

AVIATION REPORT

APPENDIX X





Sydney Metro City & Southwest

Pitt Street South Over Station Development:

Aviation Report

Applicable to:	Sydney Metro City & Southwest
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1.0 Purpose of this report

1.1. Background

This report supports a concept State Significant Development Application (concept SSD Application) submitted to the Department of Planning and Environment (DPE) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The concept SSD Application is made in accordance with Section 4.22 of the EP&A Act.

Sydney Metro is seeking to secure concept approval for a building envelope above the southern portal of Pitt Street Station, otherwise known as the over station development (OSD). The concept SSD Application seeks consent for a building envelope, maximum building height, land use options, pedestrian and vehicular access, circulation arrangements and associated car parking as well as the strategies and design parameters for the future detailed design of development.

Sydney Metro proposes to procure the construction of the OSD as part of an integrated station development package, which would result in the combined delivery of the station, OSD and public domain improvements. The station and public domain elements form part of a separate planning approval for Critical State Significant Infrastructure (CSSI) approved by DPE on 9 January 2017.

As the development is associated with railway infrastructure and is for residential or commercial premises with a Capital Investment Value of more than \$30 million, the project is a State Significant Development (SSD) pursuant to Schedule 1, Clause 19(2)(a) of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). The full extent of the proposed development can also be considered to be SSD by virtue of Clause 8(2) of the SRD SEPP.

This report has been prepared to specifically respond to the Secretary's Environmental Assessment Requirements (SEARs) issued for the concept SSD Application for Pitt Street South on 30th November 2017 which state that the Environmental Impact Statement (EIS) is to address the following requirements:

Aviation Report – Prescribed Airspace for Sydney Airport

1.2. Overview of the Sydney Metro in its context

The New South Wales (NSW) Government is implementing *Sydney's Rail Future*, a plan to transform and modernise Sydney's rail network so that it can grow with the city's population and meet the needs of customers in the future. Sydney Metro is a new standalone rail network identified in *Sydney's Rail Future*.

Sydney Metro is Australia's biggest public transport project, consisting of Sydney Metro Northwest, which is due for completion in 2019 and Sydney Metro City & Southwest, which is due for completion in 2024.

Sydney Metro West is expected to be operational in the late 2020s (refer to **Figure 1**).



Figure 1: Sydney Metro alignment map

Sydney Metro City & Southwest includes the construction and operation of a new metro rail line from Chatswood, under Sydney Harbour through Sydney's Central Business District (CBD) to Sydenham and on to Bankstown through the conversion of the existing line to metro standards.

The project also involves the delivery of seven new metro stations, including at Pitt Street. Once completed, Sydney Metro will have capacity for 30 trains an hour (one every two minutes) through the CBD in each direction - a level of service never seen before in Sydney.

On 9 January 2017, the Minister for Planning approved the Sydney Metro City & Southwest - Chatswood to Sydenham application lodged as a Critical State Significant Infrastructure project (reference SSI 15_7400), hereafter referred to as the CSSI Approval.

The CSSI Approval includes all physical work required to construct the CSSI, including the demolition of existing buildings and structures on each site. Importantly, the CSSI Approval also includes provision for the construction of below and above-ground structures and other components of the future integrated station development (including building infrastructure and space for future lift cores, plant rooms, access, parking and building services, as relevant to each site). The rationale for this delivery approach, as identified within the CSSI

Application, is to enable the integrated station development to be more efficiently built and appropriately integrated into the metro station structure.

The EIS for the Chatswood to Sydenham component of the Sydney Metro City & Southwest project identified that the OSD would be subject to a separate assessment process.

Since the CSSI Approval was issued, Sydney Metro has lodged four modification applications to amend the CSSI Approval as outlined below:

- Modification 1- Victoria Cross and Artarmon Substation which involves relocation of the Victoria Cross northern services building from 194-196A Miller Street to 50 McLaren Street together with inclusion of a new station entrance at this location referred to as Victoria Cross North. 52 McLaren Street would also be used to support construction of these works. The modification also involves the relocation of the substation at Artarmon from Butchers Lane to 98 – 104 Reserve Road. This modification application was approved on 18 October 2017.
- Modification 2- Central Walk which involves additional works at Central Railway Station including construction of a new eastern concourse, a new eastern entry, and upgrades to suburban platforms. This modification application was approved on 21 December 2017.
- Modification 3 - Martin Place Station which involves changes to the Sydney Metro Martin Place Station to align with the Unsolicited Proposal by Macquarie Group Limited (Macquarie) for the development of the station precinct. The proposed modification involves a larger reconfigured station layout, provision of a new unpaid concourse link and retention of the existing MLC pedestrian link and works to connect into the Sydney Metro Martin Place Station. This modification application was approved on 22 March 2018.
- Modification 4 - Sydenham Station and Sydney Metro Trains Facility South which incorporated Sydenham Station and precinct works, the Sydney Metro Trains Facility South, works to Sydney Water's Sydenham Pit and Drainage Pumping Station and ancillary infrastructure and track and signalling works into the approved project. This modification application was approved on 13 December 2017.

Given the modifications, the CSSI Approval is now approved to operate to Sydenham Station and also includes the upgrade of Sydenham Station.

The remainder of the City & Southwest project (Sydenham to Bankstown) proposes the conversion of the existing heavy rail line and the upgrade of the existing railway stations along this alignment to metro standards. This portion of the project, referred to as the Sydenham to Bankstown Upgrade, is the subject of a separate CSSI Application (No. SSI 17_8256) for which an Environmental Impact Statement was exhibited between September and November 2017 and a Response to Submissions and Preferred Infrastructure Report was submitted to the NSW Department of Planning & Environment (DPE) in June 2018 for further exhibition and assessment.

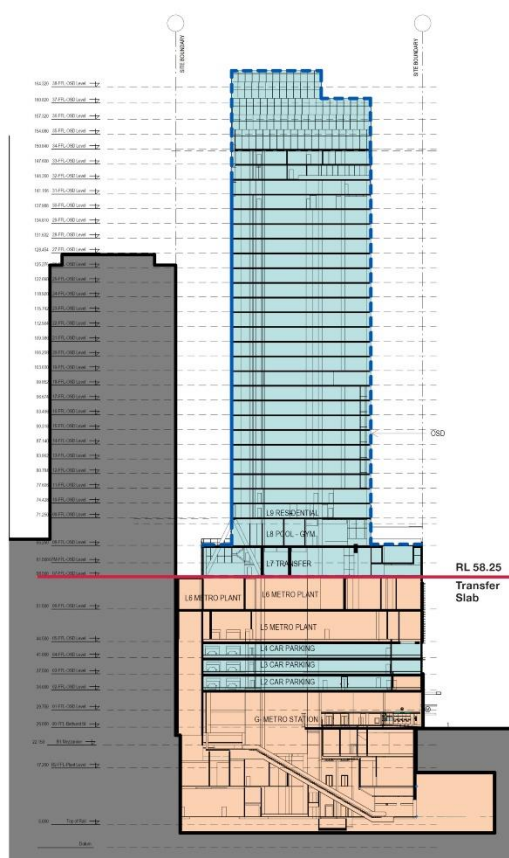
1.3. Planning relationship between Pitt Street Station and the OSD

While the southern portal of Pitt Street Station and the OSD will form an integrated station development, the planning pathways under the *Environmental Planning and Assessment Act 1979* involve separate approval for each component of the development. In this regard, the approved station works (CSSI Approval) are subject to the provisions of Part 5.1 of the EP&A Act (now referred to as Division 5.2) and the OSD component is subject to the provisions of Part 4 of the EP&A Act.

For clarity, the approved station works under the CSSI Approval included the construction of below and above ground structures necessary for delivering the station and also enabling construction of the integrated OSD. This included but is not limited to:

- demolition of existing development
- excavation
- station structure including concourse and platforms
- lobbies
- retail spaces within the station building
- public domain improvements
- station portal link (between the northern and southern portals of Pitt Street Station)
- access arrangements including vertical transport such as escalators and lifts
- structural and service elements and the relevant space provisioning necessary for constructing OSD, such as columns and beams, space for lift cores, plant rooms, access, parking, retail and building services.

The vertical extent of the approved station works above ground level is defined by the 'transfer slab' level (which for Pitt Street South is defined by RL 58.25), above which would sit the OSD. This delineation is illustrated in **Figure 2:** below.



Section North-South - CSSI Podium Approval below RL 58.25

Figure 2: Delineation between station and OSD

The CSSI Approval also establishes the general concept for the ground plane of Pitt Street Station including access strategies for commuters and pedestrians. In this regard, pedestrian access to the station would be from Bathurst Street and the OSD lobby would be accessed from Pitt Street.

Since the issue of the CSSI Approval, Sydney Metro has undertaken sufficient design work to determine the space planning and general layout for the station and identification of those spaces within the station area that would be available for the OSD. In addition, design work has been undertaken to determine the technical requirements for the structural integration of the OSD with the station. This level of design work has informed the concept proposal for the OSD. It is noted that ongoing design development of the works to be delivered under the CSSI Approval would continue with a view to developing an Interchange Access Plan (IAP) and Station Design Precinct Plan (SDPP) for Pitt Street Station to satisfy Conditions E92 and E101 of the CSSI Approval.

The public domain improvement works around the site would be delivered as part of the CSSI Approval.

1.4. The Site

The Pitt Street South OSD site is located near the corner of Pitt Street and Bathurst Street, comprising four individual allotments but excluding the Edinburgh Castle Hotel, above the southern portal of the future Pitt Street Station. The context of the site is demonstrated at **Figure 3** below.

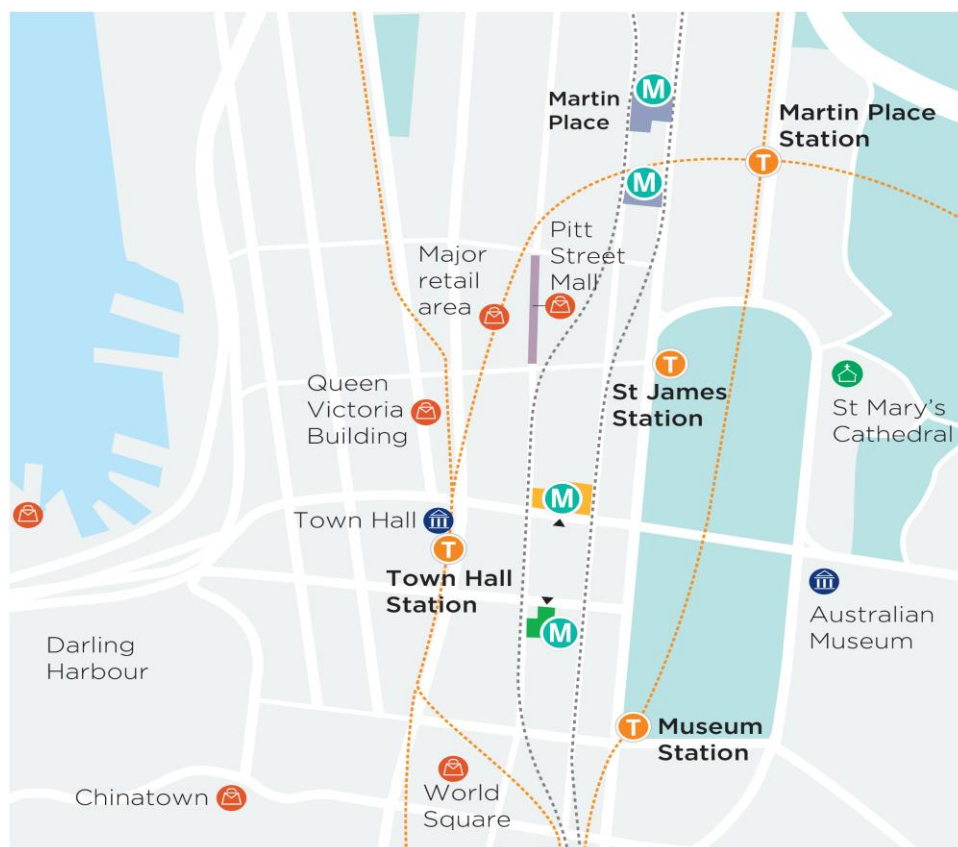


Figure 3: Pitt Street Station location plan

The site is located in the City of Sydney Local Government Area. The site (refer to **Figure 4** below) is irregular in shape, has a total area of approximately 1,708 square metres and has street frontages of approximately 32 metres to Pitt Street and 24 metres to Bathurst Street.

The Pitt Street South site comprises a number of individual properties which front Bathurst Street and Pitt Street. Specifically, the site comprises the following:

- 125-129 Bathurst Street, Sydney (Lot 1 in DP60293)
- 131-135 Bathurst Street, Sydney (Lot 1 in DP59101)
- 296-300 Pitt Street, Sydney (Lot 1 in DP436359)
- 302 Pitt Street, Sydney (Lot 1 in DP62668)

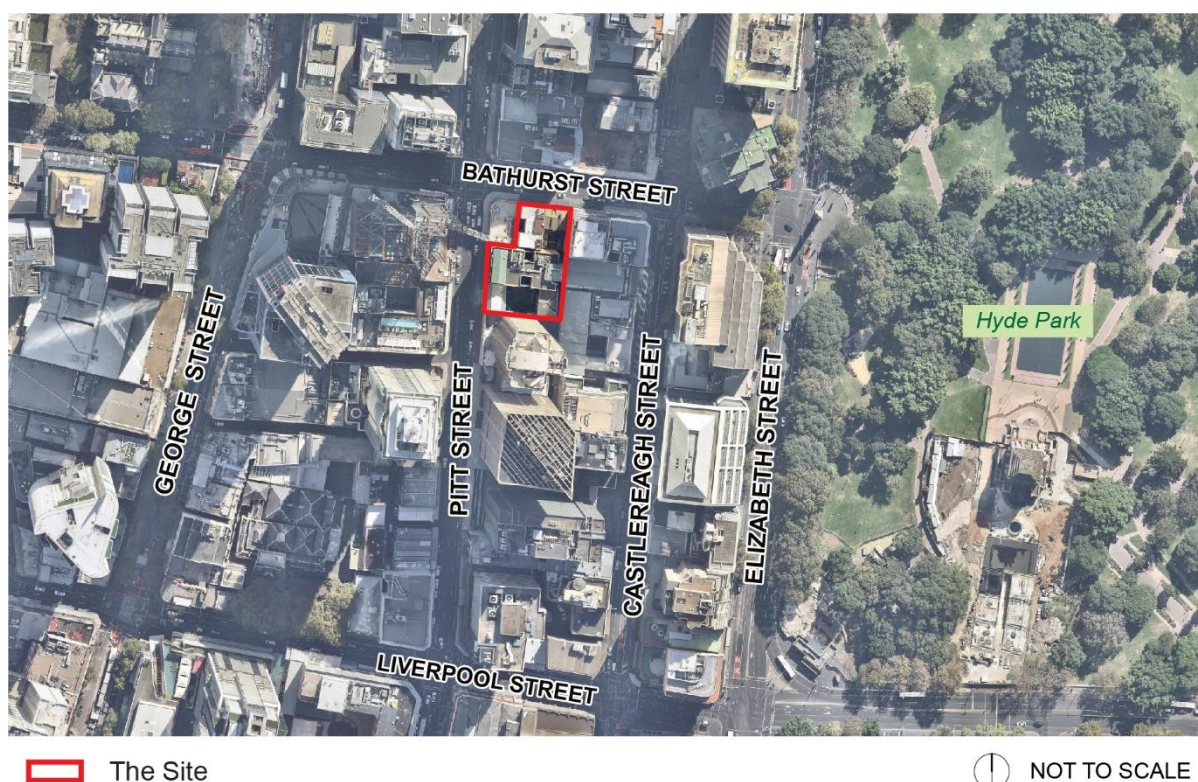


Figure 4: Aerial photo of Pitt Street South

1.5. Overview of the proposed development

This concept SSD Application comprises the first stage of the Pitt Street South OSD project. It will be followed by a detailed SSD Application for the design and construction of the OSD to be lodged by the successful contractor who is awarded the contract to deliver the integrated station development.

This concept SSD Application seeks approval for the planning and development framework and strategies to inform the future detailed design of the OSD. It specifically seeks approval for the following:

- a building envelope
- a maximum envelope height of Relative Level (RL 171.6) which equates to approximately 35 storeys, including the podium height of RL 71 which equates to approximately 8 storeys above ground
- use for the OSD component of the development for uses, subject to further detailed applications, which could include:
 - residential accommodation; or
 - commercial premises
 - use of the conceptual OSD space provisioning within the footprint of the CSSI Approval (both above and below ground), including the OSD lobby areas, podium car parking, storage facilities, services and back-of-house facilities

- car parking for a maximum of 34 spaces located across three levels of the podium
- loading, vehicular and pedestrian access arrangements from Pitt Street
- strategies for utilities and service provision
- strategies for the management of stormwater and drainage
- a strategy for the achievement of ecologically sustainable development
- indicative future signage
- a strategy for public art
- a design excellence framework
- the future subdivision of parts of the OSD footprint (if required)

As this concept SSD Application is a staged development pursuant to section 4.22 of the EP&A Act, future approval would be sought for detailed design and construction of the OSD. Concept indicative designs showing potential residential and commercial building form outcomes at the site have been provided as part of this concept SSD Application at Appendix E and Appendix F, respectively.

Pitt Street Station is to be a key station on the future Sydney Metro network, providing access to the Sydney CBD. The proposal combines the metro station with an OSD component. The OSD would assist in strengthening the role of Central Sydney as the key centre of business in Australia and would contribute to the diversity, amenity and sustainability of the CBD.

It is noted that Pitt Street Station northern portal OSD is subject to a separate application, and does not form part of this concept SSD Application.

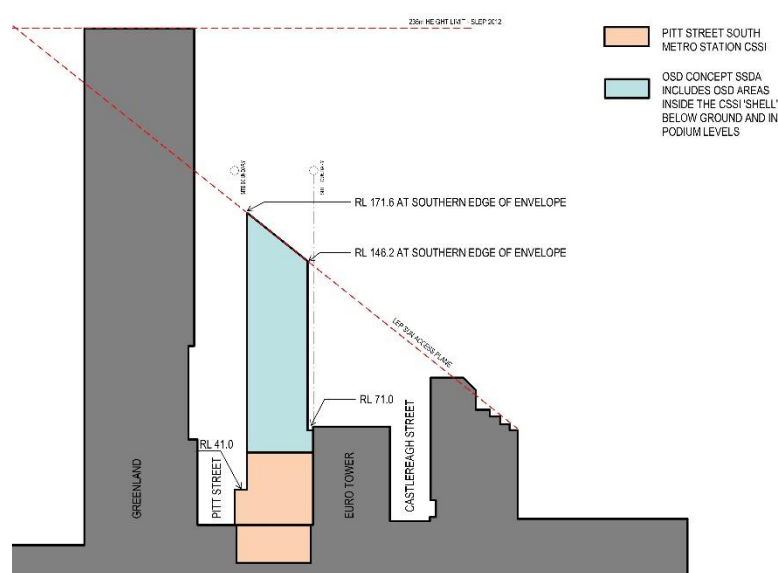


Figure 5: Pitt Street South OSD envelope, including OSD components (Blue) and station box (Orange)

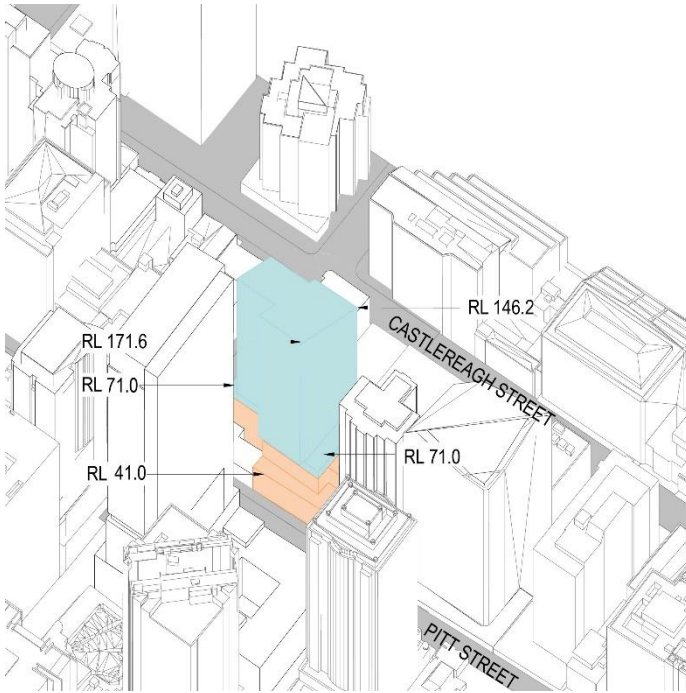


Figure 6: Pitt Street South OSD axonometric diagram, as seen from the south-west

1.6. Staging and framework for managing environmental impacts

Sydney Metro proposes to procure the delivery of the Pitt Street South integrated station development in one single package, which would entail the following works:

- station structure
- station fit-out, including mechanical and electrical
- OSD structure
- OSD fit-out, including mechanical and electrical.

Separate delivery packages are also proposed by Sydney Metro to deliver the excavation of the station boxes/shafts ahead of the integrated station development delivery package, and line-wide systems (e.g. track, power, ventilation) and operational readiness works prior to the Sydney Metro City & Southwest metro system being able to operate.

Three possible staging scenarios have been identified for delivery of the integrated station development:

1. Scenario 1 – the station and OSD are constructed concurrently by constructing the transfer slab first and then building in both directions. Both the station and OSD would be completed in 2024.
2. Scenario 2 – the station is constructed first and ready for operation in 2024. OSD construction may still be incomplete or soon ready to commence after station construction is completed. This means that some or all OSD construction is likely to still be underway upon opening of the station in 2024.
3. Scenario 3 – the station is constructed first and ready for operation in 2024. The OSD is built at a later stage, with timing yet to be determined. This creates two distinct construction periods for the station and OSD.

Scenario 1 represents Sydney Metro's preferred option as it would provide for completion of the full integrated station development and therefore the optimum public benefit at the site at the earliest date possible (i.e. on or near 2024 when the station is operational). However, given the delivery of the OSD could be influenced by property market forces, Scenarios 2 or 3 could also occur, where there is a lag between completion of the station component of the integrated station development (station open and operational), and a subsequent development.

The final staging for the delivery of the OSD would be resolved as part of the detailed SSD Application(s).

For the purposes of providing a high level assessment of the potential environmental impacts associated with construction, the following have been considered:

- Impacts directly associated with the OSD, the subject of this SSD Application
- Cumulative impacts of the construction of the OSD at the same time as the station works (subject of the CSSI Approval)

Given the integration of the delivery of the Sydney Metro City & Southwest metro station with an OSD development, Sydney Metro proposes the framework detailed in

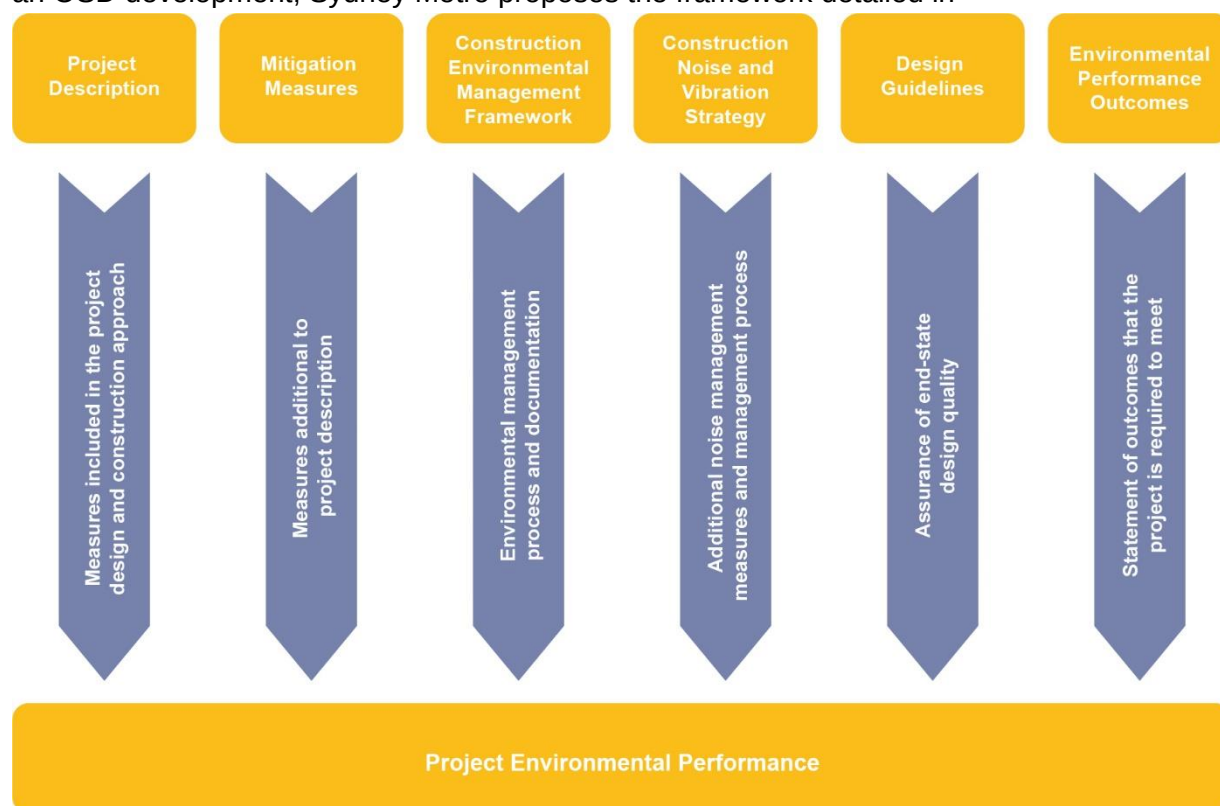


Figure 7 to manage the design and environmental impacts, consistent with the framework adopted for the CSSI Approval.

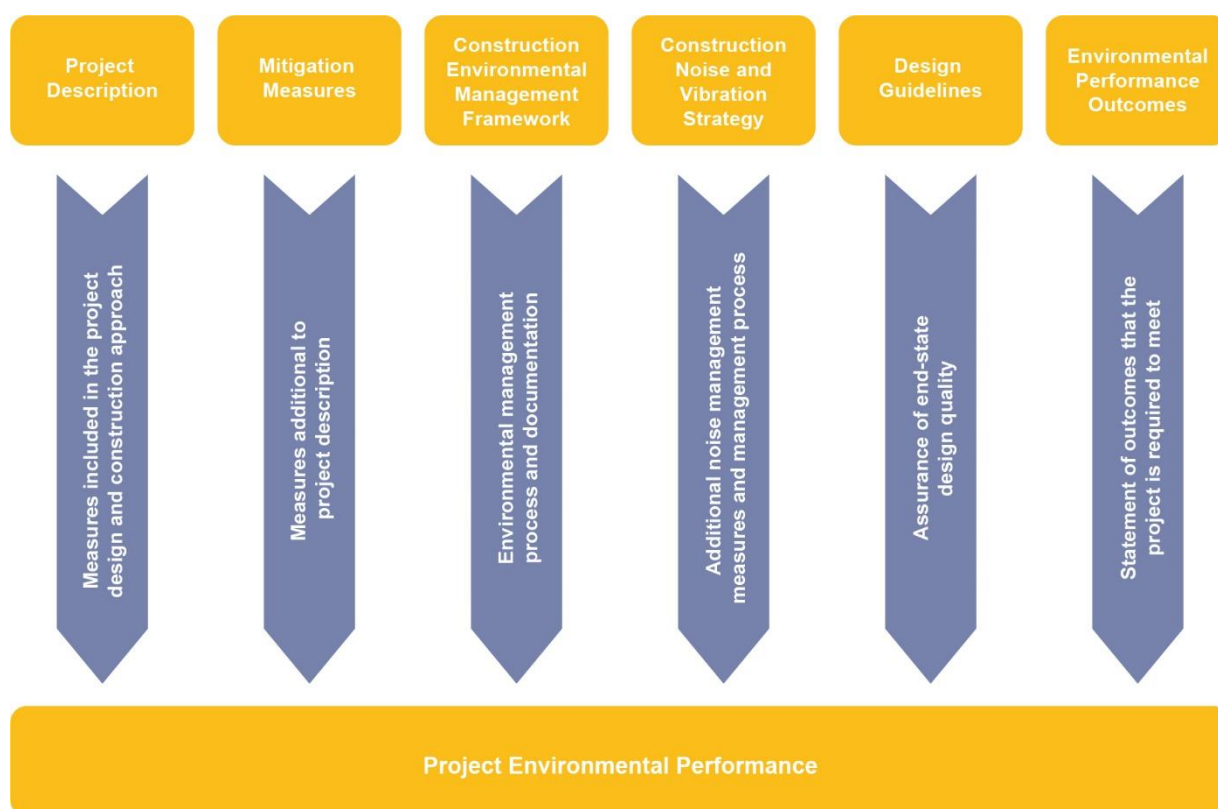


Figure 7: Project approach to environmental mitigation and management

Sydney Metro proposes to implement a similar environmental management framework where the integrated delivery of the CSSI station works and the OSD occur concurrently. This would ensure a consistent approach to management of design interface and construction-related issues.

Sydney Metro proposes this environmental management framework would apply to the OSD until completion of the station and public domain components of the integrated station development delivery contract (i.e. those works under the CSSI Approval). Should the OSD be constructed beyond the practical completion and opening of the station, standard practices for managing construction related environmental impacts would apply in accordance with the relevant guidelines and Conditions of Approval for the detailed SSD Application(s).

2.0 Introduction to Addendum

This document represents an Addendum to the LEAPP report “Review of Airspace Implications of Proposed Development” that had been prepared in late 2017 to support a concept State Significant Development (SSD) Application for an over station development (OSD) in the Sydney Central Business District (CBD). The original LEAPP report (Appendix Z: Aviation Report ATTACHMENT a) had been prepared to assess the implications on the airspace of Sydney Airport as a result of construction of a tall residential building development fronting onto Pitt St. and Bathurst St. in the Sydney CBD over the proposed Pitt St. South Metro station.

At the time the original airspace implication report was prepared in 2017 the proposed Pitt St. South OSD was planned to comprise a podium with a residential building on top, with the overall development having some 63 storeys. In the original concept for which the airspace report was prepared, the building development was proposed to rise to a top elevation of envelope of 261m AHD.

The scope of the project is to be revised, with the development being reduced from the original 63 storeys, down to approximately 35 storeys. As a result, the overall building elevation would now be reduced from 261m AHD, to 171.6m AHD.

As a result of this proposed reduction in the scale of the project, and particularly a reduction in the top elevation of the building, there is a need to comment on the effect of this on the original assessment of airspace implications prepared in late 2017. This Addendum to the original 2017 LEAPP report should be read in conjunction with that report (attached), as the only change in the building development proposal that is relevant to airspace operations is the change in the top elevation of the building. As that change is a reduction in the overall height and therefore elevation of the building, the effect is to reduce the extent of the obstacle to aviation, and consequently reduce its impact on the local airspace.

2.1 Consultation

The work carried out relates to an assessment of the proposed development upon the aviation environment in which the development is to be located. As such the work undertaken concerned matters that are entirely regulated and monitored exclusively by the Commonwealth Government, through the Civil Aviation Safety Authority (CASA) with respect to aviation safety and through Airservices Australia with respect to the operation of aircraft. As far as the airspace around the Sydney Airport is concerned, responsibility for monitoring and assessing the effect of obstacles around the airport, including over the Sydney CBD, has been delegated by CASA and Airservices to the Sydney Airport Corporation in the first instance.

Despite the delegation of responsibility to Sydney Airport Corporation for assessment of obstacles, only CASA and Airservices Australia have ultimate jurisdiction to rule upon the acceptability, or otherwise, of natural obstacles or man-made structures with respect to aircraft operations in the airspace into which such obstacles might protrude. Consequently,

other agencies and organizations at a state or municipal level do not have any jurisdiction in assessing the impact of obstacles upon aviation operations, nor are they consulted on this.

In carrying out the assessment of obstacle in the aviation environment over the Sydney CBD, we initially made contact with both CASA and Airservices, and were referred to discuss the obstacle limitation requirements for the proposed development site with the Sydney Airport Corporation. Contact was therefore made with the Sydney Airport Corporation, Airspace Protection Office (Peter Bleasdale, Airfield Design Manager – 02 9667 9246) in order to determine the requirements and process for approval of new obstacles.

Information obtained from the Sydney Airport Corporation confirmed that all obstacles rising above, or planned to rise above, 156m AHD would require that the proponent make formal application to the Airspace Protection Office of the Sydney Airport Corporation for formal assessment of the proposed obstacle (regardless of any obstacle assessments undertaken by other parties, such as the proponents for an adjacent development). It is recommended that this formal assessment be undertaken at the detailed SSD Application phase once final building and crane heights are known and to avoid duplication of the formal assessment process. The Airspace Protection Office will then forward its assessment and recommendation to CASA and Airservices for final adjudication. The process of assessment through to approval generally takes 3 months and will be undertaken as part of the detailed SSD Application process.

This aviation study has been undertaken to test the proposition that the proposed development, even at its proposed original top elevation, would not adversely affect the safety of aircraft operations over the Sydney CBD, as the resulting obstacle would still be lower in elevation than the existing critical obstacle for the area.

3.0 Airspace Environment for the Proposed Development

The proposed OSD development is located in precisely the same location as originally assessed for airspace impact in the 2017 LEAPP Report. The revised top elevation of the proposed OSD is 171.6m AHD, rather than 261m AHD as originally proposed. The obstacle environment surrounding the OSD project remains unchanged, with several tall commercial and residential tower structures existing within 300m of the OSD site. Those that rise above an elevation of 156m AHD have relevance for protection of the airspace around Sydney Airport. The existing tall structures within 300m of the project site that rise above 156m AHD are:

201 Elizabeth Street (189m AHD)

Meriton Apartments (161m AHD)

Greenland Centre Building (261m AHD) – under construction

HSBC Tower (167m AHD)

Century Tower (180m AHD)

Telstra Tower (161m AHD)

In addition to the above, the highest, and therefore the most critical, structure that forms an obstacle to aviation, in the airspace over the CBD is the Sydney Eye Tower (also previously known as the Centrepont / AMP development) which is approximately 465m north of the proposed Pitt St. OSD. This is noted on aeronautical charts as having a top elevation of 324.8m AHD (1065FT)¹. There are other tall structures (TV Masts) located to the north of the Sydney Harbour which are also within the Sydney Control Zone at 8.5NM from the Sydney Airport, and these rise to 1076FT (327.9m AHD) and form the governing obstacle setting the Minimum Safe Altitude (MSA) for aircraft operating in the airspace of the Control Zone of the Sydney Airport, and within 10NM of the airport. Based on an obstacle clearance requirement of 1000FT over the governing obstacle, rounded up to the nearest 100FT, to 1100FT (335.3m) AHD, the MSA is therefore set at 2100FT (640m) AHD.

While the Sydney Eye Tower forms the critical obstacle for aircraft operations over the airspace of the Sydney CBD south of the Harbour and in the immediate vicinity of the proposed Pitt St. OSD the Greenland Centre Building, which is an approved development under construction immediately adjacent to the proposed OSD is also significant. The Greenland Centre is located on the south-west corner of the intersection of Pitt St. and Bathurst St. in the CBD, and is directly across Pitt St. from the site of the proposed OSD. As the Greenland Centre is an approved development, already under construction to an elevation of 261m AHD, it will therefore rise above the revised elevation proposed for the

¹ Elevation data for the Sydney Eye Tower varies among reported sources as being from 324.8m AHD (Aeronautical Chart data and Architect's published information) to 330.7m AHD (Sydney Metro Martin Place Airspace Assessment – May 2017).

OSD, and be immediately adjacent to the site of the OSD and at the same distance from the airport as the OSD. Consequently, the OSD, once completed, will effectively add a second, but lower, obstacle very close to the original obstacle (Greenland Centre). In effect, construction of the OSD would not, therefore, add to the obstacle hazard environment of the southern part of the CBD. In addition, the highest obstacle in the immediate vicinity of the proposed OSD, the Sydney Eye Tower, establishes a 'shielding effect' for the proposed OSD (and for the taller Greenland Centre) as the OSD would not penetrate a 10% downward sloping conical surface from the top of the Sydney Eye Tower, which is an existing obstacle². The OSD is therefore shielded radially by this existing obstacle.

Due to the shielding effect of the Sydney Eye Tower, construction of the OSD at a top elevation of 171.6m AHD would not, therefore, add a more critical obstacle for aircraft operations within the airspace over the CBD.

² CASA MOS Part 139 Section 7.4.2.3

4.0 Revised Assessment of Airspace Hazard Due to Proposed OSD

The consultants have previously assessed the impact of the obstacle that would be created by construction of the OSD at the intersection of Pitt St. and Bathurst St. in the Sydney CBD. In this Addendum to the LEAPP report the assessment has been revised to take into account the effect of reducing the top elevation of the OSD down to 171.6m AHD. The outcome of the assessment is summarised in the following sections.

4.1. Assessment of Obstacle formed by the Proposed OSD at Pitt St. and Bathurst St.

The planned OSD proposed to be erected to a top elevation of 171.6m AHD in the Sydney CBD, is adjacent to an existing approved obstacle (the Greenland Centre Building) which, when completed in 2019, will be higher in elevation, and rise to 261m AHD immediately across Pitt St. and at a distance of less than 50m from the site of the OSD. The OSD is, however, shielded in terms of its effect as an obstacle in the airspace over the CBD both by the Greenland Centre Building and by the Sydney Eye Tower, which rises to a top elevation of 324.8m AHD some 465m north of the proposed OSD. Consequently, while the proposed OSD would create an additional obstacle for the airspace over the CBD, it will be considerably lower in elevation than the approved adjacent tower building. In addition, due to being shielded by the taller Sydney Eye Tower, the OSD would not negatively affect the safety of aircraft operations in the immediate vicinity and within 1NM of the proposed development site. The proposed OSD is also much lower than the governing obstacle (TV Masts at 328m AHD) that determine the permitted Minimum Safe Altitude of 2100FT (640m) AHD over the centre of Sydney and the harbour within 10NM radius from the Sydney Airport.

4.2. Assessment of OSD in relation to the Obstacle Limitation Surfaces for the Sydney Airport

The proposed OSD does not affect the most critical of the protected obstacle limitation surfaces established for Sydney Airport. Due to its location, it does not affect the approach and take-off areas for the runways, nor does it affect the declared protected transitional surfaces or the Inner Horizontal Surface. It does, however, lie within, and would penetrate, the declared Outer Horizontal Surface which has an obstacle limitation elevation of 156m AHD and is designed to protect the airport from the effect of taller obstacles further away from the airport. With a planned top elevation in excess of 156m AHD, the proposal to construct the OSD to an elevation of 171.6m AHD will trigger a need for the project to be subjected to official aeronautical review as to its impact on Sydney Airport, and on the safety of aircraft operations in the vicinity of the Sydney CBD. However, due to its location, approximately 8KM NNE of the airport and well clear of the approach and take-off areas, runway circling areas and the instrument approach procedures for the airport, the OSD would not affect these operations. For instrument departure procedures, the stipulated climb gradients for the critical departure procedures ensure adequate obstacle clearance over obstacles in the CBD. On account of this and the existence of other nearby obstacles rising

to higher elevations in the CBD, it is expected that any such review would deem the proposed project to be acceptable as an added obstacle in the airspace over the Sydney CBD.

4.3. Assessment of OSD in the Sydney CBD on Aircraft Operations and Prescribed Airspace

The consultants have reviewed the proscribed airspace that protects the operation of aircraft using the Sydney Airport, and have examined the current PANS-OPS flight procedures for the airport, such as the instrument arrival routes (STARs), instrument departure routes (SIDs), as well as the instrument approaches and missed approaches and circling areas defined for the airport runways. These surfaces, which are complex in nature, define the maximum elevations to which obstacles can exist consistent with aircraft performance requirements for operating into, and from, the Sydney airport, and for transiting through the protected airspace of the airport. Existing obstacles in the airspace are provided with a specific obstacle clearance allowance and this then defines the minimum safe altitude for aircraft operations in the vicinity of those obstacles. In general, the minimum safe altitude for aircraft in flight within 10NM of the airport, and therefore over the CBD is 2100FT, governed by the TV masts that rise to 328m AHD north of the harbour, whose elevation is 'rounded up' to the nearest 100FT on top of which a 1000FT obstacle clearance allowance is added.

As far as the flight procedures are concerned, the instrument routings leading to and from the airport either direct aircraft on flight paths that do not overfly the Sydney CBD, or are designed to ensure that aircraft operating close to the CBD have adequate obstacle clearance over the obstacle environment of the CBD. Similarly, the prescribed airspace that protects the airport approach lighting and precision approach path indicator systems (PAPIs) from being obscured by obstacles, and protects the transmission of electromagnetic signals from navigation and radar systems, is not affected by the proposal to construct the OSD in the CBD.

Consequently, it is concluded that the obstacles formed by the tall buildings in the CBD do not affect the published instrument flight procedures for Sydney Airport, or the proscribed airspace protecting other elements, and an additional obstacle such as the OSD immediately adjacent to an existing taller obstacle, would not add to the obstacle hazard for flight operations in the airspace over the Sydney CBD or around the Sydney airport generally.

Low level flight operations, such as by police, emergency and sight-seeing helicopters, do overfly the CBD at times, however these operations are all directed by Airservices, and aircraft are instructed to fly at prescribed minimum altitudes and on routings that ensure obstacle clearance is maintained over tall structures in the CBD. Due to the positively-controlled nature of the airspace environment over the CBD, the operation of helicopter traffic would not be adversely affected by the addition of the OSD adjacent to other taller structures.

4.4. Summary of Aviation Impact from development of the OSD at Pitt St. and Bathurst St.

The following table summarises the impact on the aviation environment of the Sydney CBD from the planned construction of the OSD close to the southeast corner of Pitt St. and Bathurst St. and the acceptability of this structure as an obstacle to aviation. This table accounts for the revised top elevation of the OSD at 171.6m AHD.

Obstacle Condition / Protection	Detail	Comment
Proposed New Obstacle	Proposed New Obstacle is the OSD at 171.6m AHD, located at 33° 52' 28.67" S 151° 12' 30.33" E (Corner of Pitt St. and Bathurst St. in Sydney CBD)	Current proposal for OSD is for the structure to rise to 171.6m AHD, which accounts for all roof-mounted equipment and structures
Existing Tallest Obstacle within Sydney CBD	Sydney Eye Tower at 324.8m AHD, 465m north of proposed OSD	Sydney Eye Tower is tallest obstacle in Sydney CBD within 1NM of proposed OSD.
Shielding of Proposed New Obstacle	Sydney Eye Tower at 324.8m AHD provides obstacle shielding of new structures down to 278.3m AHD at the location of new OSD	Proposed New OSD at 171.6m AHD is below the shielding limit provided by the Sydney Eye Tower, as per CASA MOS Part 139 Section 7.4.2.3
Existing Governing Obstacle within Sydney Control Zone and within 10NM of Sydney Airport	TV Masts at 1076FT (327.9m AHD) north of Sydney Harbour inside Sydney Control Zone	Currently this obstacle is the governing obstacle for the airspace within 10NM of the Sydney Airport, which includes the Sydney CBD
Minimum Safe Altitude (MSA) within 10NM of Sydney Airport & Minimum Radar Vectoring Altitude	2100FT (640m AHD)	MSA based on 1000FT obstacle clearance over the governing obstacle at 1076FT, rounded up to 1100FT (335.3m AHD). Proposed OSD at 171.6m AHD is well below the elevation of the governing obstacle within 10NM of the Sydney Airport by 161.67m
Sydney Airport Obstacle Limitation Surfaces (OLS)	New OSD violates OLS Outer Horizontal Surface at 156m AHD by 15.6m	Violation of OHS is the only violation of the Sydney Airport OLS due to OSD. Location of OSD suggests that noted violation would not

Obstacle Condition / Protection	Detail	Comment
		adversely affect aircraft operations over the Sydney CBD. Formal review and approval by Department of Infrastructure and Regional Development (DIRD) is required due to this violation
Sydney Airport PANS-OPS Surfaces	New OSD does not violate proscribed PANS-OPS Surfaces for Arrival, Approach and Circling Operations for Sydney Airport	OSD would not adversely affect aircraft operations for Arrival, Approach and Circling Operations as per published PANS-OPS surfaces
Sydney Airport Instrument Departure and Radar directed departure procedures	New OSD at 171.6m AHD in the Sydney CBD does not violate current instrument and radar directed departure procedures	Instrument and radar directed departures from Runway 34R and 07 towards north and northeast all have increased climb gradients (4.8% and 4.7% to 1500FT – 457.2m AHD) that ensure obstacle clearance for the Obstacle Identification Surfaces for the procedures over the proposed new OSD in the Sydney CBD. Flight procedures also ensure obstacle clearance for engine-out departures for 2, 3 and 4-engine aircraft.
Other Proscribed Airspace limitations for Sydney Airport	Proposed new OSD does not violate other proscribed airspace limitations such as for approach lighting, PAPIs, or radar terrain clearance, as published by Sydney Airport	Proposed new OSD would not adversely affect existing proscribed airspace limitations for Sydney Airport
Maximum Obstacle Elevation at the site of the Proposed New OSD	Maximum Obstacle Elevation at OSD site is governed by MSA obstacle limit of 1100FT (335.3m AHD).	Maximum obstacle elevation quoted (1100FT/335.3m AHD) provides obstacle clearance for all aircraft procedures and includes sufficient height of 163.7m

Obstacle Condition / Protection	Detail	Comment
		above the proposed OSD to accommodate construction cranes.

4.5. Conclusions Relating to Airspace Impact Due to Revised OSD Elevation

From review of the obstacle environment of the Sydney CBD, as well as the operation of the airspace and protection for flight operations established for Sydney Airport and within the positive control zone surrounding Sydney Airport (including the CBD), it is concluded that construction of the OSD at the proposed location and at a revised elevation of 171.6m AHD would not adversely affect the safety of flight operations at Sydney Airport, or within the airspace surrounding the airport.

While the proposed new OSD is to rise to a revised elevation of 171.6m AHD, the maximum obstacle limitation at this site is 335.3m AHD, which allows ample height (163.7m) above the structure for the temporary use of construction cranes.

It is to be noted that since the OSD is planned to rise above, and therefore penetrate, the top of the Outer Horizontal Surface protected at 156m AHD for the Sydney Airport, the development proposal for the OSD will need to be submitted for formal review by Sydney Airport Corporation, CASA and Airservices, and a formal determination made by the DIRD.

Sydney Metro City & Southwest

Pitt Street South Over Station Development:

Review of Airspace Implications of Proposed Development

Aviation Report ATTACHMENT

Applicable to:	Sydney Metro City & Southwest
Author:	Leading Edge Aviation Planning Professionals Pty Ltd
Owner	Sydney Airport
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1. Introduction

This report supports a concept State Significant Development (SSD) Application to be submitted to the Department of Planning and Environment (DPE) pursuant to Part 4 of the Environmental Planning and Assessment Act, 1979 (EP&A Act). The report concerns the impact, if any, of the proposed development on the airspace over the Central Business District (CBD) of Sydney and on aircraft flight operations at Sydney Airport and in the vicinity of the CBD.

Sydney Metro is seeking to secure approval for a Concept SSD for a residential building above the southern portal of the Pitt Street Metro Station (Pitt St. South or PSS), otherwise known as the “over station development” (OSD). Pitt St. is one of seven new stations and new underground platforms at Central Station approved as part of the Chatswood to Sydenham component of the Sydney Metro project, which is classified as Critical State Significant Infrastructure (CSSI). Specifically, this proposal relates to the southern station portal which forms part of Pitt St. Station, with a separate OSD process being undertaken regarding the Pitt St. North site.

The CSSI Approval (SSI 15_7400) was granted by the Minister for Planning on 9th January 2017, and includes approval for the construction of below and above ground structural and other components (including space provisioning) for the future OSD, although the fitout and use of such areas are noted as requiring separate development approvals under the relevant provision of the EP&A Act.

2. Site Description

The site of the proposed OSD is located near the corner of Bathurst and Bathurst St., comprising four individual allotments, but excluding the Edinburgh Castle Hotel. Accordingly, the site comprises two separate street frontages, one to Pitt St. to the west, and the other to Bathurst St. to the north. The site has a combined area of 1,708m² (**Figure 1**).

The site is located one block to the west of Hyde Park, and is within close proximity of the Town Hall and Museum Stations. The area surrounding the site comprises a mix of commercial and residential high density buildings, with finer grain buildings disbursed throughout. The site has a prominent location in Central Sydney, as well as proximity to nearby transport and entertainment precincts.

The Concept SSD, prepared on behalf of the Sydney Metro, relates to the collective development of the four constituent allotments, over the approved CSSI station element. The Concept SSD intends to allow for redevelopment of the site to deliver a single fully integrated station and OSD solution. The project will leverage the important urban renewal and development opportunities provided by the CSSI approval through the application of transit-

oriented development principles that support government objectives to achieve a more sustainable and efficient use of land, and to meet Sydney's housing and employment targets.

3. Overview of the Proposed Development

The proposal is a concept SSD (in accordance with Section 83B of the EP&A Act) which sets out the concept proposal for the development of the site. The concept contained in the concept SSD establishes the planning and development framework which will form the basis for the detailed design of the future building and against which the future detailed SSDs will be assessed.

The concept SSD seeks approval for the maximum building envelope for the proposed residential building, the maximum Gross Floor Area (GFA) and land uses for the building. The residential building is located immediately above and integrated with the approved Pitt St. Station southern portal.

The concept SSD more specifically seeks approval for key components and development parameters. From an airspace perspective the key element of the proposal is the construction of a building form above podium across the site, which enables development of a building form with a maximum building height of 235m above Bathurst St. The proposed top elevation of the 235m building structure is 261m AHD (Australian Height Datum).

An indicative scheme has been prepared as part of the concept SSD to illustrate what a future detailed application in accordance with the concept could look like.

An image of the concept SSD building envelope of the indicative design are provided in **Figure 2**.

4. Airspace Environment for the Proposed Development

The proposed OSD development is within the Sydney CBD among other existing tall structures. Within the immediate environs of the proposed OSD development there are several tall commercial and residential tower structures that rise above a 'marker' elevation of 156m AHD, which has relevance for protection of the airspace around Sydney Airport, as discussed later. The existing tall structures within 300m of the project site that rise above 156m AHD are:

- 201 Elizabeth Street (189m AHD)
- Meriton Apartments (161m AHD)
- Greenland Centre Building (261m AHD) – under construction
- HSBC Tower (167m AHD)
- Century Tower (180m AHD)
- Telstra Tower (161m AHD)

Aside from the above, the highest, and therefore the most critical, structure that forms an obstacle to aviation, in the airspace over the CBD is the Sydney Eye Tower (also previously known as the Centrepont / AMP development) which is approximately 465m north of the proposed Pitt St. OSD. This is noted on aeronautical charts as having a top elevation of 324.8m AHD (1065FT)¹. There are other tall structures (TV Masts) located to the north of the Sydney Harbour which are also within the Sydney Control Zone at 8.5NM from the Sydney Airport, and these rise to 1076FT (327.9m AHD) and form the governing obstacle setting the Minimum Safe Altitude (MSA) for aircraft operating in the airspace of the Control Zone of the Sydney Airport and within 10NM of the airport. Based on an obstacle clearance requirement of 1000FT over the governing obstacle, rounded up to the nearest 100FT to 1100FT (335.3m) AHD, the MSA is therefore set at 2100FT (640m) AHD.

While the Sydney Eye Tower forms the critical obstacle for aircraft operations over the airspace of the Sydney CBD south of the Harbour and in the immediate vicinity of the proposed Pitt St. OSD, the Greenland Centre Building, which is an approved development under construction immediately adjacent to the proposed OSD is also significant. The Greenland Centre is located on the south-west corner of the intersection of Pitt St. and Bathurst St. in the CBD, and is directly across Pitt St. from the site of the proposed OSD. As the Greenland Centre is an approved development already under construction to an elevation of 261m AHD, it will therefore rise to the same elevation as is proposed for the OSD, and be immediately adjacent to the site of the OSD and at the same distance from the airport as the OSD. Consequently, the OSD, once completed, will effectively add a second obstacle very close to the original obstacle (Greenland Centre), but no higher than that obstacle. In effect, construction of the OSD would not, therefore, add to the obstacle hazard environment of the southern part of the CBD. In addition, the highest obstacle in the immediate vicinity of the proposed OSD, the Sydney Eye Tower, establishes a 'shielding effect' for the proposed OSD (and for the Greenland Centre) as the OSD would not penetrate a 10% downward sloping conical surface from the top of the Sydney Eye Tower, which is an existing obstacle². The OSD is therefore shielded radially by this existing obstacle.

Due to the shielding effect of the Sydney Eye Tower, construction of the OSD at a top elevation of 261m AHD would not, therefore, add a more critical obstacle for aircraft operations within the airspace over the CBD.

¹ Elevation data for the Sydney Eye Tower varies among reported sources as being from 324.8m AHD (Aeronautical Chart data and Architect's published information) to 330.7m AHD (Sydney Metro Martin Place Airspace Assessment – May 2017).

² CASA MOS Part 139 Section 7.4.2.3

5. Protection of the Airspace and Aircraft Operations Over the Sydney CBD

The airspace over the Sydney CBD is protected from erection of obstacles that might compromise aircraft safety in the following ways:

- By protection of the Sydney Airport Obstacle Limitation Surfaces (OLS), defined by the Civil Aviation Safety Authority (CASA) and promulgated under the Civil Aviation Safety Regulations Part 139;
- By protection of the Obstacle Identification Surfaces (OIS) required to safeguard the flight procedures defined for the Sydney Airport, and known as the PANS-OPS surfaces (as specified in ICAO Doc 8168 Procedures for Air Navigation Services – Operations), and defined, monitored and amended from time to time by Airservices³;
- By protection of several other surfaces of relevance to aviation that protect the signal transmission from ground-based air navigation aids (including radar equipment), protect the visibility of airfield lighting such as High Intensity Approach Lighting to approaching aircraft, protect terrain clearance for aircraft vectored in the airspace under radar guidance, and protect the visibility of the Precision Approach Path Indicator systems (PAPI) for landing aircraft.

Protection of the airspace from erection of obstacles that could create a hazard to aviation either by infringing vertically into the airspace so as to create a collision risk, or by obscuring electromagnetic transmissions from navigation aids and visibility of airfield lighting systems, is achieved by regulation of the required protection surfaces by the Commonwealth Government - Department of Infrastructure and Regional Development (DIRD)- under the Airports (Protection of Airspace) Regulations.

5.1. Sydney Airport Obstacle Limitation Surfaces

As far as erection of obstacles that could affect aircraft operations at or above Sydney Airport is concerned, a set of OLS has been established by CASA to ensure obstacles are not erected that might represent a hazard to flight operations for aircraft arriving at, or departing from, Sydney Airport, or otherwise circling around or over Sydney Airport, or transiting the Sydney airspace. These surfaces define the required areas within which obstacles are to be assessed, monitored and controlled so that additional hazards are not created due to obstacles that are too high, or inappropriately located, with respect to safe aircraft flight operations. While the defined OLS are designed to enable the aviation regulator to control and prevent erection of obstacles that might have an adverse effect on safe flight operations, they are also intended to define the maximum height to which obstacles can safely be erected

³ Formerly known as 'Airservices Australia'

beneath the OLS, and where obstacles may penetrate the protected OLS but may be permitted on the basis of an aeronautical study that demonstrates that such violations of the OLS do not result in a hazard to aircraft operations. The OLS applicable to the Sydney Airport are illustrated in **Figure 3**.

In relation to the Sydney Airport, the proposed OSD is located approximately 8KM to the NNE of Sydney Airport⁴, and outside the critical approach and take-off areas for the runways, outside the transitional areas for the runways, and outside the protected Inner Horizontal Surface area established at a distance of 4KM around the airport. The OSD is, however, located within the declared Outer Horizontal Surface (OHS) area for the airport which extends to a distance of 15KM around the airport. This protected surface is an imaginary plane that is set at a height of 150m above the airport reference elevation (i.e. at an elevation of 156m AHD in the case of Sydney Airport) and forms a protected surface that is monitored and controlled to the extent necessary to ensure safe flight operations for the airport. At 261m AHD, the proposed OSD would penetrate the OHS by 105m, however its location well away from the protected surfaces for the runway approach and take-off surfaces would suggest a low probability for an adverse impact on the airspace arising from construction of this building form above podium.

Several tall buildings already exist in the Sydney CBD and the six buildings listed above in Section 4 that are located within 300m of the proposed OSD all rise above 156m AHD and therefore all already penetrate the OHS. This already creates an obstacle environment containing structures that penetrate the protected OHS for the airport, which has the effect of establishing precedents for tall structures in the CBD that are judged to be acceptable obstacles in terms of flight operations. Nevertheless, any additional tall structures that are planned to be constructed within 15KM of the Sydney Airport, and which would rise to an elevation above 156m AHD and penetrate the OHS of the OLS established for the airport are subject to review and approval by the CASA, based on advice from Sydney Airport and Airservices. Consequently, the OSD, which lies within the area of the OHS and has a planned top elevation of 261m AHD, is required to be reviewed officially through the formal review and approval process, since it is to be taller than 156m AHD.

5.2. Sydney Airport PANS-OPS Surfaces

It is to be noted that the official review that will be required for the OSD also covers the implications of the proposed development on the instrument flight procedures for the airport, with these being the airport's instrument arrival and departure routes, instrument approaches to the three runways, and procedures for runway circling. This element of the official review is assessed by Airservices as the operator of the airspace.

⁴ The OSD site is 7.1KM from the threshold of Runway 16R on a bearing of 029°T, 8.7KM from the threshold of Runway 16L on a bearing of 012°T, and 7.2KM from the threshold of Runway 25 on a bearing of 014°T.

As far as the arrival, approach, missed approach and circling procedures are concerned, the prescribed airspace of the PANS-OPS surfaces defined to protect the Sydney Airport is illustrated in **Figure 4**. As is evident, the proposed OSD is sited well clear of the prescribed airspace for the PANS-OPS surfaces and is therefore not significant to flight operations based on these procedures.

Mention should be made, however, of two of the Standard Instrument Departure (SID) procedures published for Take-off from Runway 34R. These are the ENTRA 5 and MARUB 6 SIDs. The former directs aircraft departing from Runway 34R and heading towards the north and northeast to climb on a track to the east of the Sydney CBD and therefore past the proposed OSD and Sydney Eye Tower, while the latter initially directs aircraft departing from Runway 34R in a climbing right turn towards the CBD, before continuing in the turn towards the south and east. An illustration of the existing departure flight procedures for the Sydney Airport runways is shown in **Figure 5**.

Both of the above SIDs require that aircraft climb to 500FT off the runway and then initiate turns to the right, climbing at a minimum climb gradient of 4.8% until reaching 1500FT AMSL (457.2m), and at a gradient of 3.3% thereafter. This is done to ensure that aircraft achieve an adequate obstacle clearance over close-in obstacles within the first 9.5KM along the departure flight track, allowing for deviation from the intended flight track due to winds. While a detailed examination of the two SIDs has not been carried out, it is possible that for the ENTRA 5 SID, which passes by the proposed OSD and the Sydney Eye Tower in the CBD, the OIS for the procedure may include the OSD and the Sydney Eye Tower and consequently a check of the expected altitude of aircraft using these procedures has been made. Based on achieving a 4.8% climb gradient an aircraft departing from Runway 34R on the ENTRA 5 SID would reach an altitude of 1445FT (440.6m) when passing abeam the OSD giving an obstacle clearance over the OSD of 179.65m, and reach an altitude of 1500FT (457m) just before passing abeam the Sydney Eye Tower and ensuring an obstacle clearance over the top elevation of the Sydney Eye Tower of just over 141m in the climb. A similar argument would apply for radar directed departures from Runway 34R, which also require a climb gradient of 4.8% until an altitude of 1500Ft is reached, while radar directed departures from Runway 07 require a climb gradient of 4.7%.

For the MARUB 6 procedure, which also involves a climbing right turn after reaching 500FT after take-off, an aircraft following the specified procedure parameters for the turn⁵ would already be heading towards the southeast and away from the CBD after reaching an altitude of 1100FT (335m), which is already above the elevation of both the OSD and the Sydney Eye Tower. Consequently, it is not expected that this procedure would be impacted by development of the OSD in the CBD.

⁵ This procedure requires a right turn upon reaching 500FT after take-off, a continued climbing right turn at 4.8% climb gradient at an indicated airspeed no greater than 180KTS, with an angle of bank not less than 25°.

5.3. Sydney Airport Control Zone

While the obstacle environment around the Sydney Airport is protected from erection of obstacles that might infringe upon the prescribed airspace and flight procedures of the airport, a further layer of protection exists in the form of the positive control of aircraft operating within the Sydney Control Zone. Within this Control Zone all aircraft operations are positively controlled by Airservices while in flight, whether approaching, landing or taking off from Sydney Airport, whether over-flying the Sydney Airport controlled airspace, or whether operating within or transiting the controlled airspace. Specific aircraft routings, headings and maximum and minimum altitudes are assigned for these operations so as to ensure safe operations over obstacles, and with respect to other aircraft in flight.

As far as the proposed OSD is concerned, this is to be located within the Class C controlled airspace of the Sydney Airport Control Zone, where all aircraft operations are controlled from the surface of the earth to the ceiling of the control zone. As such, the proposed new development lies within airspace that is totally controlled by air traffic control from the Sydney Area Control Centre and any risk of the new obstacle becoming a hazard to aircraft in flight is mitigated by the fact that aircraft operating over the airspace of the CBD are assigned specific altitudes and routings to ensure sufficient vertical clearance over obstacles, and thereby ensure safe flight operations.

6. Assessment of Airspace Hazard Due to Proposed OSD

The consultants have assessed the impact of the obstacle that would be created by construction of the OSD at the intersection of Pitt St. and Bathurst St. in the Sydney CBD. The outcome of the assessment is described in the following sections.

6.1. Assessment of Obstacle formed by the Proposed OSD at Pitt St. and Bathurst St.

The planned OSD, proposed to be erected to a top elevation of 261m AHD in the Sydney CBD, is adjacent to an existing approved obstacle (the Greenland Centre Building) which, when completed in 2019, will also rise to 261m AHD immediately across Pitt St. and at a distance of less than 50m from the site of the OSD. The OSD is, however, shielded in terms of its effect as an obstacle in the airspace over the CBD by the Sydney Eye Tower, which rises to a top elevation of 324.8m AHD some 465m north of the proposed OSD. Consequently, while the proposed OSD would create an additional obstacle for the airspace over the CBD, it will not rise any higher than the approved adjacent tower building. In addition, due to being shielded by the taller Sydney Eye Tower, the OSD would not negatively affect the safety of aircraft operations in the immediate vicinity and within 1NM of the proposed development site. The proposed OSD is also lower than the governing obstacle (TV Masts at 328m AHD) that

determine the permitted Minimum Safe Altitude (MSA) of 2100FT (640m) AHD over the centre of Sydney and the harbour within 10NM radius from the Sydney Airport.

6.2. Assessment of OSD in relation to the Obstacle Limitation Surfaces for the Sydney Airport

The proposed OSD does not affect the most critical of the protected OLS established for the Sydney Airport. For instance, due to its location, it does not affect the approach and take-off areas for the runways, nor does it affect the declared protected transitional surfaces or the Inner Horizontal Surface. It does, however, lie within, and would penetrate, the declared OHS which has an obstacle limitation elevation of 156m AHD and is designed to protect the airport from the effect of taller obstacles further away from the airport. With a planned top elevation in excess of 156m AHD, the proposal to construct the OSD to an elevation of 261m AHD will trigger a need for the project to be subjected to official review as to its impact on Sydney Airport and on the safety of aircraft operations in the vicinity of the Sydney CBD. However, due to its location, approximately 8KM NNE of the airport and well clear of the approach and take-off areas, runway circling areas and the instrument approach procedures for the airport, the OSD would not affect these operations. For instrument departure procedures, the stipulated climb gradients for the critical departure procedures ensure adequate obstacle clearance over obstacles in the CBD. On account of this and the existence of other obstacles rising to the same elevation, and higher, in the CBD, it is expected that any such review would deem the proposed building form above podium project to be acceptable as an added obstacle in the airspace over the Sydney CBD.

6.2.1 Assessment of OSD in the Sydney CBD on Aircraft Operations and Prescribed Airspace

The consultants have reviewed the proscribed airspace that protects the operation of aircraft using the Sydney Airport, and have examined the current PANS-OPS flight procedures for the airport, such as the instrument arrival routes (STARs), instrument departure routes (SIDs), as well as the instrument approaches and missed approaches and circling areas defined for the airport runways. As far as these flight procedures are concerned, the instrument routings either direct aircraft on flight paths that do not overfly the Sydney CBD, or are designed to ensure that aircraft operating close to the CBD have adequate obstacle clearance over the obstacle environment of the CBD. Similarly, the proscribed airspace that protects the airports approach lighting and PAPIs from being obscured by obstacles and protects the transmission of electromagnetic signals from navigation and radar systems is not affected by the proposal to construct the OSD in the CBD. Consequently, it is concluded that the obstacles formed by the tall buildings in the CBD do not affect the published instrument flight procedures for Sydney Airport, or the prescribed airspace protecting other elements, and an additional obstacle such as the OSD immediately adjacent to an existing obstacle of the same elevation, would not add to the obstacle hazard for flight operations in the airspace over the Sydney CBD or around the Sydney airport generally.

Low level flight operations, such as by police, emergency and sight-seeing helicopters, do overfly the CBD at times, however these operations are all directed by Airservices, and aircraft are instructed to fly at prescribed minimum altitudes and on routings that ensure obstacle clearance is maintained over tall structures in the CBD. Due to the positively-controlled nature of the airspace environment over the CBD, the operation of helicopter traffic is not expected to be adversely affected by the addition of the OSD adjacent to another potentially tall structure at the same elevation.

6.3. Summary of Aviation Impact from Development of the OSD at Pitt St. and Bathurst St.

The following table summarises the impact on the aviation environment of the Sydney CBD from the planned construction of the OSD close to the southeast corner of Pitt St. and Bathurst St. and the acceptability of this structure as an obstacle to aviation.

Obstacle Condition / Protection	Detail	Comment
Proposed New Obstacle	Proposed New Obstacle is the OSD at 261m AHD, located at 33° 52' 28.67" S 151° 12' 30.33" E (Corner of Pitt St. and Bathurst St. in Sydney CBD)	Current proposal for OSD is for the structure to rise to 261m AHD, which accounts for all roof-mounted equipment and structures
Existing Tallest Obstacle within Sydney CBD	Sydney Eye Tower at 324.8m AHD, 465m north of proposed OSD	Sydney Eye Tower is tallest obstacle in Sydney CBD within 1NM of proposed OSD
Shielding of Proposed New Obstacle	Sydney Eye Tower at 324.8m AHD provides obstacle shielding of new structures down to 278.3m AHD at location of new OSD	Proposed New OSD at 261m AHD is below shielding limit provided by Sydney Eye Tower, as per CASA MOS Part 139 Section 7.4.2.3
Existing Governing Obstacle within Sydney Control Zone and within 10NM of Sydney Airport	TV Masts at 1076FT (327.9m AHD) north of Sydney Harbour inside Sydney Control Zone	Currently this obstacle is the governing obstacle for the airspace within 10NM of the Sydney Airport, which includes the Sydney CBD
MSA within 10NM of Sydney Airport & Minimum Radar Vectoring Altitude	2100FT (640m AHD)	MSA based on 1000FT obstacle clearance over the governing obstacle at 1076FT, rounded up to 1100FT (335.3m AHD).

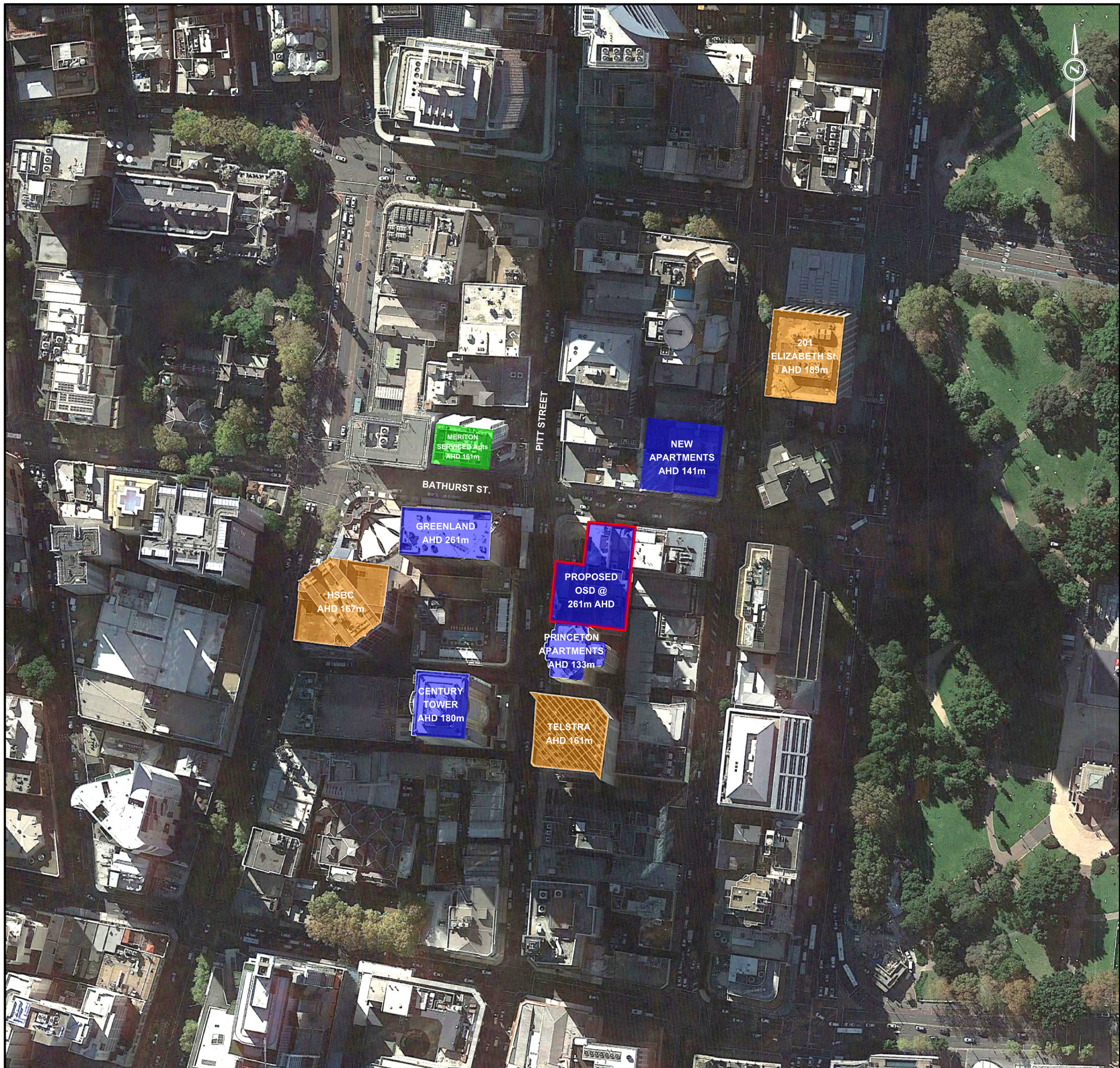
Obstacle Condition / Protection	Detail	Comment
		Proposed OSD at 261 m AHD is below the elevation of the governing obstacle within 10NM of the Sydney Airport by 74.3m
Sydney Airport OLS	New OSD violates OLS OHS at 156m AHD by 105m	Violation of OHS is the only violation of the Sydney Airport OLS due to OSD. Location of OSD suggests that noted violation would not adversely affect aircraft operations over the Sydney CBD. Formal review and approval by DIRD required due to this violation
Sydney Airport PANS-OPS Surfaces	New OSD does not violate proscribed PANS-OPS Surfaces for Arrival, Approach and Circling Operations for Sydney Airport	OSD would not adversely affect aircraft operations for Arrival, Approach and Circling Operations as per published PANS-OPS surfaces
Sydney Airport Instrument Departure and Radar directed departure procedures	New OSD at 261m AHD in the Sydney CBD does not violate current instrument and radar directed departure procedures	Instrument and radar directed departures from Runway 34R and 07 towards north and northeast all have increased climb gradients (4.8% and 4.7% to 1500FT – 457.2m AHD) that ensure obstacle clearance for procedure OIS over the proposed new OSD in the Sydney CBD. Procedures also ensure obstacle clearance for engine-out departures for 2, 3 and 4-engine aircraft.
Other Proscribed Airspace limitations for Sydney Airport	Proposed new OSD does not violate other proscribed airspace limitations such as for approach lighting, PAPIs, or radar terrain clearance, as published by Sydney Airport	Proposed new OSD would not adversely affect existing proscribed airspace limitations for Sydney Airport

Obstacle Condition / Protection	Detail	Comment
Maximum Obstacle Elevation at the site of the Proposed New OSD	Maximum Obstacle Elevation at OSD site is governed by MSA obstacle limit of 1100FT (335.3m AHD).	Maximum obstacle elevation quoted (1100FT/335.3m AHD) provides obstacle clearance for all aircraft procedures and includes sufficient height of 74m above the proposed OSD to accommodate construction cranes.

7. Conclusions

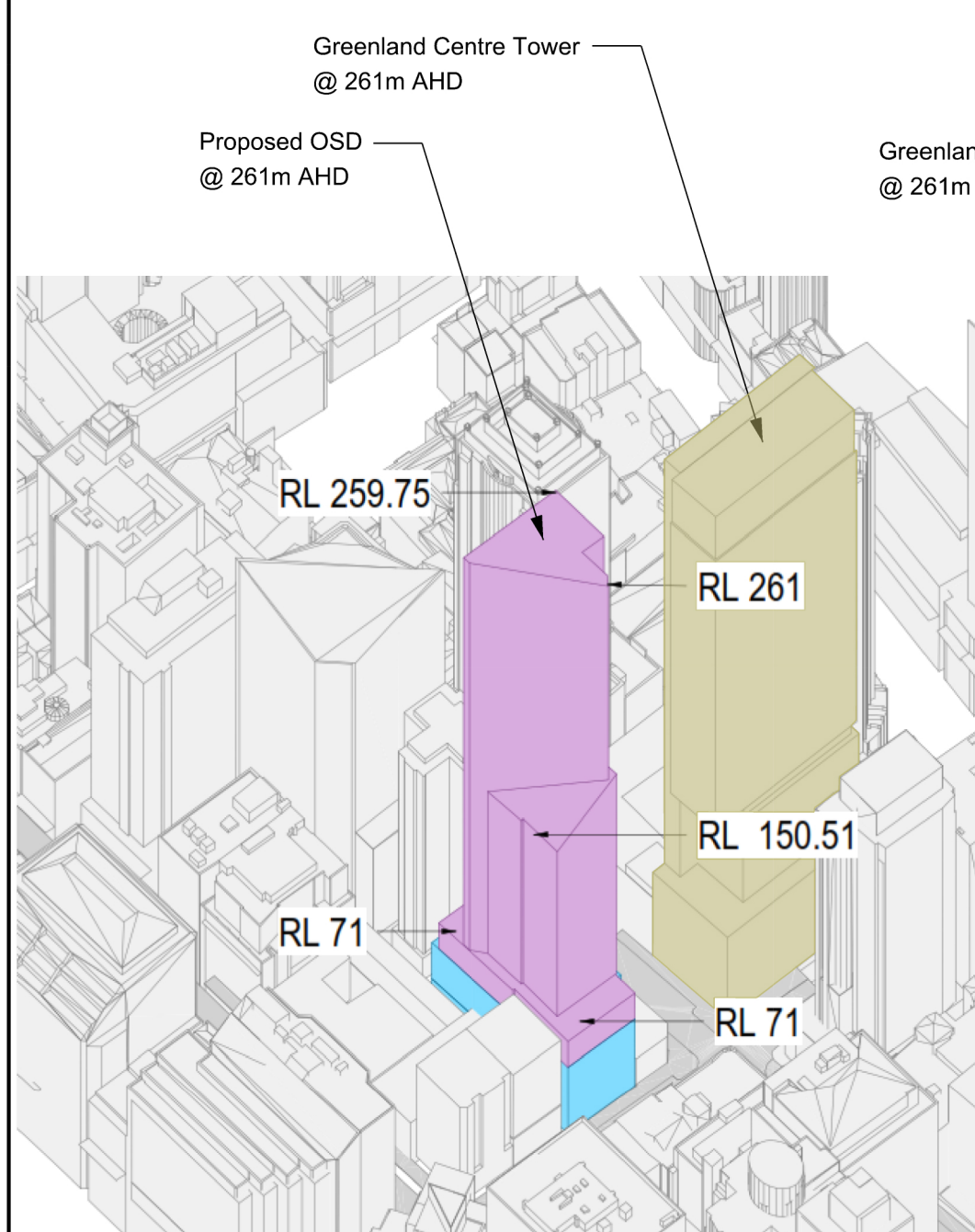
From review of the obstacle environment of the Sydney CBD, as well as the operation of the airspace and protection for flight operations established for Sydney Airport and within the positive control zone surrounding Sydney Airport (including the CBD), it is concluded that construction of the OSD at the proposed location and elevation would not adversely affect the safety of flight operations at Sydney Airport, or within the airspace surrounding the airport. While the proposed new OSD is to rise to 261m AHD, the maximum obstacle limitation at this site is 335.3m AHD, which allows sufficient height (74m) above the structure for the temporary use of construction cranes.

It is to be noted that since the OSD is planned to rise above the top of the OHS protected at 156m AHD for the Sydney Airport, the development proposal for the OSD will need to be submitted for formal review by Sydney Airport Corporation, CASA and Airservices, and a formal determination made by the DIRD. This formal review is therefore the next step in progressing the approval for the OSD, in terms of its impact as an obstacle to aviation, and application for that will need to be made to the Airspace Protection Office at the Sydney Airport Corporation.

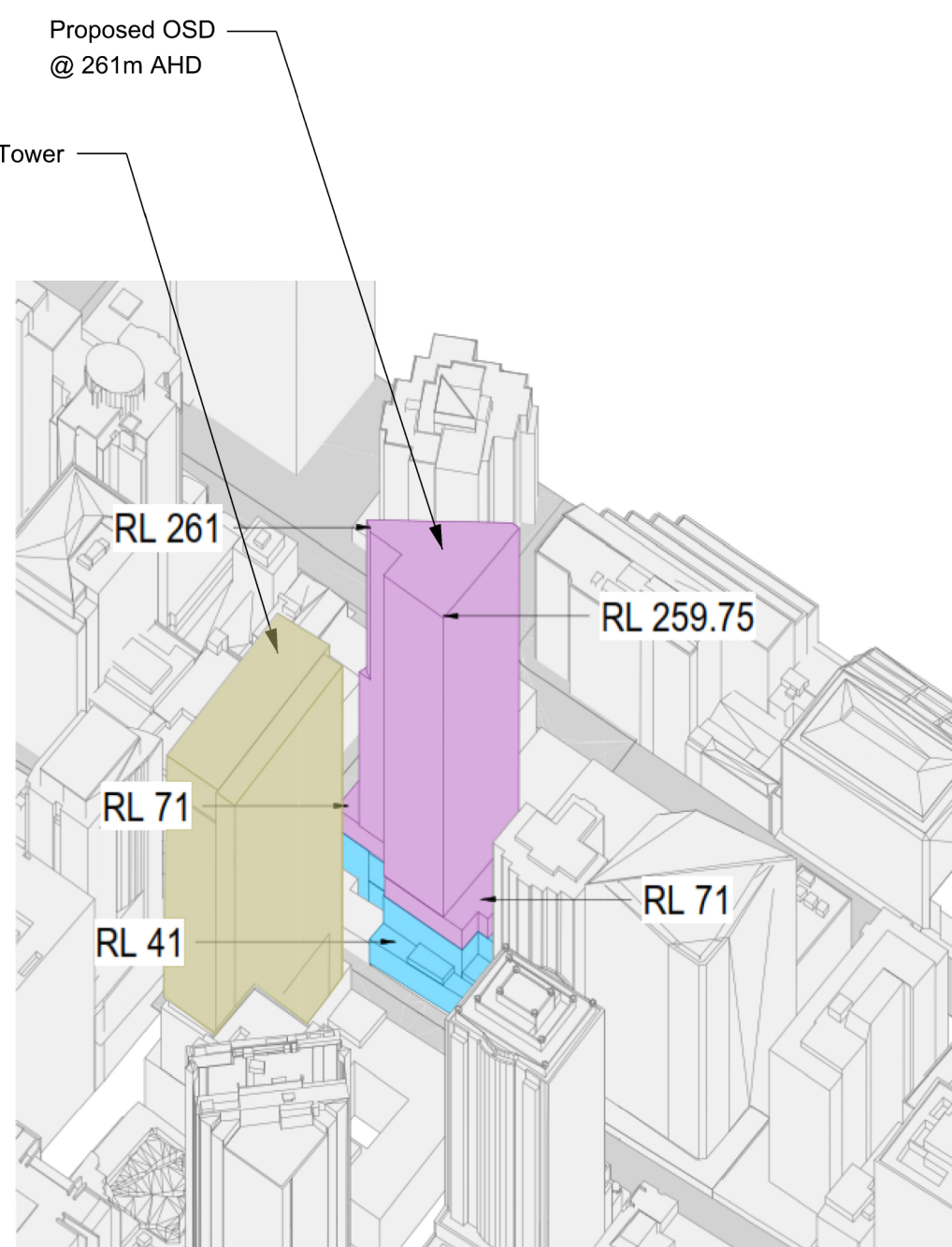


**SYDNEY METRO PROJECT
PITT ST.**

Figure 1
Proposed OSD in Relation
to other Nearby Tall Buildings
in the Sydney CBD



View from north-east

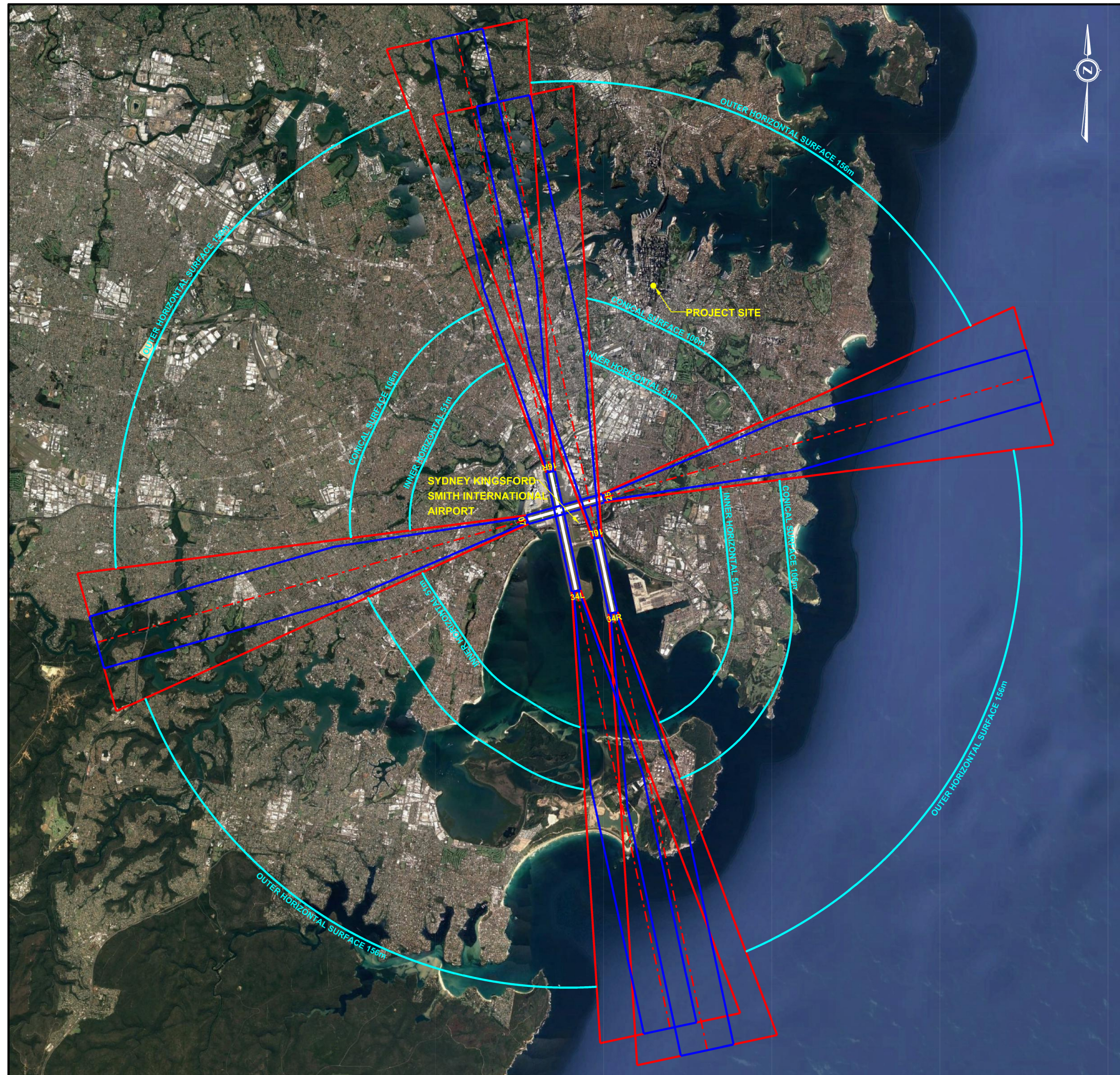


View from South-West

**SYDNEY METRO PROJECT
PITT ST.**

Figure 2
Proposed OSD in Relation
to Adjacent Buildings





GHDWOODHEAD

Legend:

-  Extent of Inner Horizontal Surface, Conical Surface & Outer Horizontal Surface
-  Runway Take-off Surface
-  Runway Approach Surface

Note:

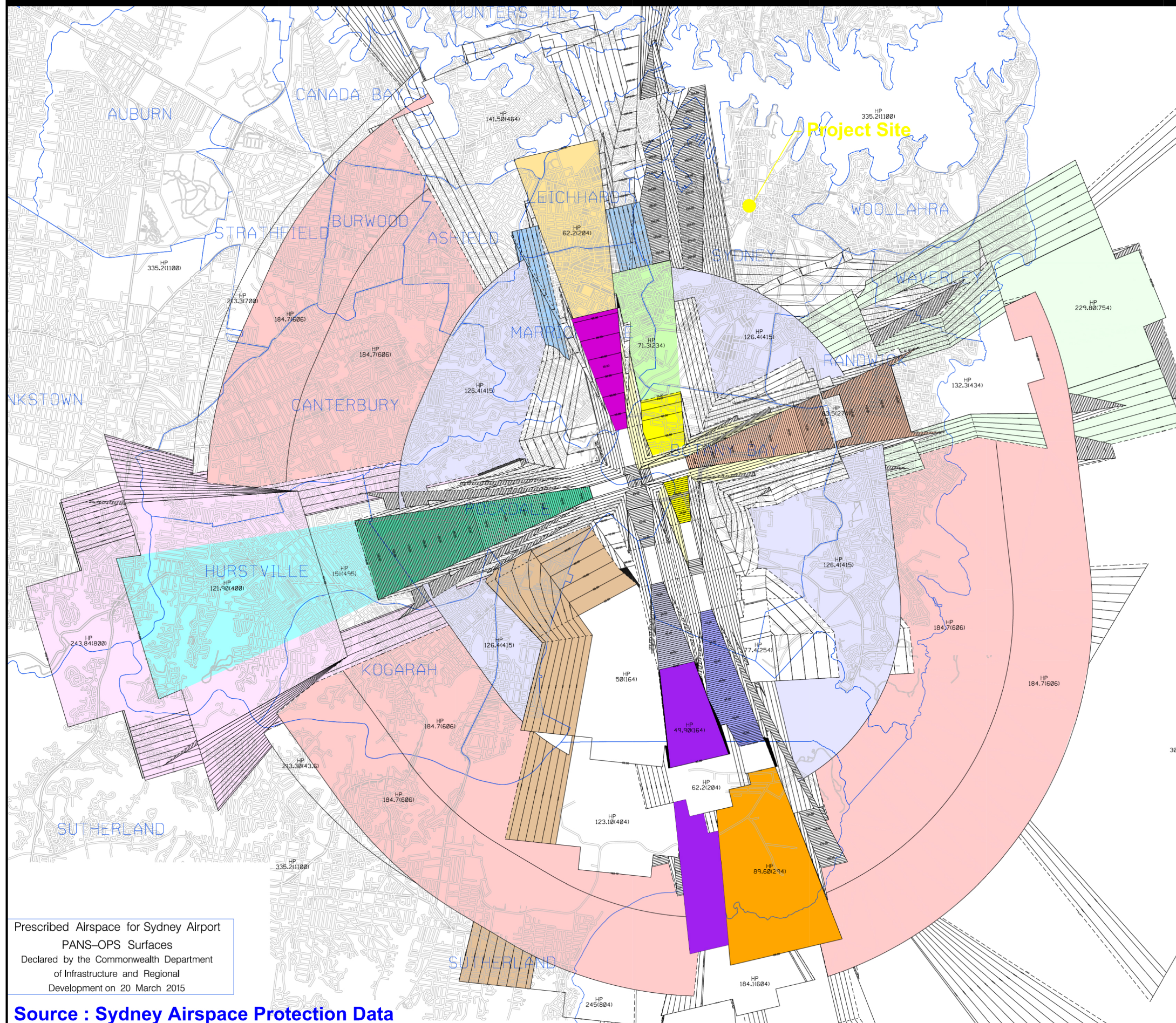
1. These OLS have been adapted from the OLS Chart published by Sydney Airport on their Airspace Protection Web Page

SYDNEY METRO PROJECT PITT ST.

Figure 3
Prescribed Airspace for Sydney Airport
Obstacle Limitation Surfaces



L • E • A • P • P



Source : Sydney Airspace Protection Data

GHDWOODHEAD

Legend:

- | | |
|---|--------------------------------|
|  | CIRCLING MINIMA CATEGORY A & B |
|  | CIRCLING MINIMA CATEGORY C & D |
|  | ILS TRANSITIONAL SURFACES |
|  | RWY 07 ILS |
|  | RWY 07 LLZ / DME |
|  | RWY 07 RNAV/VOR |
|  | RWY 16L ILS |
|  | RWY 16L LLZ / DME |
|  | RWY 16R ILS |
|  | RWY 16R LLZ / DME |
|  | RWY 16R RNAV/VOR |
|  | RWY 25 ILS |
|  | RWY 25 LLZ / DME |
|  | RWY 25 RNAV/VOR |
|  | RWY 34L ILS |
|  | RWY 34L LLZ / DME |
|  | RWY 34L RNAV/VOR |
|  | RWY 34R ILS |
|  | RWY 34R LLZ / DME |

Note:

1. Diagram shown is reproduced from charts published by Sydney Airport on their Airspace Protection Web Page

**SYDNEY METRO PROJECT
PITT ST.**

Figure 4
Prescribed Airspace for Sydney Airport
PANS-OPS Surfaces



L · E · A · P · P