specified in, or ascertained in accordance with, the Regulations, where it is in the interests of the safety, efficiency or regularity of existing or future air transport operations into or out of an airport for the airspace to be protected. The prescribed airspace for an airport is the airspace above any part of either an OLS or a PANS OPS surface for the airport and airspace declared in a declaration relating to the airport.

Radar Terrain Clearance Chart (RTCC) is a chart that provides air traffic controllers with the lowest usable altitude that they can vector an aircraft using prescribed surveillance procedures within controlled airspace. There is a protection surface below this usable altitude which is shown in airport master plans.

Regulations (Civil Aviation Safety Regulations)

VFR (Visual Flight Rules) are rules applicable to the conduct of flight under VMC. VFR allow a pilot to operate an aircraft in weather conditions generally clear enough to allow the pilot to maintain visual contact with the terrain and to see where the aircraft is going. Specifically, the weather must be better than basic VFR weather minima. If the weather is worse than VFR minima, pilots are required to use instrument flight rules. Pilots must be specifically qualified and aircraft specifically equipped to enable flight in IMC,

VMC (Visual Meteorological Conditions) are meteorological conditions expressed in terms of visibility, distance from cloud and ceiling, equal or better than specified minima.

Abbreviations

Abbreviations used in this report, and the meanings assigned to them for the purposes of this report are detailed in the following table.

Abbreviation	Meaning
AC	Advisory Circular (documents that support CAR 1998)
ACFT	Aircraft
AD	Aerodrome
ADS-B	Automatic Dependent Surveillance – Broadcast
AHD	Australian Height Datum
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Service
ALT	Altitude
AMSL	Above Mean Sea Level
APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
BARO-VNAV	Barometric Vertical Navigation
BRA	Building Restricted Area
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
DAP	Departure and Approach Procedures (charts published by AsA)
DER	Departure End of (the) Runway
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DITRDC	Department of Infrastructure, Transport, Regional Development and Cities
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	Enroute Supplement Australia
FAF	Final Approach Fix
FAP	Final Approach Point
FAS	Final Approach Surface of a BARO-VNAV approach

Abbreviation	Meaning
ft	feet
GBAS	Ground Based Augmentation System (satellite precision landing system)
GNSS	Global Navigation Satellite System
GP	Glide Path
HLS	Helicopter Landing Site
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organisation
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System
ISA	International Standard Atmosphere
km	kilometres
kt	Knot (one nautical mile per hour)
LAT	Latitude
LOC	Localizer
LONG	Longitude
LNAV	Lateral Navigation criteria
m	metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
MVA	Minimum Vector Altitude
NASAG	National Airports Safeguarding Advisory Group
NDB	Non Directional Beacon
NE	North East
NM	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in nautical miles)
NNE	North North East
NOTAM	NOtice to AirMen
OAS	Obstacle Assessment Surface
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OHS	Outer Horizontal Surface
OIS	Obstacle Identification Surface
OLS	Obstacle Limitation Surface

Abbreviation	Meaning
PANS OPS	Procedures for Air Navigation Services – Aircraft Operations, ICAO Doc 8168
PBN	Performance Based Navigation
PRM	Precision Runway Monitor
QNH	An altimeter setting relative to height above mean sea level
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes — replaced by the MOS Part 139 — Aerodromes
RPT	Regular Public Transport
RTCC	Radar Terrain Clearance Chart
RWY	Runway
SFC	Surface
SID	Standard Instrument Departure
SOC	Start Of Climb
STAR	STandard ARrival
SGHAT	Solar Glare Hazard Analysis Tool
TAR	Terminal Approach Radar
TAS	True Air Speed
THR	Threshold (Runway)
TNA	Turn Altitude
TODA	Take-Off Distance Available
VNAV	Vertical Navigation criteria
V_n	aircraft critical Velocity reference
VOR	Very high frequency Omni directional Range
WAC	World Aeronautical Chart