

Airspace Assessment for Development at 161-179 Princes Hwy and 26-42 Eden Street and Eden Street, Arncliffe, NSW

Final Report

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Glossary

AGL	Above Ground Level
AHD	Australian Height Datum
ANEF	Aircraft Noise Exposure Forecast
ARP	Aerodrome Reference Point
ATC	Air Traffic Control
BRA	Building Restricted Area
CASA	Civil Aviation Safety Authority
DITRDC	Department of Infrastructure, Transport, Regional Development and Communications
GBAS	Ground Based Augmentation System
IFR	Instrument Flight Rules
ILS	Instrument Landing System
Km	Kilometres
LOC	Localiser
m	Metres
MOS	Manual of Standards
nm	Nautical miles
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services-Operations
RTCC	Radar Terrain Clearance Chart
SACL	Sydney Airport Corporation Ltd
SID	Standard Instrument Departure
TAR	Terminal Approach Radar
VFR	Visual Flight Rules

Executive Summary

- This aviation assessment report is submitted to the Department of Planning, Industry and Environment (DPIE) in support of a State Significant Development Application (SSDA-11429726) for the development of land identified at 26-42 Eden Street and 161-179 Princes Highway, Arncliffe.
- Arncliffe Eden Property Pty Ltd is seeking to construct four buildings on a site at 161-179 Princes Hwy and 26-42 Eden Street, Arncliffe. This development site is located approximately 2.8km west-northwest from the Sydney Airport aerodrome reference point (ARP) and 1.53km northwest of the Sydney Runway 07 threshold. Building developments in the Arncliffe area are impacted by the protected airspace restrictions defined for Sydney Airport.
- The maximum heights of the four building within the development site are:
 - Building A: 95.05m AHD;
 - Building B: 98.25m AHD;
 - Building C: 89.65m AHD;
 - Building D: 91.2m AHD.
- Four hammerhead cranes will undertake construction. The maximum heights of the cranes are:
 - TC1: 110.13m AHD;
 - TC2: 101.79m AHD;
 - TC3: 113.97m AHD;
 - TC4: 102.75m AHD.
- Over the development site the height of the Sydney Obstacle Limitation Surface (OLS) is 51m AHD. The height of the Radar Terrain Clearance Chart (RTCC) surface is 152m AHD. The PANS-OPS surface slopes downward from Building C (113m AHD) to Building D (86m AHD). All buildings and cranes will penetrate the OLS but remain below the RTCC surfaces. TC1 and TC2 remain below the PANS-OPS surface but TC3 and TC4 will penetrate the PANS-OPS surface for a maximum duration of three months.
- The positions of each corner of each building, in relation to the PANS-OPS surface, are height sensitive. Table 1 below details the heights of each corner of Building A and the impact on Sydney prescribed airspace:

Table 1: Impact of Building A on Prescribed Airspace

Position	Building Position Height	OLS Height	PANS-OPS Height at Postion	Impact on Prescribed Airspace
Southwest Corner	94.3m AHD	51m AHD	112m AHD	Penetrate OLS by 43.3m 17.7m below PANS-OPS
West Corner	94.3m AHD	51m AHD	113m AHD	Penetrate OLS by 43.3m 18.7m below PANS-OPS
North Corner	94.3m AHD	51m AHD	107m AHD	Penetrate OLS by 43.3m 12.7m below PANS-OPS
East Corner	94.3m AHD	51m AHD	104m AHD	Penetrate OLS by 43.3m 9.7m below PANS-OPS
Lift Overrun	95.05m AHD	51m AHD	109m AHD	Penetrate OLS by 44.05m 13.95m below PANS-OPS

- Table 2 below details the heights of each corner of Building B and the impact on Sydney prescribed airspace:

Table 2: Impact of Building B on Prescribed Airspace

Position	Building Position Height	OLS Height	PANS-OPS Height at Postion	Impact on Prescribed Airspace
Western Corner	93.9m AHD	51m AHD	112m AHD	Penetrate OLS by 42.9m 18.1m below PANS-OPS
Southern Corner	94.03m AHD	51m AHD	95m AHD	Penetrate OLS by 43.03m 0.97m below PANS-OPS
Northern Corner	95.3m AHD	51m AHD	100m AHD	Penetrate OLS by 44.3m 4.7m below PANS-OPS
Lift Overrun	98.25m AHD	51m AHD	102m AHD	Penetrate OLS by 47.25m 3.75m below PANS-OPS

- Table 3 details the heights of each corner of Building C and the impact on Sydney prescribed airspace:

Table 3: Impact of Building C on Prescribed Airspace

Position	Building Position Height	OLS Height	PANS-OPS Height at Postion	Impact on Prescribed Airspace
Northwest Corner	86.7m AHD	51m AHD	113m AHD	Penetrate OLS by 35.7m 26.3m below PANS-OPS
Northeast Corner	86.7m AHD	51m AHD	101m AHD	Penetrate OLS by 35.7m 14.3m below PANS-OPS
Southeast Corner	86.7m AHD	51m AHD	93m AHD	Penetrate OLS by 35.7m 6.3m below PANS-OPS
Southwest Corner	86.7m AHD	51m AHD	111m AHD	Penetrate OLS by 35.7m 24.3m below PANS-OPS
Lift Overrun	89.65m AHD	51m AHD	98m AHD	Penetrate OLS by 38.65m 8.35m below PANS-OPS

- Table 4 details the heights of each corner of Building D and the impact on Sydney prescribed airspace:

Table 4: Impact of Building D on Prescribed Airspace

Position	Building Position Height	OLS Height	PANS-OPS Height at Position	Impact on Prescribed Airspace
Northwest Corner	91.2m AHD	51m AHD	93m AHD	Penetrate OLS by 40.2m 1.8m below PANS-OPS
Northeast Corner	91.2m AHD	51m AHD	95m AHD	Penetrate OLS by 40.2m 3.8m below PANS-OPS
Southwest Corner	86.0m AHD	51m AHD	90m AHD	Penetrate OLS by 35.0m 4.0m below PANS-OPS
Southeast Corner	86.0m AHD	51m AHD	86m AHD	Penetrate OLS by 35.0m 0m below PANS-OPS
Lift Overrun	91.2m AHD	51m AHD	92m AHD	Penetrate OLS by 40.2m 0.8m below PANS-OPS

- Table 5 details the heights of cranes and their boom radius that will undertake construction activities. It also details their impact on Sydney prescribed airspace.

Table 5: Impact of Cranes on Prescribed Airspace

Crane	Maximum Height	Crane Boom Radius	OLS	PANS-OPS Height Above Crane	Impact on Prescribed Airspace
TC1	110.13m AHD	45m	51m AHD	111m AHD	Penetrate OLS by 59.13m 0.87m below PANS-OPS
TC2	101.79m AHD	40m	51m AHD	107m AHD	Penetrate OLS by 50.79m 5.2m below PANS-OPS
TC3	113.97m AHD	45m	51m AHD	109m AHD at shaft 100m AHD at boom	Penetrate OLS by 62.97m Shaft penetrates PANS-OPS by 4.97m Boom penetrates PANS-OPS by 13.97m
TC4	102.75m AHD	45m	51m AHD	99m AHD at shaft 90m AHD at boom	Penetrate OLS by 51.75m Shaft penetrates PANS-OPS by 3.75m Boom penetrates PANS-OPS by 12.75m

The table shows that TC1 and TC2 penetrate the OLS but remain below the PANS-OPS surface. TC3 and TC4 will penetrate both the OLS and PANS-OPS surfaces.

- To undertake the majority of construction activities, TC3 and TC4 will operate up to but not penetrate the PANS-OPS surface. These cranes will then penetrate the PANS-OPS surface for three months, to maximum heights of 113.97 (TC3) and 102.75m (TC4), to complete construction of the upper floors.
- Since all buildings and tower cranes will penetrate Sydney prescribed airspace, an aviation approval is required in accordance with the Airports (Protection of Airspace) Regulations. Approval will also be sought for TC3 and TC4 to penetrate the PANS-OPS surface for a duration of three months. This approval will be granted by the Department of Infrastructure, Transport, Regional Development and Communications (DITRDC).

- The development site is located outside the 20 Aircraft Noise Exposure Forecast (ANEF) contour. This means that all forms of building are acceptable in this area. Due to the proximity of the development site to this contour, some noise dampening measures may be needed to be applied to the two buildings.
- In view of the operation of helicopter and aircraft operations in the Arncliffe area, we conclude that the proposed 161-179 Princes Hwy and 26-42 Eden Street will not present a safety risk to aviation activities.
- CASA will require obstacle lighting to be placed at the top of the two buildings and the construction cranes to ensure they are visible to aircraft and helicopter flying in the vicinity.

1.0 Introduction

1.1 SSDA Requirements

This aviation assessment report is submitted to the Department of Planning, Industry and Environment (DPIE) in support of a State Significant Development Application (SSDA-11429726) for the development of land identified at 26-42 Eden Street and 161-179 Princes Highway, Arncliffe (the site) for the purposes of a mixed-use precinct with open space, retail, and residential uses, comprising social and market housing as part of the NSW Land and Housing Corporation (LAHC)'s 'Communities Plus' program.

SSDA-11429726 seeks approval for the following development:

- Demolition of all existing buildings and structures on the site;
- Site preparation works, excavation and tree removal;
- The construction of a mixed-use development comprising:
 - 744 apartments across (4) buildings between 19-23 storeys in height, as follows:
 - 186 market housing apartments in Building A;
 - 202 market housing apartments in Building B;
 - 180 social housing apartments in Building C; and
 - 176 market housing apartments in Building D;
 - 3,113m² retail gross floor area;
 - 240m² for a future childcare centre;
 - 706m² of communal open space;
 - 813 spaces of lower ground and basement car parking; and
- 4,870m² of publicly accessible open space including a 4,000m² park, an 870m² public plaza (meeting space), and through site link connecting Eden Street and the Princes Highway.

In accordance with section 4.39 of the Environmental Planning & Assessment Act 1979 (EP&A Act), the Secretary's Environmental Assessment Requirements (SEARs) for SSDA-11429726 were issued on 18 December, 2020. This report has been prepared to respond to the following SEARs:

<i>SEAR</i>	<i>Relevant section of report</i>
Identify whether the proposed development is located within any of the ANEF contours	Section 6
Providing details of any flight paths that may be impacted by the proposed development	Section 4.0 and Section 5.0
Assessing any potential impacts, including construction cranes, of the development on the aviation operations and the protected airspace of any nearby airports and affected flight paths of any existing HLS	Section 5.0

1.2 Introduction to Aviation Assessment Report

Arncliffe Eden Property Pty Ltd is seeking approval for a building development and construction cranes on a site at 161-179 Princes Hwy and 26-42 Eden Street and 26-42 Eden Street, Arncliffe. This development site is located approximately 2.8km west-northwest from the Sydney Airport aerodrome reference point (ARP) and 1.53km northwest of the Sydney Runway 07 threshold.

The development will comprise four buildings, each with a hammerhead crane. Due to the proximity of Sydney Airport, each building will penetrate the Sydney obstacle limitation surface (OLS) but remain beneath the PANS-OPS surface. Each hammerhead crane will also penetrate the OLS and remain below the PANS-OPS surface.

This report begins by detailing the legislative context and methodology. The height and position of buildings and cranes on the development site at 161-179 Princes Hwy and 26-42 Eden Street and 26-42 Eden Street are described. Details are provided of the heights of prescribed airspace above the site plus presents an assessment of the impact of the buildings and cranes on these surfaces. An assessment is then made of the impact on aircraft and helicopter from this development and crane operations. The impact of aircraft noise over the development site and other high-rise buildings within this area are also assessed.

2.0 Legislative Context

Airspace surrounding an airport is protected by the Airports (Protection of Airspace) Regulations 1996. It details the process required to be undertaken when an obstacle could infringe prescribed airspace and the responsibilities of various organisations.

Prescribed airspace around an airport includes the obstacle limitation surface (OLS), the PANS-OPS surface and radar terrain clearance chart (RTCC) surface. An OLS provides general protection for aircraft operations around an airport. A PANS-OPS surface protects the airspace used by aircraft flying instrument approach procedures.

The RTCC provides protection for aircraft that are operating under radar control but not flying on published instrument flight procedures or routes.

Permanent or temporary obstructions can be approved to penetrate the OLS. Permanent obstructions cannot be approved to penetrate the PANS-OPS surface. The Airports Act provides provision for temporary obstructions e.g., construction cranes to penetrate the PANS-OPS surface for a duration not exceeding three months. This temporary penetration of the PANS-OPS surface requires the support of the airport owner. It must also not materially impact aircraft operations. No temporary or permanent penetrations of the RTCC are permitted.

When the proposed height of an obstruction is likely to penetrate the OLS a proponent is required to make application to the airport owner-operator, in this case Sydney Airport Corporation Ltd (SACL). In cases where shielding is not available from existing buildings or a potential hazard may exist, the airport owner-operator may require the proponent to complete a detailed aviation study to be completed to support the application. The airport owner-operator then seeks the input from the Civil Aviation Safety Authority (CASA), Airservices and the building authority concerned. This process seeks to determine whether there is any impact on safety or operational efficiency to aircraft activities.

The Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) ultimately grant approval for the buildings and cranes to penetrate prescribed airspace. Should the development not be approved by DITRDC, there is also an appeal process to the Administrative Appeals Tribunal.

3.0 Methodology

This section provides an overview of the approach undertaken to determine the impact on prescribed airspace and aircraft operations of the proposed building development at 161-179 Princes Hwy and 26-42 Eden Street, Arncliffe.

The airspace over Arncliffe is impacted by the prescribed airspace defined for Sydney Airport. It governs the maximum permissible heights for buildings in this area. Calculations of the height of the OLS, PANS-OPS and RTCC surfaces were sourced from planning information maintained by SACL.

The purpose of this report is to assess the impact that the proposed development at 161-179 Princes Hwy and 26-42 Eden Street presents to aircraft and helicopter operations. In particular it involves a safety assessment about the impact on aircraft or helicopter operations by the proposed development.

Buildings in proximity to Sydney Airport and its flight paths are very noise sensitive. The acceptability of different forms of development are depicted by ANEF contours that surround an airport. A chart depicting the ANEF contours was prepared for Sydney Airport by Airservices.

In order to explore the safety impact on aircraft and helicopter operations of the proposed development at 161-179 Princes Hwy and 26-42 Eden Street, discussions and/or information was obtained from:

- Sydney Airport Corporation Ltd;
- Airservices-Sydney operations; and
- CASA.

4.0 Location of Proposed Buildings and Cranes Relative to Prescribed Airspace

This section details the heights of the OLS, PANS-OPS surface and RTCC surfaces above the development site at 161-179 Princes Hwy and 26-42 Eden Street. We then detail the position coordinates for each corner of the building; position coordinates and operating radius of the cranes; along with the heights of the OLS and PANS-OPS surfaces at these positions. We then highlight the impact of the OLS and PANS-OPS surfaces from the buildings and cranes at these positions.

4.1 Sydney Airport Obstacle Limitation Surface (OLS)

The development site at 161-179 Princes Hwy and 26-42 Eden Street is located in the Inner Horizontal area of the OLS defined for Sydney Airport. At this position the height of the OLS is 51m AHD.

4.2 Sydney Airport PANS-OPS Surfaces

The height of the PANS-OPS surface overhead the proposed development at 161-179 Princes Hwy and 26-42 Eden Street is governed by the ILS Runway 07. It varies across the site.

Airservices' Procedure Design Unit (PDU) will confirm this height during their evaluation of the aviation application. They are final arbiter of the PANS-OPS height.

4.3 RTCC Surface

At the position of 161-179 Princes Hwy and 26-42 Eden Street the height of the RTCC surface is 152.0m AHD.

The maximum heights of the buildings and cranes are well below the RTCC surface.

4.4 Position and Heights of Buildings

The development comprises four buildings. The position coordinates of each corner of each building, plus high points associated with lift overruns, are presented in Attachment 1.

The tables below detail the building position, position coordinates, height of OLS, height of PANS-OPS surface, and impact on Sydney prescribed airspace.

Table 1: Impact of Building A on Prescribed Airspace

Position	Coordinates	Building Position Height	OLS Height	PANS-OPS Height at Postion	Impact on Prescribed Airspace
Southwest Corner	N6243216.698 E3288846.956	94.3m AHD	51m AHD	112m AHD	Penetrate OLS by 43.3m 17.7m below PANS-OPS
West Corner	N6243231.213 E328863.336	94.3m AHD	51m AHD	113m AHD	Penetrate OLS by 43.3m 18.7m below PANS-OPS
North Corner	N6243199.416 E328894.832	94.3m AHD	51m AHD	107m AHD	Penetrate OLS by 43.3m 12.7m below PANS-OPS
East Corner	N6243182.422 E328883.616	94.3m AHD	51m AHD	104m AHD	Penetrate OLS by 43.3m 9.7m below PANS-OPS
Lift Overrun	N6243204.502 E328869.715	95.05m AHD	51m AHD	109m AHD	Penetrate OLS by 44.05m 13.95m below PANS-OPS

Table 2: Impact of Building B on Prescribed Airspace

Position	Coordinates	Building Position Height	OLS Height	PANS-OPS Height at Postion	Impact on Prescribed Airspace
Western Corner	N6243188.449 E328837.406	93.9m AHD	51m AHD	112m AHD	Penetrate OLS by 42.9m 18.1m below PANS-OPS
Southern Corner	N6243127.617 E328848.419	94.03m AHD	51m AHD	95m AHD	Penetrate OLS by 43.03m 0.97m below PANS-OPS
Northern Corner	N6243157.013 E328866.587	95.3m AHD	51m AHD	100m AHD	Penetrate OLS by 44.3m 4.7m below PANS-OPS
Lift Overrun	N6243106.071 E328849.649	98.25m AHD	51m AHD	102m AHD	Penetrate OLS by 47.25m 3.75m below PANS-OPS

Table 3: Impact of Building C on Prescribed Airspace

Position	Coordinates	Building Position Height	OLS Height	PANS-OPS Height at Postion	Impact on Prescribed Airspace
Northwest Corner	N6243154.061 E328778.960	86.7m AHD	51m AHD	113m AHD	Penetrate OLS by 35.7m 26.3m below PANS-OPS
Northeast Corner	N6243147.036 E328787.262	86.7m AHD	51m AHD	101m AHD	Penetrate OLS by 35.7m 14.3m below PANS-OPS
Southeast Corner	N6243103.784 E328759.291	86.7m AHD	51m AHD	93m AHD	Penetrate OLS by 35.7m 6.3m below PANS-OPS
Southwest Corner	N6243120.867 E328743.270	86.7m AHD	51m AHD	111m AHD	Penetrate OLS by 35.7m 24.3m below PANS-OPS
Lift Overrun	N6243135.878 E328778.594	89.65m AHD	51m AHD	98m AHD	Penetrate OLS by 38.65m 8.35m below PANS-OPS

Table 4: Impact of Building D on Prescribed Airspace

Position	Coordinates	Building Position Height	OLS Height	PANS-OPS Height at Postion	Impact on Prescribed Airspace
Northwest Corner	N6243107.084 E328788.920	91.2m AHD	51m AHD	93m AHD	Penetrate OLS by 40.2m 1.8m below PANS-OPS
Northeast Corner	N6243127.667 E328802.624	91.2m AHD	51m AHD	95m AHD	Penetrate OLS by 40.2m 3.8m below PANS-OPS
Southwest Corner	N6243078.149 E328817.894	86.0m AHD	51m AHD	90m AHD	Penetrate OLS by 35.0m 4.0m below PANS-OPS
Southeast Corner	N6243098.908 E328831.544	86.0m AHD	51m AHD	86m AHD	Penetrate OLS by 35.0m 0m below PANS-OPS
Lift Overrun	N6243107.719 E328810.322	91.2m AHD	51m AHD	92m AHD	Penetrate OLS by 40.2m 0.8m below PANS-OPS

4.6 Position and Height of Cranes

Four hammerhead cranes will undertake construction. Attachment 2 presents the maximum crane height and operating radius for TC1 and TC2.

Attachment 3 presents the maximum crane height and operating radius for TC3 and TC4.

Accurate position coordinates for the cranes have not been defined. The approximate positions for the four cranes are:

- TC1 is located on the western side of Building C, on the site boundary that extends along Eden Street;
- TC2 is located slightly to the north of the Building D, approximately half way along its northern side;
- TC3 is located adjacent to the southwestern side of Building A;
- TC4 is located on the northern section of Building B, along the site boundary that extends along Princes Highway.

Table 5 below details the maximum height of the cranes, their boom operating radius and their impact on the OLS and PANS-OPS surfaces.

Crane	Maximum Height	Crane Boom Radius	OLS	PANS-OPS Height Above Crane	Impact on Prescribed Airspace
TC1	110.13m AHD	45m	51m AHD	111m AHD	Penetrate OLS by 59.13m 0.87m below PANS-OPS
TC2	101.79m AHD	40m	51m AHD	107m AHD	Penetrate OLS by 50.79m 5.2m below PANS-OPS
TC3	113.97m AHD	45m	51m AHD	109m AHD at shaft 100m AHD at boom	Penetrate OLS by 62.97m Shaft penetrates PANS-OPS by 4.97m Boom penetrates PANS-OPS by 13.97m
TC4	102.75m AHD	45m	51m AHD	99m AHD at shaft 90m AHD at boom	Penetrate OLS by 51.75m Shaft penetrates PANS-OPS by 3.75m Boom penetrates PANS-OPS by 12.75m

Table 5 shows that TC1 and TC2 will penetrate the Sydney OLS. TC3 and TC4 will penetrate the OLS, plus the PANS-OPS surface for a three-month duration.

4.7 Crane Strategy TC3 and TC4

As noted in the section above, TC3 and TC4 will penetrate the Sydney PANS-OPS surface. To undertake the majority of construction activities, TC3 and TC4 will operate up to but not penetrate the PANS-OPS surface. Aviation approval will be sought for these cranes to penetrate the PANS-OPS surface for three months, to the maximum heights of 113.97 (TC3) and 102.75m (TC4), to complete construction of the upper floors. Dates of the penetration of the PANS-OPS surface are still to be determined.

4.8 Summary

Each building and tower crane will penetrate the Sydney OLS but remain below the RTCC surface. TC1 and TC2 will also remain below the PANS-OPS surface. TC3 and TC4, however, will penetrate the PANS-OPS surface for a maximum duration of three months. Approval is required for the buildings and cranes to penetrate Sydney OLS in accordance with the Airports (Protection of Airspace) Regulations. It is also required for TC3 and TC4 to penetrate the PANS-OPS surface.

5.0 Aircraft and Helicopter Operations in Arncliffe Area

The development site is located approximately 1.1km north of the Runway 07 centreline. Aircraft arriving and departing Sydney on Runway 07/25 are well clear of the development site. Since these aircraft are almost always flying under instrument flight rules (IFR), their flight paths are contained within the PANS-OPS surface.

In the very rare cases of VFR aircraft operating in the Arncliffe area or arriving and taking-off Runway 07/25 they will be both horizontally and vertically clear of the development site. In any case, the building development and crane operations will be clearly visible, including having obstruction lighting.

There are no hospital or strategically important helipads in the vicinity of the development site. The helicopter landing site (HLS) designated for Sydney Airport is located immediately to the south of the Runway 25 threshold, or approximately 3.9km from the development site. Therefore, the development will not impact the helicopter flight paths at Sydney Airport. Helicopter operations that might fly in the vicinity of the development site will be able to clearly observe the development during daylight hours.

Obstruction lighting will be placed on the buildings and cranes to enable them to be visible to aircraft and helicopters. Details of these obstruction lights are detailed in Section 8.0 below.

In view of the operation of helicopter and aircraft operations in the Arncliffe area, we conclude that the proposed 161-179 Princes Hwy and 26-42 Eden Street will not present a safety risk to aviation activities.

6.0 Exposure to Aircraft Noise

Airservices have published information about the likely impact of aircraft noise on various forms of activity in the vicinity of an airport. This information is depicted in an Aeronautical Noise Exposure Forecast (ANEF) chart. The ANEF chart depicts a number of noise contours surrounding an airport's runways. Each contour depicts an envelope, which relate to the forms of activity that are considered suitable with this volume of noise.

Attachment 4 presents the ANEF chart for Sydney Airport, along with the position of the development site at 161-179 Princes Hwy and 26-42 Eden Street. The development site is located in red. It shows that the development site is outside the 20 ANEF contour. This means that all forms of building are acceptable in this area. Due to the proximity of the development site to this contour, some noise dampening measures may be needed to be applied to the two buildings.

7.0 Impact on Navigation Aids and Surveillance Radar Performance

National Airports Safeguarding Framework (NASF) Guideline G specifies the Building Restricted Areas (BRA) surrounding surveillance systems and navigation aids at airports. BRA identify the areas where buildings may affect the performance of these systems and aids. Cranes are not considered to affect the performance of surveillance systems and navigation aids.

Table 6 below details the terminal and approach radar systems in proximity to Sydney Airport. It also details the distance of the system/aid from development site, the height of the clearance plan and affect from each building.

Table 6: Effect of Buildings on Surveillance Systems

Surveillance System	Distance from Development (m)	Antenna Height (m)	Clearance Plan Elevation at Development Site (m)	Impact of Development: Maximum Building Height 98.25m AHD
Sydney Airport TAR	3,300	38.2	66.9	Penetrate by 31.35m
Cecil Park TAR	29,300	200.5	456.2	Clearance of at least 358m

The maximum building heights of the buildings will penetrate the Sydney Airport Terminal and Approach Radar (TAR) BRA. This means an assessment will be required by Airservices.

The Cecil Peak TAR is located outside the BRA. It provides overlapping radar coverage of the Arncliffe development site. Therefore, the buildings will not affect TAR radar coverage in the Sydney area.

Table 7 details the navigation aids located on Sydney Airport, the distance from the development site and any potential impact on their performance from the two buildings.

Table 7: Potential for Impact on Navigation Aids

Navigation Aid	Distance from Development Site (m)	Impact
SY DME	3,368	Beyond maximum BRA radius
SY GBAS	4,300	Beyond maximum BRA radius
RWY 25 ILS LOC	4,037	Beyond maximum BRA radius
RWY 07 ILS LOC	1,423	Antenna points away from development site and beyond lateral limits of BRA

The table shows that the two buildings will not affect the performance of navigation aids located at Sydney Airport.

8.0 CASA

CASA will review this report as part of their assessment about the safety impact to aircraft or helicopters arising from the proposed building and crane operations at 161-179 Princes Hwy and 26-42 Eden Street. They will consider safety issues that may impact on flight operations in the surrounding area.

When a proposed development penetrates the OLS, CASA will almost certainly require the extremities of each building and construction cranes to be lit. It is likely that medium intensity red strobe lights will be required to be placed at the top of each building. At the top of each crane, a further lighting system is likely to be required. This will involve lights that flash red at night and white during the day.

In addition to lighting, CASA is likely to require the crane to be painted with bands of contrasting colours. Details of lighting and painting requirements will be provided by CASA during the Airports (Protection of Airspace) approval process. General requirements for lighting and painting are contained in the Manual of Standards (MOS) Part 139-Aerodromes.

9.0 Conclusion

This report has assessed the impact of four buildings and construction cranes on Sydney prescribed airspace. It has also explored the impact of the development on

aircraft and helicopter operations, as well as the performance of surveillance and navigation aids. The impact of aircraft noise on the development site has also been assessed.

The four buildings and cranes will all penetrate the Sydney OLS but remain below the RTCC surface. TC3 and TC4 will penetrate the Sydney PANS-OPS surface for a maximum duration of three months. These buildings and cranes will not present a risk to aviation safety or affect surveillance systems and navigation aids located on Sydney Airport. Aircraft noise from the Sydney Airport will not affect the development.