Atlassian

Aeronautical Assessment for Atlassian YHA Site: 8-10 Lee St, Sydney

Version 1.2

10 September 2019

strategic airspace

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Document Title: **Aeronautical Assessment for Atlassian YHA Site: 8-10 Lee St, Sydney**

Purpose / Abstract: *This report has been prepared for a planning proposal being prepared by Avenor for the new Corporate Headquarters in Sydney for Atlassian Pty Limited. Atlassian is planning to construct a new building on the current site of the Sydney Central Youth Hostels Association (YHA) next to Sydney's Central Railway Station. The site is part of a new Technology Precinct (along the side of the rail corridor leading to Central Railway Station) envisaged by the NSW Government. The existing YHA building (which is Heritage Listed) will be incorporated into the new development and it is intended that YHA will continue to operate in the lower portion of the new Atlassian building.*

This report assesses the airspace height constraints above the site. It has been prepared to support the Planning Proposal being made by Avenor on behalf of Atlassian. It considers Sydney Airport's Prescribed Airspace Plans, including draft 2018 updates to their PANS-OPS surfaces and the airspace requirements of current operations at Sydney Airport. It also assesses any likely changes to the airspace caused by changes forecast in the Sydney Airport Master Plan 2039 (Preliminary Draft released in September 2018 for public comment). The airspace constraints are summarised in relation to how they apply to permanent structures as well as for temporary obstacles such as cranes.

The study concludes that the development as proposed would be approvable under the Airports (Protection of Airspace) Regulations.

Contract: - *StratAir Ref:* 18.026

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Distribution Control

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APT, SACL	Sydney Airport Sydney Airport Corporation Ltd	*DITCRD*	Department of Infrastructure, Transport, Cities & Regional Development (formerly *DITCRD)*
CASA	Civil Aviation Safety Authority		

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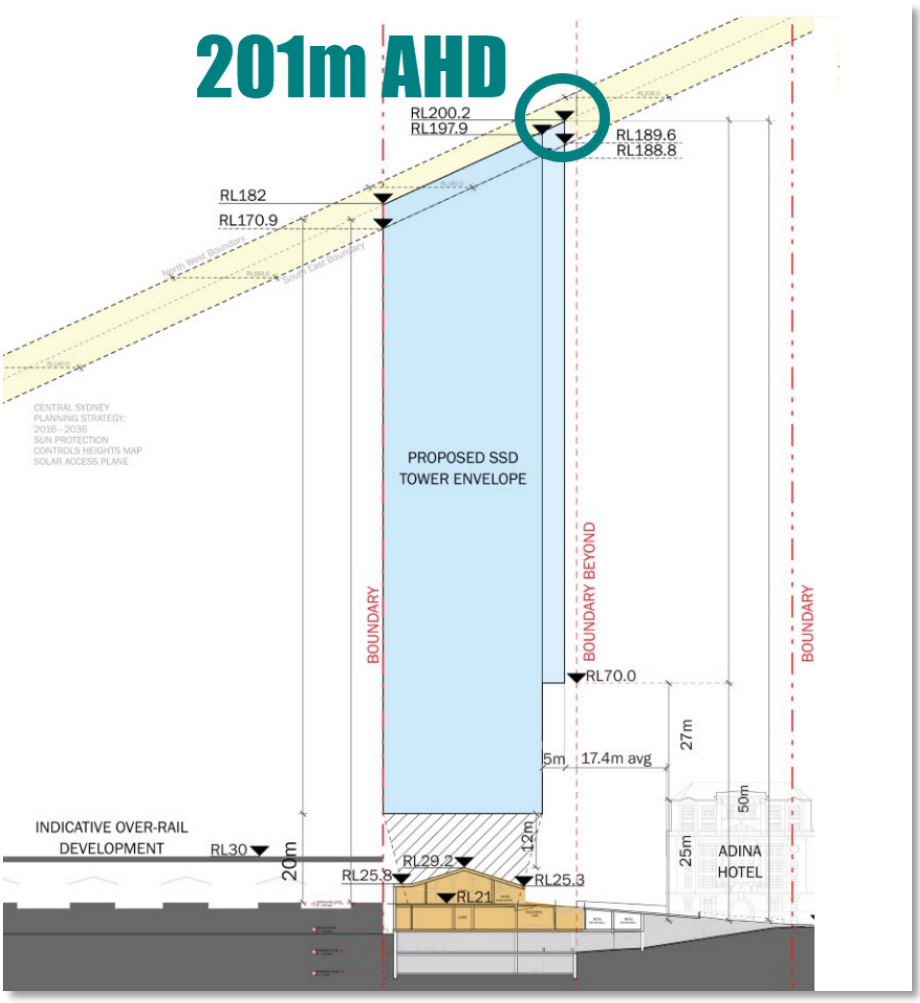
Contents

1 Executive Summary

Strategic Airspace (StratAir) has been commissioned by Atlassian Pty Limited to conduct an aeronautical assessment of the airspace above the site of the Youth Hostels Association (YHA) accommodation facilities adjacent to Sydney Central Railway Station.

The location of the site, as part of a concept plan for the NSW Government's proposed Central Station Technology Precinct (CSTP), is shown in Figure 1 below. Atlassian proposes to re-develop the YHA site for its new corporate headquarters in Sydney. It will also continue to provide tourist accommodation through the YHA. The proposed building is shown in Figure 1, and also depicted within the CSTP context in Figure 2.

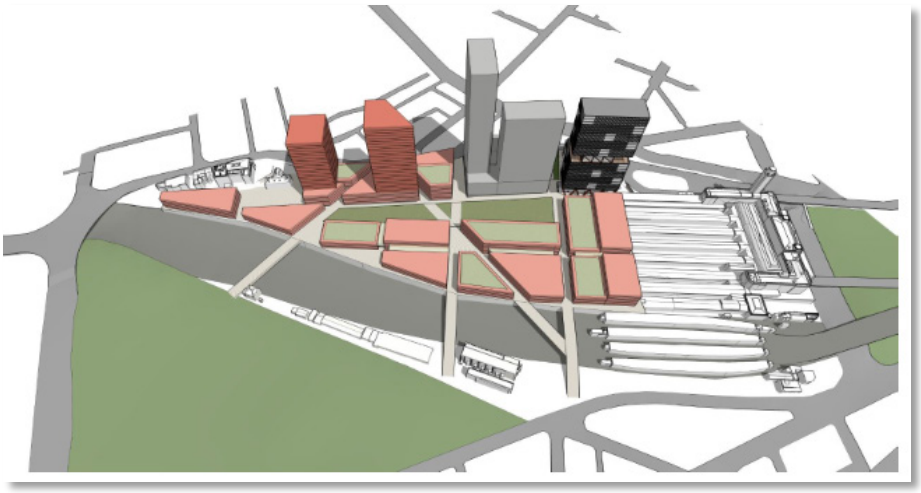
Figure 1 – Section through proposed building viewed from the North



Source: 2019-09-10 Atlassian YHA Envelope

The purpose of the aeronautical assessment is to determine the maximum building height for the YHA site that is approvable under the Airports (Protection of Airspace) Regulations 1996 (APARs). The maximum building height is determined by considering the safety buffers for aircraft that might be operating near the YHA site. These safety buffers are defined by the International Civil Aviation Organisation (ICAO) standards and recommended practices and the safety requirements of the Civil Aviation Safety Authority of Australia (CASA). The maximum building height determination also includes consideration of a reasonable clearance below the safety buffers to accommodate the cranes needed to construct the building.

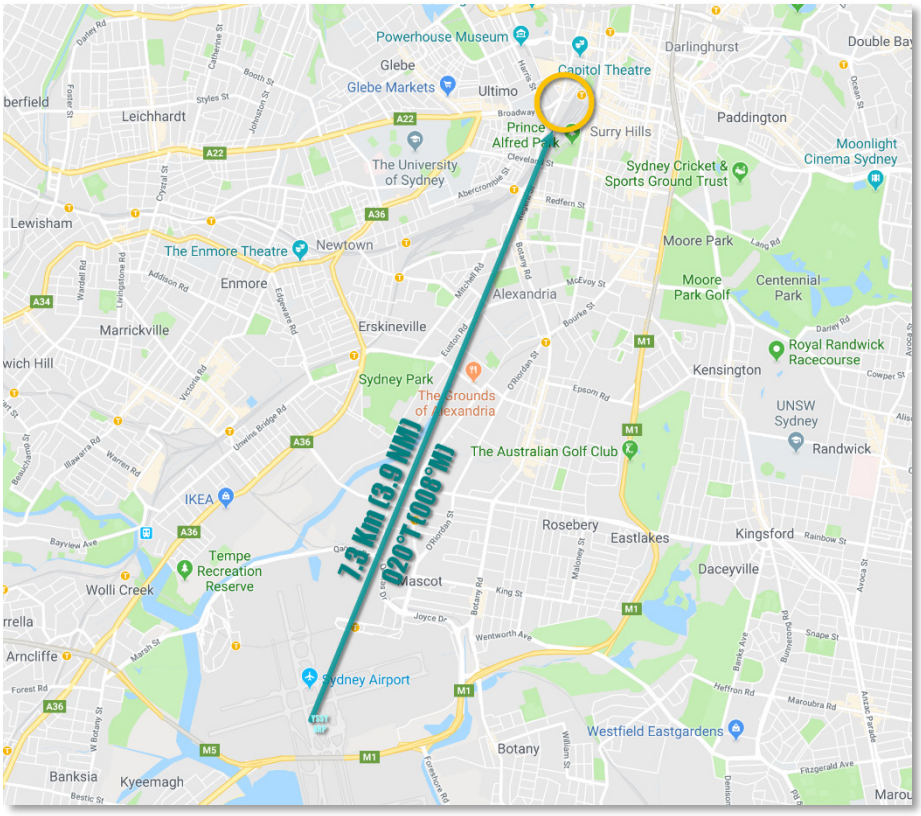
Figure 2 – Concept Plan of the Central Railway Technology Precinct



Source: Avenor – Figure 8C: Indicative Central Station Masterplan Design Concept by Bates Smart

The Central Station YHA site is located approximately 7.3km (3.9 Nautical Miles (NM)) north-north-east of Sydney Airport's Aerodrome Reference Point (ARP – a survey marker near the centre of the aerodrome). It is relatively near the centreline of RWY 34R/16L

Figure 3 — Site location relative to Sydney Airport



This report has been prepared having regard to Prescribed Airspace for Sydney Airport. It examines the current and forecast regulated airspace height limits constraints overhead the site that are related to aviation airspace protection requirements.

The relevant airspace constraints overhead the site are summarised below.

Table 1 —Summary of Key Airspace Height Constraints

Height Limits (AHD)	*Height Limit Detail*	*Comment*
~144m - ~147.5m	OLS Outer Horizontal Surface (OHS)	THRESHOLD HEIGHT limits (depicted in Figure 6 on page 9) The erection of obstacles, including buildings, which exceed this height require a prior 'airspace height' approval from the Department of Infrastructure, Transport, Cities and Regional Development under the Airports Protection of Airspace Regulations (or APAR).
244m	**Radar Terrain Clearance Chart (RTCC) / Minimum Vector Altitude (MVA)**	**The site lies within the lateral limits of the RTCC sector where the limiting height is 244m** (Figure 8, p15)**.** **Being lower than the PANS-OPS heights, this constraint is the maximum permissible height for obstacles at the site.** This restriction will also apply to any cranes deployed during the construction of the proposed building.
263m+	Other surfaces: PANS-OPS Approach & Omnidirectional Departure Surfaces, 10NM MSA	All other protection surfaces overhead the site are 263m AHD or higher. For more details, refer to Table 2 (p8).

The proposed building envelope at a maximum height (for assessment purposes) of **201m AHD** will:

- Infringe the Obstacle Limitation Surface (OLS), with the most limiting height at approximately 144m AHD (at the southern edge of the site), sloping up to approximately 147.5m AHD at the northern edge of the site (see Figure 6, p9).
  As such, the building would require a prior height approval under the APAR.
- NOT infringe any PANS-OPS Surfaces — at the maximum proposed height, the proposed building envelope will be below the most constraining PANS-OPS surface height.

Furthermore, as noted in the table above, in this case the RTCC surface height is more restrictive than the most limiting of the PANS-OPS surfaces, and therefore this becomes the effective maximum height for the proposed building at the site that would be considered approvable under the APAR.

The same applies for any temporary cranes that would be required for construction. The 43m clearance between the top of the proposed building envelope and the constraining RTCC surface leave sufficient room for the operation of cranes which would be required to construct a building on the site. This demonstrates the feasibility of granting a height approval for the building, with a condition that separate applications would need to be made at a later date for crane operations.

Any approval for this project may include conditions regarding marking and obstacle lighting in accordance with the Civil Aviation Safety Regulations Manual of Standards (CASR MOS) Part 139.

Taking these factors into consideration, as well as the location of the site in relation to the airport and the Sydney CBD, from an aviation standpoint **there is no technical impediment to approval of the proposed building at the Sydney Central YHA site under the Airports (Protection of Airspace) Regulations**.

2 Introduction

Strategic Airspace (StratAir) has been commissioned by Atlassian to conduct a complete review of the existing aeronautical constraints and opportunities of the site at the Central Station YHA (the site).

This report assesses the regulated airspace height constraints over the site to inform the development potential and identify any constraints and possibilities as a result of aeronautical activities.

1.1 Site Description

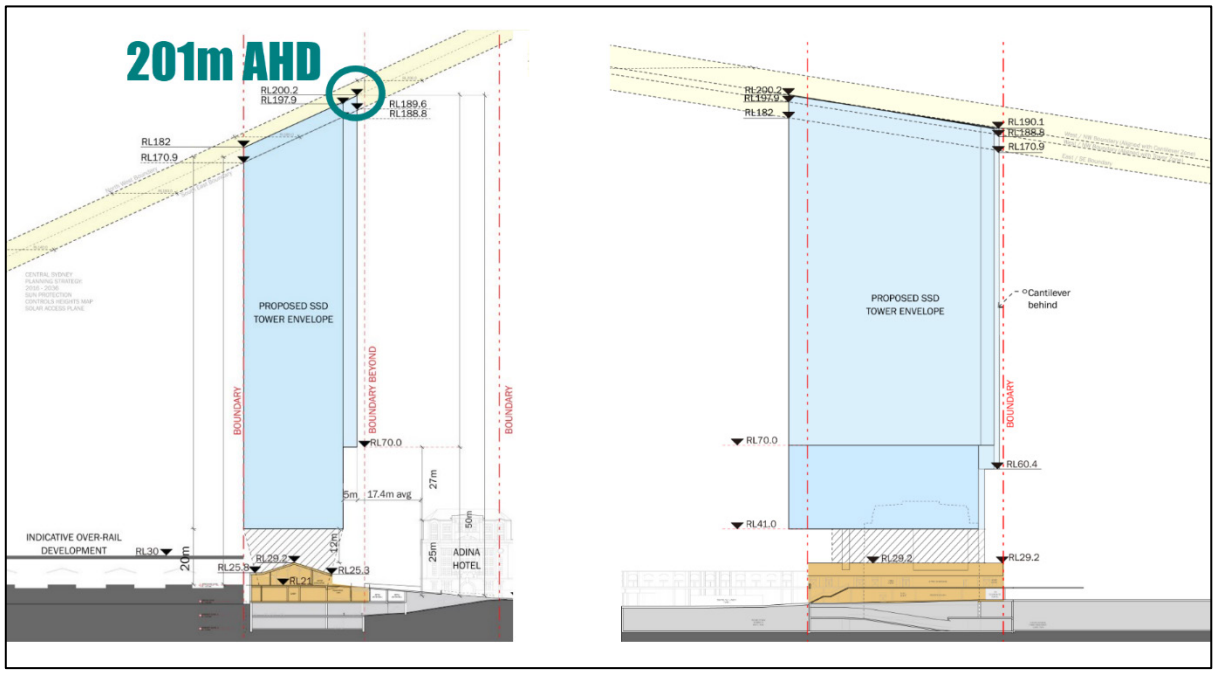
The site is located adjacent to Sydney's Central Station, at the southern end of the Sydney Central Business District (CBD). The site currently houses an historic railyard workshop, which will be preserved for its historic significance. The proposed development will offer commercial offices and tourist accommodation and will connect to the wider Central Station Technology Precinct which is part of the NSW Government's Central Sydney Planning Strategy and Vision.

2.1 Proposed Development from an Aviation Perspective

From the aviation perspective, the most relevant key aspect of the development is the height of the proposed building envelope in metres Australian Height Datum (m AHD). In order to comply with Sun Protection Controls the building will have a sloping top. The maximum height of the building envelope is proposed at 200.2m AHD. For aeronautical assessment purposes that has been rounded up to the nearest metre — that is:

- **201m AHD**

Figure 4 — Profile view of Proposed Development



The airspace constraints are examined in relation to the maximum building height proposed and the additional airspace that would be required for any cranes necessary to enable the development.

3 Aeronautical Impact Context

3.1 Location of the Proposed Development

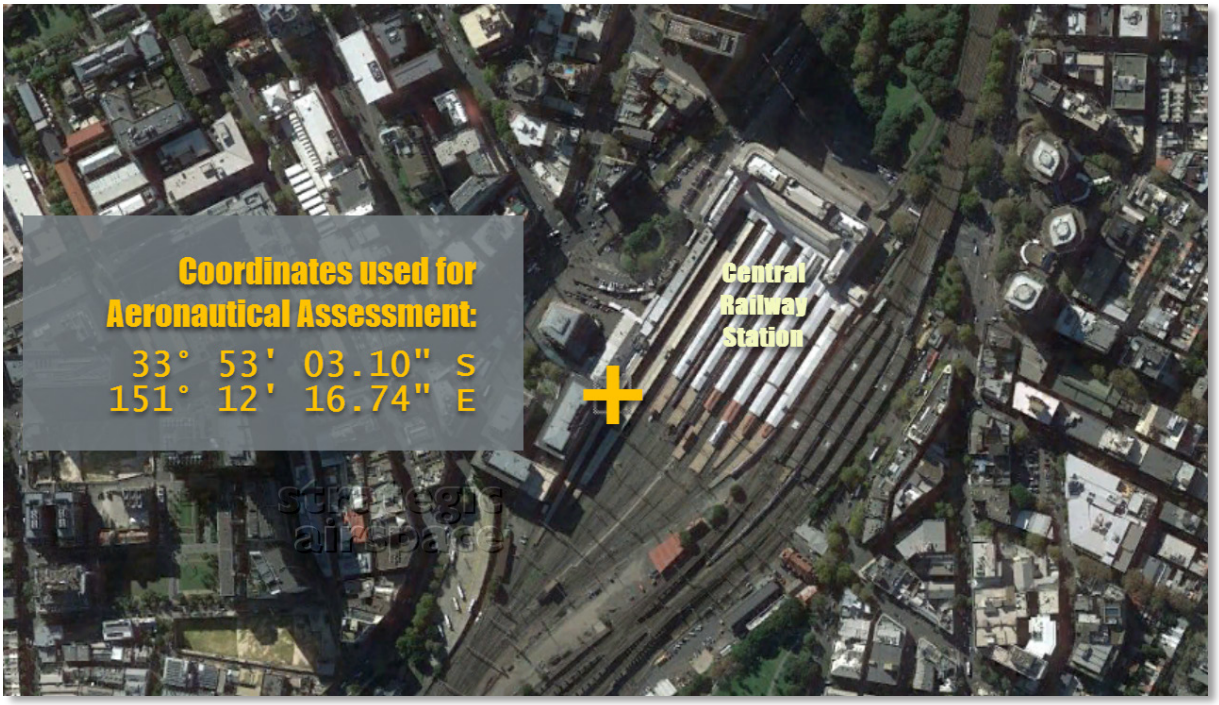
The site is located just west of Sydney's central railway station, approximately 7.3km (3.9 Nautical Miles (NM)) north-north-east of Sydney Airport's Aerodrome Reference Point (ARP).

The measurement point used for this preliminary aeronautical assessment is at the southern corner of the proposed site, the approximate coordinates being:

Latitude:	33° 53' 03.10" S	Longitude:	151° 12' 16.74" E	
Easting:	333,968.19	Northing:	6,249,233.64	Zone 56 H

** Note: These are not survey coordinates. They have been digitised from GoogleEarth™, having registered the roof plan in situ.*

Figure 5 — Coordinate used for Assessment



The other airports in the Sydney Basin are too distant from the proposed site to have any impact on the airspace overhead it.

3.2 Methodology

The methodology used to determine the maximum building height (or minimum airspace height limitation) above the development site takes into consideration each of the following.

3.2.1 Airspace Regulations

The proposed development site is subject to the Airports (Protection of Airspace) Regulations (APAR), under the Commonwealth's Airports Act, 1996), because of its proximity to Sydney Airport and because of its proposed height. These regulations define both: how building height limitations due to airspace

safety can be determined; and the process for gaining approval of the proposed development under the regulations.

The Prescribed Airspace Regulations, and their impact upon building height limitations, are briefly described below.

3.2.2 Prescribed Airspace

Prescribed airspace, under these regulations, includes at minimum:

A Obstacle Limitation Surfaces (OLS)

The OLS surfaces are used to identify buildings and other structures that may have an impact upon the safety or regularity of aircraft operations at an airport. This impact depends upon both the type of operations at the aerodrome and which OLS surfaces are penetrated by a (proposed) building or structure.

The OLS are flat and rising (invisible) surfaces around the airport. They are based on the geometry of the airport and its runways and therefore they rarely change.

If a permanent building development (or temporary crane) that is proposed at a height that will penetrate (exceed) the height limit of an OLS surface, then an application must be made to the Commonwealth Department of Infrastructure, Transport, Cities and Regional Development (DITCRD) — via the closest airport, and with copies to any other potentially affected airport — for an airspace height approval prior to construction of the permanent development &/or erection of the temporary crane obstacle. Such applications should demonstrate the proposed building development does not penetrate or adversely affect surfaces protecting: instrument flight procedures (PANS-OPS surfaces); radar vectoring; navigation infrastructure; or anything else that might affect the safety or regularity of operations at the airport.

B PANS-OPS Surfaces

PANS-OPS surfaces represent the protection surfaces for published instrument flight procedures to and from the airport. These surfaces comprise flat, sloping and complex surface components.

PANS-OPS surfaces must not be penetrated by either permanent or temporary buildings or structures. However, for a variety of reasons, PANS-OPS surfaces can and do change over time.

As flight procedures are changed from time to time (usually by Airservices) , the PANS-OPS Surface Plan published by an airport may not reflect the current situation — which is why we not only reference the airport's plans but also review the published charts for current (or pending) instrument flight procedures and evaluate the associated PANS-OPS height limits. The regulations also make a provision for any factor which may be deemed to adversely affect the safety, regularity or efficiency of aircraft operations at an airport. In light of this, it is necessary to consider the following factors.

C Other Considerations

Sydney Airport's Declared Airspace Plans additionally include:

- Radar Terrain Clearance Charts (RTCC), which depict the areas and height limits related to the Minimum Vector Altitudes (MVAs) used by Air Traffic Controllers when vectoring aircraft;
- Lighting and visual guidance protection plans — used for approach guidance by aircraft, especially at night and in times of poor visibility; and
- Navaid and radar evaluation / protection surface plans.

Other Factors

- Protection for other Instrument Flight Procedure surfaces, where the procedures are not classified as PANS-OPS and/or have been omitted from Sydney Airport's declared

PANS-OPS surfaces charts. These may include a variety of Required Navigation Procedures (RNP).

- Airline Engine-Out (Contingency) Take-Off Splays (as per Civil Aviation Order 20.7 1b)

  These are generally assessed independently by the airlines as part of their own evaluations of any given airspace height application, but it is prudent to evaluate any potential impact in advance.

- Other miscellaneous factors that may be considered as potential safety issues by any of the key stakeholders, and the Civil Aviation Safety Authority (CASA) in particular.

  Note: Airspace that is approved by the Department of Infrastructure, Transport, Cities and Regional Development as Declared Airspace is considered part of an airport's Prescribed Airspace.

3.2.3 Note about Heights: Australian Height Datum (AHD) vs Above Ground Level (AGL)

All "heights" provided in this document are elevations expressed in metres in the Australian Height Datum (AHD) — and thus they are true elevations, and NOT heights above ground level (AGL).

For estimating maximum development heights AGL, the ground elevation (AHD) should be subtracted from the airspace height limits (AHD).

Note also for aviation-related airspace height limits, any building height approval under the Airports (Protection of Airspace) Regulations is regarded as inclusive of the building itself, plus all rooftop furniture and overruns (plant buildings, lift risers, antennae, etc).

3.2.4 Making an Application for an Aviation-related Airspace Height Approval

All applications under APAR must be submitted to DITCRD, at the appropriate time, through the closest relevant airport — in this case, Sydney Airport. Applications should include aeronautical impact assessment reports — such as this, but which are based on the most current plans for the proposed development available at the time. For major developments, such reports should include consideration of cranes that will be required for construction: this information will be used for assessment of the feasibility of constructing the buildings if approved at the maximum heights sought. Safety impact assessments and mitigation strategies may need to be included in the aeronautical study, depending on the nature and location of the development in relation to the airspace restrictions and other aeronautical impact factors.

Separate applications for cranes will also be required at the appropriate times during the construction period, prior to their installation and operation.

4 Analysis

The impact of the various building height limitations, from lowest to highest, is summarised in the following table:

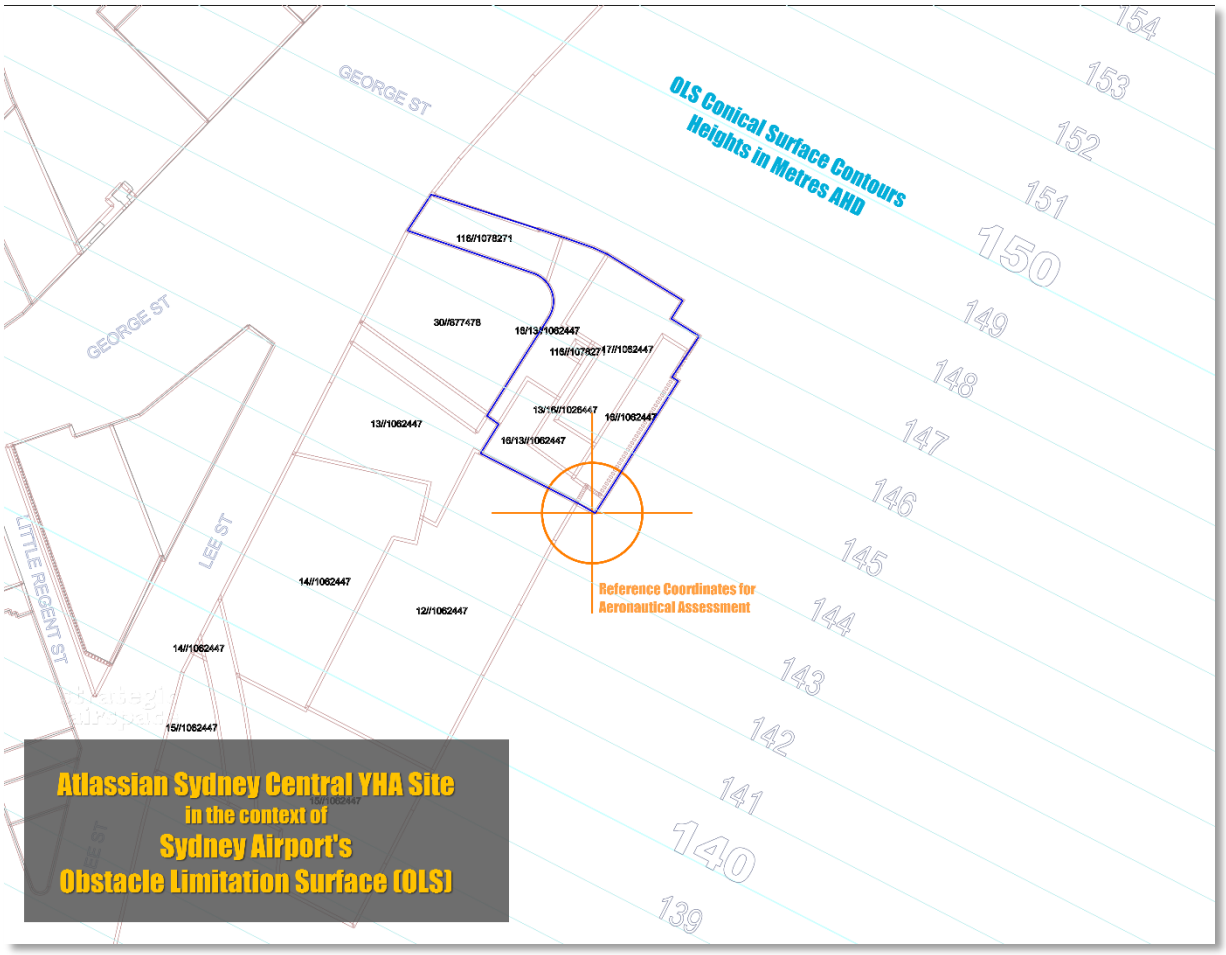
Table 2 — Summary of Airspace Height Constraints

Height Limits (AHD)	*Height Limit Detail*	*Comment*
~144m - ~ 147.5m	OLS Outer Horizontal Surface (OHS)	THRESHOLD HEIGHT limits (depicted in Figure 6 on page 9) The erection of obstacles, including buildings, which exceed this height require a prior 'airspace height' approval from the Department of Infrastructure, Transport, Cities and Regional Development under the Airports Protection of Airspace Regulations (or APAR).
244m	**Radar Terrain Clearance Chart (RTCC) / Minimum Vector Altitude (MVA)**	**The site lies within the lateral limits of the RTCC sector where the limiting height is 244m. This constraint is the maximum permissible height for obstacles at the site.** This restriction will also apply to any cranes deployed during the construction of the proposed building.
263m	PANS-OPS Approach Surfaces	The proposed site is outside the extent of the protection areas of most of the PANS-OPS Approach and Departure Surfaces for Sydney Airport. Some PANS-OPS Missed Approach and Departure Procedure Surfaces do overlay the site. The limiting height is that of the PANS-OPS Missed Approach surface for the RNAV GNSS (LNAV/VNAV) procedure to runway 34R.
278m	PANS-OPS Omnidirectional Departure Surfaces	Calculations, based on current published procedures and in accordance with current applicable PANS-OPS criteria, puts the most limiting protection surface height at the value documented here.
335+m	PANS-OPS 10NM Minimum Sector Altitude (MSA), STARs	The site lies within the lateral limits of the 10NM Minimum Sector Altitude protection area where the limiting height is conservatively 335m.
NA	Other Surfaces	The study area is outside any airspace protection requirements related to Sydney Airport's Navigation and Airport Lighting and Visual Guidance facilities, as well as those related to Airline Engine Inoperative contingency take-off procedures.

4.1 OLS Analysis

The proposed development will penetrate the Conical Surface of Sydney Airport's OLS. The Conical Surface is a sloping surface with a lowest height, overhead the southern border of the site, being approximately 144m AHD. The surface, illustrated with 1m contours, is depicted in Figure 6 below.

Figure 6 — Proposed site with respect to Sydney Airport's OLS



Buildings and cranes may penetrate OLS surfaces. However, such an OLS infringement requires approval under the APAR. An application for approval for the proposed development must be submitted to DITCRD, via Sydney Airport. Failure to obtain such approval before construction commences can result in significant penalties under the Airports Act (1996).

Sydney Airport's Draft Master Plan to 2039 does not forecast any changes to the aerodrome that would occasion a change to the OLS. Thus, the current OLS is anticipated to remain in force for the planning horizon of the project.

Table 3 — OLS Height Impact & APAR Approval Implications

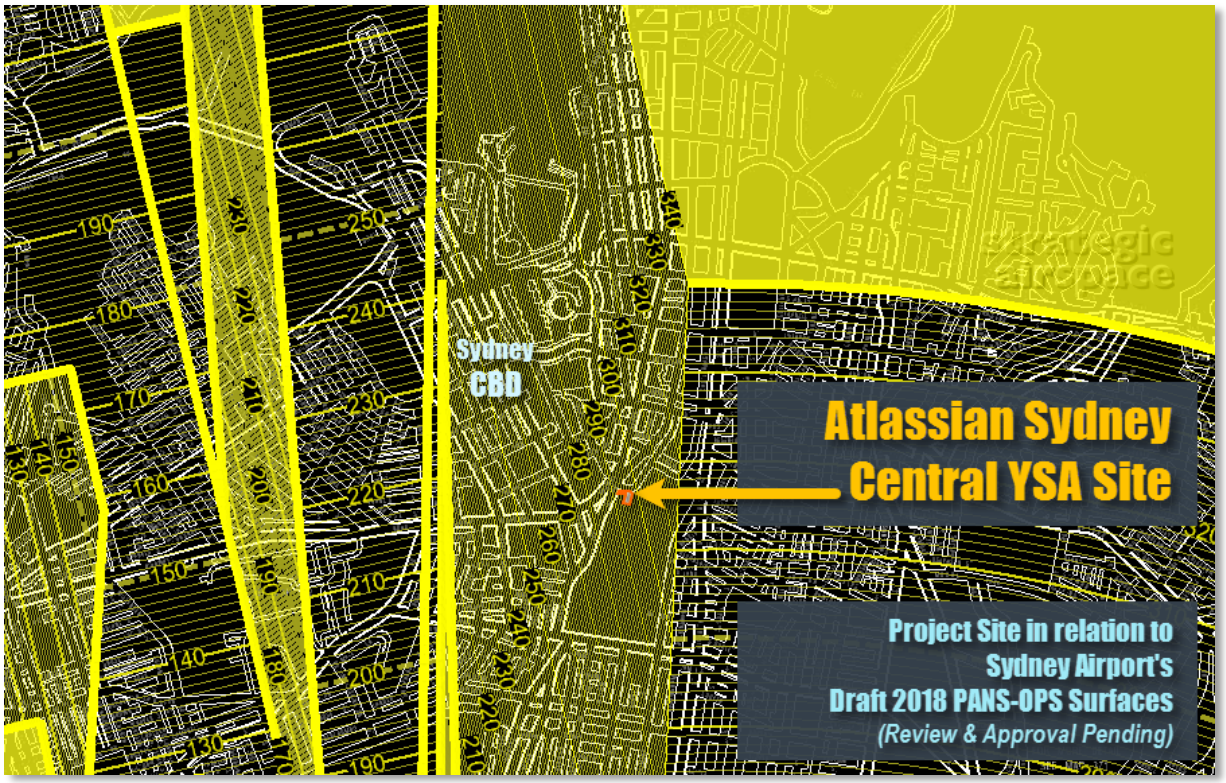
Max Height (m AHD)	*Penetration of OLS **144+**m AHD*	*Approvability Comment*
201	57	Requires prior APAR approval

Under the Civil Aviation Safety Regulations Manual of Standards (CASR MOS) Part 139, any building that penetrates an OLS is subject to obstacle lighting conditions. The Civil Aviation Safety Authority (CASA), when assessing the application for approval will probably recommend to DITCRD that appropriate lighting be installed as a condition of approval.

4.2 PANS-OPS Analysis

The site location relative to the PANS-OPS surfaces overhead the site is shown in Figure 7 below. This image is based on the new draft update chart provided by Sydney Airport (as screen-capture images for requested areas[1]) as the best and latest information; it supersedes their 2015 Declared Airspace PANS-OPS (approach) and PANS-OPS Omnidirectional Radar Departure surface charts.

Figure 7 — Site in relation to Sydney Airport's Draft Updated 2018 PANS-OPS Approach Surfaces



In addition to reviewing the PANS-OPS Surfaces data provided by Sydney Airport, assessment was conducted of the following instrument procedure types and areas for Sydney Airport, as published in the Australian Aeronautical Information Publication (AIP) Departure and Approach Procedures (DAP), up to Amendment 160 (effective 15-Aug-2019 to 06-Nov-2019):

- The areas with defined minima for aircraft manoeuvring (i.e. Circling Minima and Minimum Sector Altitudes (MSAs))
- The protection areas for Standard Arrivals (STARs) coming in from the en-route airways.
- The discrete minima for the Instrument Approach Procedures
- The existing Standard Instrument Departure Procedures (SIDs)

The Sydney Airport Master Plan to 2039 was reviewed for potential future impact. The Master Plan does not forecast any changes to procedures that would, to our best knowledge, make the airspace above the project site any more constraining than that resulting from analysis of the current PANS-OPS procedures.

We note that the PANS-OPS heights calculated by StratAir from the published IFPs result in constraining surface values (dependent on procedure type) which are lower than that indicated in Sydney Airport's draft 2018 chart. The lowest PANS-OPS surface height resulting from the assessment of the published IFPs should be regarded as the limiting height.

1 Review and approval of Sydney Airport's updated charts by DITCRD remains pending, but it is anticipated in the coming months. Until such time as they are approved, the 2015 Declared Airspace charts are the only ones publicly available for download on the Airspace Protection page of Sydney Airport's website.

4.2.1 "Area" Procedures

A. Circling Minima

Though the site is within range of a standard circling area for Cat C aircraft (at 5.9km from the threshold of runway 16R), the site is located in a sector of the Circling Area where circling is explicitly prohibited: beyond 3NM from SY DME, East of RWY 16R and North of RWY 25. Hence Circling Procedures above the site are not applicable.

B. Minimum Sector Altitudes (MSAs)

The relevant sector is the inner 10 NM sector around the airport which has a 2,100ft minimum flight altitude.

Procedure	*Feature and / or Restriction*	*Description*
10NM MSA	Horizontal Surface: • **335.28m**	Covers the entire site. This value is based on a conservative Minimum Obstacle Clearance of 1,000ft, rather than the ICAO value of 300m.

4.2.2 STARs

The minimum segment altitude on any of the STARs surrounding Sydney Airport is 2,100ft, which would have a protection surface of 335.2m AHD (based on a conservative Minimum Obstacle Clearance value of 1,000ft). A detailed study of the extent of the protection of STARs is not included as even a finding of a protection area extending overhead the site would not result in any further restriction beyond what is already imposed by the MSA protection surface.

4.2.3 Instrument Approaches & Missed Approaches

The impact of each of the relevant PANS-OPS protection surfaces for current approach and departure procedures for Sydney Airport are detailed below:

Table 4 — Summary of detailed assessment of PANS-OPS restrictions.

Procedure	*Impact*	*Max Permissible Obstacle Elev (AHD)*	*Comment*
ILS Approaches			
RWY 07 ILS-Z & LOC-Z ILS-Y & LOC-Y	Nil – Outside lateral extent of protection surfaces	N/A	The site is located outside the lateral extent of the Basic ILS surfaces, standard OLS surfaces, OAS surfaces modified to cater for A380 and Localiser Only protection areas.
RWY 25 ILS-Z & LOC-Z	Nil – Outside lateral extent of protection surfaces	N/A	The site is located outside the lateral extent of the Basic ILS surfaces, standard OLS surfaces, OAS surfaces modified to cater for A380 and Localiser Only protection areas.
ILS 16L ILS-Z, LOC-Z & ILS-Z PRM ILS-Y, LOC-Y & ILS-Y PRM	Nil – Outside lateral extent of protection surfaces	N/A	The site is located outside the lateral extent of the Basic ILS surfaces, standard OLS surfaces, OAS surfaces modified to cater for A380 and Localiser Only protection areas.
ILS 34R ILS-Z, LOC-Z & ILS-Z PRM ILS-Y, LOC-Y & ILS-Y PRM	Site situated under missed approach surface	275m	The site is located outside the lateral extent of the Basic ILS surfaces, standard OLS surfaces, and OAS surfaces modified to cater for A380. The site is located inside the turn protection for the missed approach. Calculations used to obtain maximum permissible height are shown in the relevant section below.

Procedure	*Impact*	*Max Permissible Obstacle Elev (AHD)*	*Comment*
ILS 16R ILS-Z, LOC-Z & ILS-Z (Cat I & II) PRM ILS-Y, LOC-Y & ILS-Y PRM	Nil – Outside lateral extent of protection surfaces	N/A	The site is located outside the lateral extent of the Basic ILS surfaces, standard OLS surfaces, OAS surfaces modified to cater for A380 and Localiser Only protection areas.
ILS 34L ILS-Z, LOC-Z & ILS-Z (Cat I & II) PRM ILS-Y, LOC-Y & ILS-Y PRM	Nil – Outside lateral extent of protection surfaces	N/A	The site is located outside the lateral extent of the Basic ILS surfaces, standard OLS surfaces, OAS surfaces modified to cater for A380 and Localiser Only protection areas.
GLS Approaches			
GLS 07	Nil – Outside lateral extent of protection surfaces	N/A	
GLS 25	Nil – Outside lateral extent of protection surfaces	N/A	
GLS 16L	Nil – Outside lateral extent of protection surfaces	N/A	
GLS 34R	Site situated under missed approach surface	275m	The site is located outside the lateral extent of the Basic ILS surfaces, standard OLS surfaces, and OAS surfaces modified to cater for A380. The site is located inside the turn protection for the missed approach. Calculations used to obtain maximum permissible height are shown in the relevant section below.
GLS 16R	Nil – Outside lateral extent of protection surfaces	N/A	
GLS 34L	Nil – Outside lateral extent of protection surfaces	N/A	
RNAV Approaches			
RNAV 07 LNAV LNAV/VNAV	Nil – Outside lateral extent of protection surfaces	N/A	
RNAV 25 LNAV LNAV/VNAV	Nil – Outside lateral extent of protection surfaces	N/A	
RNAV 16L LNAV LNAV/VNAV	Nil – Outside lateral extent of protection surfaces	N/A	
RNAV 34R LNAV LNAV/VNAV	Site situated under missed approach surface	263m	The site is located inside the turn protection for the missed approach. Calculations used to obtain maximum permissible height are shown in the relevant section below.

Procedure	*Impact*	*Max Permissible Obstacle Elev (AHD)*	*Comment*
RNAV 16R LNAV LNAV/VNAV	Nil – Outside lateral extent of protection surfaces	N/A	
RNAV 34L LNAV LNAV/VNAV	Nil – Outside lateral extent of protection surfaces	N/A	

A ILS-Z, ILS-Y and GLS RWY 34R Missed Approach @ 2.5%

Distance THR to SOC: -783.1m (before the THR)

Distance from SOC to TA (600ft): 3666.9m

Distance from the TA to the site: 6267.3m

Altitude reached overhead the site: (6267.3m @ 2.5%) + 600ft = 339.5m

Height of protection surface over the site: 339.5 – 50 = 289.5m

B ILS-Z, ILS-Y and GLS RWY 34R Missed Approach @ 3.3%

Distance from THR to SOC: 340.3m

Distance from SOC to TA (600ft): 4532.8m

Distance from the TA to the site: 4310.9m

Altitude reached overhead the site: (4310.9m @ 3.3%) + 600ft = 325.1m

Height of protection surface over the site: 325.1 – 50 = 275.1m

C LNAV/VNAV RWY 34R Missed Approach

Distance THR to SOC: 2368.2m

Distance SOC to TA (600ft): 1584.9m

Distance from TA to the site: 9171.6m

Altitude reached: (9171.6m @ 2.5%) + 600ft = 313.3m

Height of protection surface: 313.3 – 50 = 263.3m

4.2.4 Departures

Height limitations would be most restrictive from departure procedures from RWY34R. StratAir's calculations of the current effective PANS-OPS omnidirectional departure procedures indicate that the height constraints from the current procedures are as follows:

A. Departures from Runway 34R

Turning altitude for the departure is 500ft with an initial climb at 4.8% to 1,500ft.

Distance from the turn initiation area to the site: 4,193.6m

Altitude reached: (4,193.6m x 4.8%) + 500ft = 353.7m

Calculated minimum obstacle clearance: (2,968 + 4,193) x 0.8% = 57.3m

Applicable minimum obstacle clearance in turn area: no less than 75m

Height of protection surface: 353.7 – 75 = 278.7m

4.3 Other Assessment Considerations

The following table provides a brief assessment of other considerations.

Table 5 — Summary of Other Assessment Considerations

Procedure	*Height Limit (m AHD)*	*Description*
Radar Terrain Clearance Chart (RTCC) / Minimum Vector Altitude (MVA)	**244**	This height constraint is applicable over the site. This is the limit related to the Minimum Vectoring Altitude (MVA), which is used by air traffic controllers. This information is sourced from the RTCC published as part of Sydney Airport's Prescribed Airspace Plans.
Navigation Infrastructure Surfaces	N/A	The proposed development is too far from the airport to affect any ground-based navigation infrastructure.
Approach Lighting & VGSI Surfaces		The site is outside the lateral extent of published approach lighting surfaces.
Airlines Engine Out Procedures	N/A	Engine Out procedures (from RWY 34R, the most relevant take-off runway end for these procedures) are designed and maintained by each of the passenger transport aircraft operators in accordance with the relevant regulations. Though confirmation will need to be sought from the operators at the time of application for approval, the proposed site can be considered to be sufficiently distant from the track centreline that it will not adversely affect any contingency procedures.

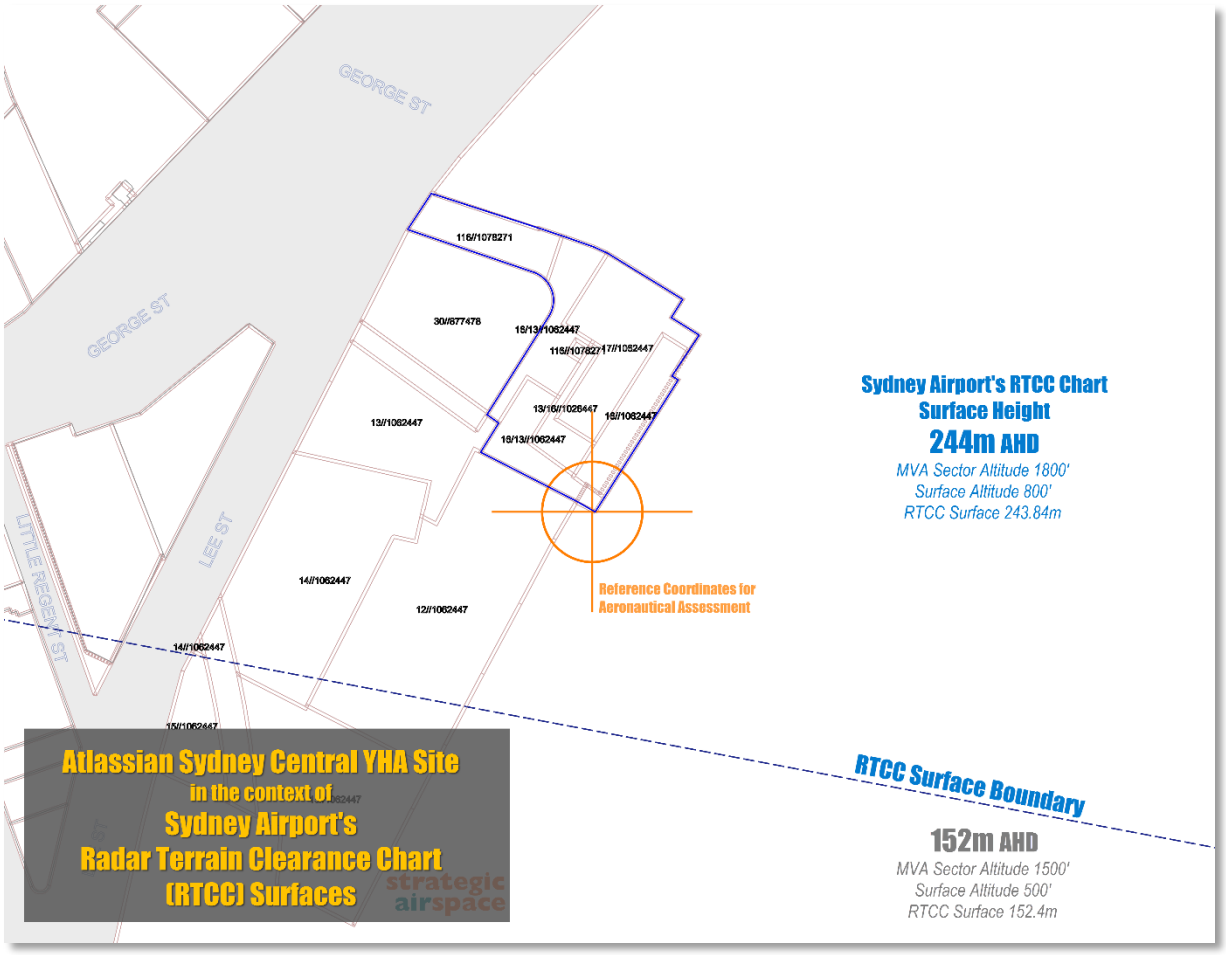
There are no other considerations that might limit the building height at the project site.

4.3.1 Radar Terrain Clearance Chart (RTCC) / Minimum Vector Altitude (MVA) Surface

The surfaces depicted in Sydney Airport's Radar Terrain Clearance Chart (RTCC) overhead the site protect the airspace used by air traffic controllers as the lowest Minimum Vector Altitude (MVA) they can use for vectoring aircraft.

The RTCC / MVA height limit overhead the entire site is 244m AHD. This surface imposes more stringent restrictions than those imposed by the PANS-OPS protection surfaces and constitutes the maximum permissible height for any permanent or temporary structure at the site's location. The nearest RTCC surface boundaries are shown in relation to the site in Figure 8 below.

Figure 8 — Proposed site with respect to RTCC Surfaces



5 Conclusion

The minimum OLS height overhead the site is derived from the Conical Surface, which is approximately 144m AHD above the site (see Figure 6, p9). Since the proposed building envelope, at a maximum height of 201m AHD, is higher than 144m it (and the cranes needed to construct it) will require approval under the Airports (Protection of Airspace) Regulations.

To be approved by DITCRD as a controlled activity under the APARs, the building must not penetrate any PANS-OPS surface or any other protection surface that is critical to the safety or regularity of operations at Sydney Airport.

The site is sufficiently distant from the centrelines of RWYs 16L/34R and 07/25 that there are no low-level PANS-OPS protection surfaces directly above the site. It is also relatively near the taller buildings in the CBD and all protection surfaces in the nearby vicinity are designed to clear these buildings. Our analysis of the PANS-OPS protection surfaces overhead the site has shown that the lowest PANS-OPS surface above site is 263m AHD; the building is well beneath this surface.

However, this is not the maximum allowable height as the RTCC is 244m above the site. This is the maximum allowable height for any obstacle on the site including cranes. Thus, with the building at 201m AHD, there is a 43m clearance above the maximum building envelope which is sufficient operating space for cranes that would be required for construction.

In summary:

- Both the building and cranes will penetrate the OLS Conical Surface (at 140m AHD) and therefore will require (separate) approval by DITCRD.
- The maximum allowable height is determined by the RTCC surface above the site, at a height of 244m AHD.
- It would be feasible to construct the proposed building without causing any adverse impact on the prescribed airspace, because there is sufficient clear airspace for crane operations (42m between the top of the proposed building envelope and the constraining RTCC surface).

Taking these factors into consideration, as well as the location of the site in relation to the airport and the Sydney CBD, from an aviation standpoint **there is no technical impediment to approval of the proposed building at the Sydney Central YHA site under the Airports (Protection of Airspace) Regulations**.

APPENDICES

Appendix 1 — Abbreviations

Abbreviations used in this report and/or associated reference documents, and the meanings assigned to them for the purposes of this report are detailed in the following table:

Abbreviation	*Meaning*
AC	Advisory Circular (document supporting CAR 1998)
ACFT	Aircraft
AD	Aerodrome
AGL	Above Ground Level (Height)
AHD	Australian Height Datum
AHT	Aircraft Height
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Services
ALARP	As Low As Reasonably Practicable
ALC	Airport Lease Company
Alt	Altitude
AMAC	Australian Mayoral Aviation Council
AMSL	Above Minimum Sea Level
ANEF	Australian Noise Exposure Forecast
ANSP	Airspace and Navigation Service Provider
APACL	Australia Pacific Airports Corporation Limited, owner of Melbourne and Launceston Airports
APCH	Approach
APARs, or A(PofA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ASDA	Accelerated Stop Distance Available
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
BA (Planning)	Building Application or Building Approval (Planning)
BAC	Brisbane Airport Corporation
BCC	Brisbane City Council
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
CBD	Central Business District
CG	Climb Gradient
CNS/ATM	Communications, Navigation, Surveillance / Air Traffic Management
CPA	Cairns Port Authority, Operators Of Cairns Airport
DA (Aviation)	Decision Altitude (Aviation)
DA (Planning)	Development Application or Development Approval (Planning)
DAH	Designated Airspace Handbook
DAP	Departure and Approach Procedures (published by AsA)
DEP	Departure
DER	Departure End (of the) Runway

Abbreviation	*Meaning*
DEVELMT	Development
DH	Decision Height
DITCRD	Commonwealth Department of Infrastructure, Transport, Cities & Regional Development (formerly DITCRD, Department of Infrastructure, Regional Development and Cities)
DME	Distance Measuring Equipment
DPIE	Department of Planning, Industry & Environment (NSW)
Doc nn	ICAO Document Number nn
DoD	Department of Defence
DODPROPS	Dependent Opposite Direction Parallel Runway OPerations
EIS	Environmental Impact Study
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	EnRoute Supplement Australia
ESE	East South East
FAF	Final Approach Fix
FAP	Final Approach Point
Ft	Feet
GBAS	Ground-Based Augmentation System, a GNSS augmentation system to provide vertical guidance and additional precision to non-precision approaches — permits GLS Approaches
GLS	GNSS Landing System – a precision landing system like ILS but based on augmented GNSS using ground and satellite systems.
GNSS	Global Navigation Satellite System
GP	Glide Path
HIAL	High Intensity Approach Light
HLS	Helicopter Landing Site
IAS	Indicated Air Speed
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System, a precision approach landing system
IMC	Instrument Meteorological Conditions
IPA	Integrated Planning Act 1997, Queensland State Government
ISA	International Standard Atmosphere
IVA	Independent Visual Approach
Km	Kilometres
Kt	Knot (one nautical mile per hour)
LAT	Latitude
LDA	Landing Distance Available
LEP	Local Environment Plan (Planning
LLZ	Localizer
LONG	Longitude
LSALT	Lowest Safe ALTitude
M	Metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude

Abbreviation	*Meaning*
MDH	Minimum Descent Height
MDP	Major Development Plan
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOCA	Minimum Obstacle Clearance Altitude
MOS	Manual Of Standards, published by CASA
MP	Master Plan
MSA	Minimum Sector Altitude
MVA	Minimum Vector Altitude
NASF	National Airports Safeguarding Framework
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
NNW	North North West
NOTAM	NOTice to AirMen
NPR	New Parallel Runway (Project, Brisbane Airport)
OAR	Office of Airspace Regulation
OCA	Obstacle Clearance Altitude (in this case, in AMSL)
OCH	Obstacle Clearance Height
ODPROPS	Opposite Direction Parallel Runway OPerations
OHS	Outer Horizontal Surface, an Obstacle Limitation Surface
OLS	Obstacle Limitation Surface, defined by ICAO Annex 14; refer also CASA MOS Part 139
PANS-OPS	Procedures for Air Navigation – Operations, ICAO Doc 8168; refer also CASA MOS Part 173
PAPI	Precision Approach Path Indicator (a form of VGSI)
PBN	Performance Based Navigation
PRM	Precision Runway Monitor
RAAF	Royal Australian Air Force
RAPAC	Regional AirsPace users Advisory Committee
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 (refer also MVA)
RWY	Runway
SACL	Sydney Airport Corporation Limited
SID	Standard Instrument Departure
SODPROPS	(Independent) Simultaneous Opposite Direction Parallel Runway OPerations
SPP	State Planning Policy, Queensland (specifically SPP 1/02: Development in the Vicinity of Certain Airports and Aviation Facilities)
SSDA	State Significant Development Application

Abbreviation	*Meaning*
SSP	State Significant Precinct
SSR	Secondary Surveillance Radar
STAR	STandard Arrival
TAR	Terminal Approach Radar
TAS	True Airspeed
THR	THReshold (of Runway)
TMA	TerMinal Area
TNA	Turn Altitude
TODA	Take-off Distance Available
TORA	Take-Off Runway Available
VFR	Visual Flight Rules
VIS	Visual
VMC	Visual Meteorological Conditions
Vn	Aircraft critical velocity reference
VOR	Very high frequency Omni-directional Range
VSS	Visual Segment Surface
WAC	Westralia Airports Corporation, operators of Perth Airport
WAM	Wide-Area Multilateration
WNW	West North West
WSW	West South West
WGS84	World Geodetic System 1984
WSA	Western Sydney Airport – the proposed second international airport for the Sydney Basin

Appendix 2 — PANS-OPS Procedures

The latest versions of the IFPs consulted were from AIP Amendment 160, effective from 15-Aug-2019 to 06-Nov-2019, current at the time of this version of the report as indicated in Table 6 below.

The procedures initially consulted in the preceding version, from AIP Amendment 155 (effective from 24-May-2018 to 15-Aug-2018), are documented in the left-hand side of the table below. The IFP charts that were changed since the preceding version of this report highlighted in the CHG column.

Table 6 —All PANS OPS Instrument Flight Procedure Charts for Sydney Airport (AIP Amendment 160 – Effective 15 Aug 2019 to 06 Nov 2019)

SYDNEY (YSSY)

Report v1.1 (Superseded)	***AIP Amdt 155***		*Version 1.2 of this Report*	***AIP Amdt 160***
Name of Chart	*Effective Date (Amdt No)*	***CHG***	*Name of Chart*	*Effective Date (Amdt No)*
AERODROME CHART PAGE 1	2-Mar-2017 (Am 150)	X	AERODROME CHART PAGE 1	15-Aug-2019 (Am 160)
AERODROME CHART PAGE 2	10-Nov-2016 (Am 149)	X	AERODROME CHART PAGE 2	15-Aug-2019 (Am 160)
APRON CHART - INTERNATIONAL PAGE 1	13-Nov-2014 (Am 141)	X	APRON CHART - INTERNATIONAL PAGE 1	15-Aug-2019 (Am 160)
APRON CHART - INTERNATIONAL PAGE 2	24-May-2018 (Am 155)	X	APRON CHART - INTERNATIONAL PAGE 2	23-May-2019 (Am 159)
APRON CHART - DOMESTIC PAGE 1	26-May-2016 (Am 147)	X	APRON CHART - DOMESTIC PAGE 1	23-May-2019 (Am 159)
APRON CHART - DOMESTIC PAGE 2	24-May-2018 (Am 155)	X	APRON CHART - DOMESTIC PAGE 2	23-May-2019 (Am 159)
APRON CHART - DOMESTIC PAGE 3	24-May-2018 (Am 155)	X	APRON CHART - DOMESTIC PAGE 3	23-May-2019 (Am 159)
STANDARD DOMESTIC TAXI ROUTES - ARRIVALS	21-Aug-2014 (Am 140)		STANDARD DOMESTIC TAXI ROUTES - ARRIVALS	21-Aug-2014 (Am 140)
STANDARD DOMESTIC TAXI ROUTES - DEPARTURES	6-Mar-2014 (Am 138)		STANDARD DOMESTIC TAXI ROUTES - DEPARTURES	6-Mar-2014 (Am 138)
NOISE ABATEMENT PROCEDURE PAGE 1	17-Nov-2011 (Am 129)		NOISE ABATEMENT PROCEDURE PAGE 1	17-Nov-2011 (Am 129)
NOISE ABATEMENT PROCEDURE PAGE 2	17-Aug-2017 (Am 152)		NOISE ABATEMENT PROCEDURE PAGE 2	17-Aug-2017 (Am 152)
NOISE ABATEMENT PROCEDURE PAGE 3	3-Mar-2016 (Am 146)		NOISE ABATEMENT PROCEDURE PAGE 3	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 4	3-Mar-2016 (Am 146)		NOISE ABATEMENT PROCEDURE PAGE 4	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 5	2-Mar-2017 (Am 150)		NOISE ABATEMENT PROCEDURE PAGE 5	2-Mar-2017 (Am 150)
NOISE ABATEMENT PROCEDURE PAGE 6	24-May-2018 (Am 155)		NOISE ABATEMENT PROCEDURE PAGE 6	24-May-2018 (Am 155)
NOISE ABATEMENT PROCEDURE PAGE 7	3-Mar-2016 (Am 146)		NOISE ABATEMENT PROCEDURE PAGE 7	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 8	3-Mar-2016 (Am 146)		NOISE ABATEMENT PROCEDURE PAGE 8	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 9	3-Mar-2016 (Am 146)		NOISE ABATEMENT PROCEDURE PAGE 9	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 10	3-Mar-2016 (Am 146)		NOISE ABATEMENT PROCEDURE PAGE 10	3-Mar-2016 (Am 146)
AIRPORT EFFICIENCY PROCEDURES	1-Mar-2018 (Am 154)		AIRPORT EFFICIENCY PROCEDURES	1-Mar-2018 (Am 154)
IVA USER GUIDE PAGE 1	1-Mar-2018 (Am 154)		IVA USER GUIDE PAGE 1	1-Mar-2018 (Am 154)

Report v1.1 (Superseded)	***AIP Amdt 155***		*Version 1.2 of this Report*	***AIP Amdt 160***
Name of Chart	*Effective Date (Amdt No)*	***CHG***	*Name of Chart*	*Effective Date (Amdt No)*
IVA USER GUIDE PAGE 2	1-Mar-2018 (Am 154)		IVA USER GUIDE PAGE 2	1-Mar-2018 (Am 154)
SID SYDNEY ONE DEP (RADAR) - ALL RWYS	17-Aug-2017 (Am 152)	X	SID SYDNEY ONE DEP (RADAR) - ALL RWYS	23-May-2019 (Am 159)
SID RWY 34L SOUTH WEST DEP (JET)	10-Nov-2016 (Am 149)		SID RWY 34L SOUTH WEST DEP (JET)	10-Nov-2016 (Am 149)
SID RWY 16R & 34L SOUTH DEP (NON-JET) (RNAV)	24-May-2018 (Am 155)		SID RWY 16R & 34L SOUTH DEP (NON-JET) (RNAV)	24-May-2018 (Am 155)
SID RWY 16R DEENA SEVEN (JET) (RNAV)	24-May-2018 (Am 155)		SID RWY 16R DEENA SEVEN (JET) (RNAV)	24-May-2018 (Am 155)
SID RWY 34R ENTRA FIVE (JET) (RNAV)	10-Nov-2016 (Am 149)		SID RWY 34R ENTRA FIVE (JET) (RNAV)	10-Nov-2016 (Am 149)
SID RWY 07 FISHA EIGHT (JET) (RNAV)	17-Aug-2017 (Am 152)		SID RWY 07 FISHA EIGHT (JET) (RNAV)	17-Aug-2017 (Am 152)
SID KAMBA DEP RWYS 07 & 16L (NON-JET) (RNAV)	1-Mar-2018 (Am 154)		SID KAMBA DEP RWYS 07 & 16L (NON-JET) (RNAV)	1-Mar-2018 (Am 154)
SID RWY 16R KAMPI FIVE (JET) (RNAV)	24-May-2018 (Am 155)	X	SID RWY 16R KAMPI FIVE (RNAV)	24-May-2018 (Am 155)
SID RWY 16L KEVIN SIX (JET) (RNAV)	9-Nov-2017 (Am 153)		SID RWY 16L KEVIN SIX (JET) (RNAV)	9-Nov-2017 (Am 153)
SID RWY 16L ABBEY THREE (JET) (RNAV)	24-May-2018 (Am 155)		SID RWY 16L ABBEY THREE (JET) (RNAV)	24-May-2018 (Am 155)
SID RWY 34R MARUB SIX (JET) (RNAV)	24-May-2018 (Am 155)		SID RWY 34R MARUB SIX (JET) (RNAV)	24-May-2018 (Am 155)
SID RWY 34L RICHMOND FIVE DEP (JET)	17-Aug-2017 (Am 152)		SID RWY 34L RICHMOND FIVE DEP (JET)	17-Aug-2017 (Am 152)
STAR BOREE EIGHT A ARRIVAL (RNAV)	24-May-2018 (Am 155)	X	STAR BOREE NINE A ARRIVAL (RNAV)	23-May-2019 (Am 159)
STAR BOREE EIGHT P ARRIVAL (RNAV)	24-May-2018 (Am 155)	X	STAR BOREE NINE P ARRIVAL (RNAV)	23-May-2019 (Am 159)
STAR MEPIL THREE ARRIVAL (RNAV)	24-May-2018 (Am 155)		STAR MEPIL THREE ARRIVAL (RNAV)	24-May-2018 (Am 155)
STAR MARLN THREE ARRIVAL (RNAV)	24-May-2018 (Am 155)	X	STAR MARLN FOUR ARRIVAL (RNAV)	23-May-2019 (Am 159)
STAR ODALE SEVEN ARRIVAL (RNAV)	24-May-2018 (Am 155)		STAR ODALE SEVEN ARRIVAL (RNAV)	24-May-2018 (Am 155)
STAR RIVET THREE ARRIVAL (RNAV)	24-May-2018 (Am 155)		STAR RIVET THREE ARRIVAL (RNAV)	24-May-2018 (Am 155)
ILS OR LOC RWY 07	9-Nov-2017 (Am 153)	X	ILS OR LOC RWY 07	23-May-2019 (Am 159)
ILS OR LOC RWY 16L PAGE 1	24-May-2018 (Am 155)	X	ILS OR LOC RWY 16L PAGE 1	23-May-2019 (Am 159)
ILS RWY 16L PAGE 2	24-May-2018 (Am 155)	X	ILS RWY 16L PAGE 2	23-May-2019 (Am 159)
ILS OR LOC RWY 16R PAGE 1	24-May-2018 (Am 155)	X	ILS OR LOC RWY 16R PAGE 1	23-May-2019 (Am 159)
ILS RWY 16R PAGE 2	24-May-2018 (Am 155)	X	ILS RWY 16R PAGE 2	23-May-2019 (Am 159)
ILS OR LOC RWY 25	9-Nov-2017 (Am 153)	X	ILS OR LOC RWY 25	23-May-2019 (Am 159)
ILS OR LOC RWY 34L PAGE 1	24-May-2018 (Am 155)	X	ILS OR LOC RWY 34L PAGE 1	23-May-2019 (Am 159)

Report v1.1 (Superseded)	***AIP Amdt 155***	*Version 1.2 of this Report*		***AIP Amdt 160***
Name of Chart	*Effective Date (Amdt No)*	***CHG***	*Name of Chart*	*Effective Date (Amdt No)*
ILS RWY 34L PAGE 2	24-May-2018 (Am 155)	X	ILS RWY 34L PAGE 2	23-May-2019 (Am 159)
ILS OR LOC RWY 34R PAGE 1	24-May-2018 (Am 155)	X	ILS OR LOC RWY 34R PAGE 1	23-May-2019 (Am 159)
ILS RWY 34R PAGE 2	24-May-2018 (Am 155)	X	ILS RWY 34R PAGE 2	23-May-2019 (Am 159)
RNAV-Z (GNSS) RWY 07	17-Aug-2017 (Am 152)	X	RNAV-Z (GNSS) RWY 07	15-Aug-2019 (Am 160)
RNAV-Z (GNSS) RWY 16L	9-Nov-2017 (Am 153)	X	RNAV-Z (GNSS) RWY 16L	23-May-2019 (Am 159)
RNAV-Z (GNSS) RWY 16R	9-Nov-2017 (Am 153)	X	RNAV-Z (GNSS) RWY 16R	8-Nov-2018 (Am 157)
RNAV-Z (GNSS) RWY 25	17-Aug-2017 (Am 152)	X	RNAV-Z (GNSS) RWY 25	8-Nov-2018 (Am 157)
RNAV-Z (GNSS) RWY 34L	9-Nov-2017 (Am 153)	X	RNAV-Z (GNSS) RWY 34L	8-Nov-2018 (Am 157)
RNAV-Z (GNSS) RWY 34R	9-Nov-2017 (Am 153)		RNAV-Z (GNSS) RWY 34R	9-Nov-2017 (Am 153)
GLS RWY 07	9-Nov-2017 (Am 153)	X	GLS RWY 07	23-May-2019 (Am 159)
GLS RWY 16L	9-Nov-2017 (Am 153)	X	GLS RWY 16L	23-May-2019 (Am 159)
GLS RWY 16R	9-Nov-2017 (Am 153)	X	GLS RWY 16R	23-May-2019 (Am 159)
GLS RWY 25	9-Nov-2017 (Am 153)	X	GLS RWY 25	23-May-2019 (Am 159)
GLS RWY 34L	9-Nov-2017 (Am 153)	X	GLS RWY 34L	23-May-2019 (Am 159)
GLS RWY 34R	9-Nov-2017 (Am 153)	X	GLS RWY 34R	23-May-2019 (Am 159)
		X	PRM USER INSTRUCTIONS	23-May-2019 (Am 159)
ILS PRM USER INSTRUCTIONS PAGE 1	10-Nov-2016 (Am 149)	X	Withdrawn - incorporated in: PRM USER INSTRUCTIONS	
ILS PRM USER INSTRUCTIONS PAGE 2	20-Aug-2015 (Am 144)	X	Withdrawn - incorporated in: PRM USER INSTRUCTIONS	
ILS PRM RWY 16L	9-Nov-2017 (Am 153)	X	Withdrawn - incorporated in ILS Charts above for RWY	
ILS PRM RWY 16R	24-May-2018 (Am 155)	X	Withdrawn - incorporated in ILS Charts above for RWY	
ILS PRM RWY 34L	24-May-2018 (Am 155)	X	Withdrawn - incorporated in ILS Charts above for RWY	
ILS PRM RWY 34R	24-May-2018 (Am 155)	X	Withdrawn - incorporated in ILS Charts above for RWY	

Source: AIP Book (15-Aug-2019 to 06-Nov-2019) via http://www.airservicesaustralia.com/aip/aip.asp?pg=10