AERONAUTICAL IMPACT ASSESSMENT

PETERSHAM NSW

19 October 2017

For

DEICORP PROJECTS (PETERSHAM) PTY LTD

DEICORP

SUITE 301, LEVEL 3
161 REDFERN STREET
REDFERN NSW 2016

T: 02 8665 4100
F: 02 8665 4111

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Project	Client	Project No.	Version No.	Author
Petersham Development	DeiCorp Projects Petersham Pty Ltd	**LB00145**	001	Bruce Robinson
			002	Bruce Robinson
			003	Bruce Robinson

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001	Draft report	17 October 2017	BWS
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003	Draft report for submission to Client PANS OPS Amendments	19 October 2017	BWS

Contents

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1. Introduction

Landrum & Brown Worldwide Services Pty Ltd have been engaged by DieCorp Projects Petersham Pty Ltd to prepare an Aeronautical Impact Statement (AIS) for the proposed development of three sites at Petersham NSW.

The street addresses for the three sites in Petersham are:

- Site 1: 3-7 Regent St;
- Site 2: 13-17 Regent St; and
- Site 3: 287-309 Trafalgar St.

The maximum building height for the 3 sites is 69.5 m AHD, and the proposed maximum crane height is 74.5 m AHD.

This Aeronautical Impact Statement (AIA) has been prepared with reference to the Prescribed Airspace for Sydney Airport as published by the Sydney Airport Corporation Limited (SACL). These Airspaces include:

- The Obstacle Limitation Surfaces (OLS);
- Procedures for Air Navigation Services – Operations (PANS-OPS);
- Surfaces for the protection of Navigation Aids and Surveillance Sensors.

Other items that are addressed are Illuminated Signage, roof top exhaust plume rises and contingency procedures for engine inoperative flight paths

Coordinates for the sites and location plan are shown at Appendix A, the building coordinates for Site 2 are shown at Appendix B, the surveyed height of the nearby water tower are shown at Appendix C, and a Glossary of Aeronautical Terms and Abbreviations is shown at Appendix D.

2. Summary of Conclusions

This Aeronautical Impact Assessment has been prepared for DeiCorp Projects Petersham Pty Ltd for the proposed building developments at the following three sites in Petersham NSW:

- Site 1: 3-7 Regent St;
- Site 2: 13-17 Regent St; and
- Site 3: 287-309 Trafalgar St.

The Prescribed Airspace Protection Surfaces published by Sydney Airport Corporation Limited (SACL) were examined in relation to the proposed maximum building height of 69.5 m AHD and crane height of 74.5 m AHD.

Obstacle Limitation Surfaces (OLS)

The AIA concludes that the buildings and crane will penetrate the OLS Inner Horizontal Surface (IHS) and Conical Surface (CS) as follows:

- Site 1: The Conical Surface (CS) of 52 m AHD to 55 m AHD
- Site 2: The Inner Horizontal Surface (IHS) of 51 m AHD
- Site 3: The Conical Surface (CS) of 52 m AHD to 56 m AHD

An Aeronautical Study and Safety Case was conducted to show that the penetrations of the IHS and CS will not impact on the circling altitudes at Sydney and will *"not adversely affect safety or significantly affect the regularity of operations of aeroplanes."*

Submissions for approvals to penetrate the OLS surfaces will be sent to SACL which will refer these to the Department of Industry and Regional Development (DIRD), the Civil Aviation Safety authority (CASA), Airservices Australia (AsA) and aircraft operators for comment.

The following OLS will not be penetrated:

- The RWY 16R Approach surface of 87.23 m AHD, and
- The RWY 34L Take-off Climb surface of 82.21 m AHD.

PANS-OPS Surfaces

The published PANS-OPS surface of 62.2 m AHD will be penetrated. SACL has advised that the PANS-OPS surface chart is being reviewed

Pending the result of this review, the consultants propose that the PANS-OPS surface in the vicinity of the 3 sites cannot be less than 76.04 m AHD, due to the existing water tower at that height located 43 m south of Site 2.

The consultants have calculated the following PANS-OPS surface heights which are **not** penetrated. <u>These heights will require confirmation by Airservices Australia</u>:

- RWY 16R RNAV-Z (GNSS) LNAV Approach 83.82 m AHD
- RWY 16R LOC/DME Approach surface of 107.9 m AHD
- RWY 16R RNAV (GNSS) VNAV Approach FAS of 124.34 m AHD
- RWY 16R Visual Segment Surface (VSS) of 133.9 m AHD

Navigation Aids and Airspace Surveillance Protection

The protection surfaces for navigation aids and radar surveillance sensors will not be impacted.

Illuminated Signage

The proposed illuminated signage on the Site 3 building will not impact on operations at Sydney Airport.

Roof Top Exhaust Plumes

Roof top exhaust plume rises in excess of 4.3 m/s will require a plume rise assessment that will be conducted by CASA. If the rise is less, then no assessment will be required.

Contingency Procedures

SACL will refer the proposed development location and heights to aircraft operators for their comments regarding impacts on engine inoperative contingency procedures. SACL will advise if there is an impact and if a variation is required to the building and/or crane heights.

3. Development Site Locations

The nearest site boundary is located 5.9 km to the north of the Sydney Airport Aerodrome Reference Point (ARP) as shown in Figure 3.1.

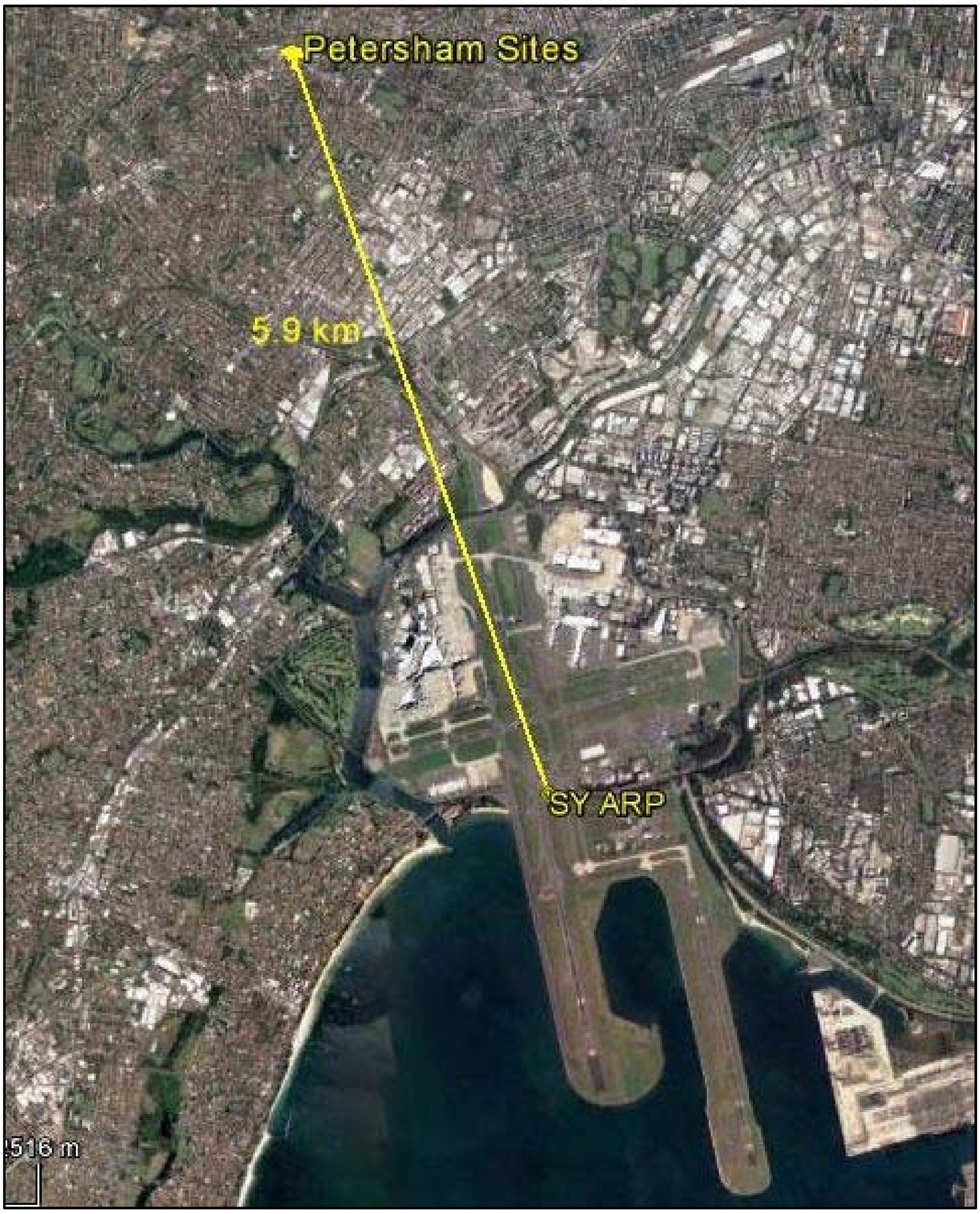


Figure 3.1 Petersham Sites in relation to Sydney Airport

Figure 3.2 shows the development sites in relation to the local area. In addition, the location of a concrete water tower (height 76.04 m AHD) is also shown.

A surveyed drawing of the water tower is shown in Appendix B.

Figure 3.2 Petersham Sites and Water Tower

4. Obstacle Limitation Surfaces (OLS)

Figure 4.1 is based on the OLS chart provided by SACL and shows that the OLS surfaces for the 3 sites are as follows:

- Site 1: The Conical Surface (CS) of 52 m AHD to 55 m AHD;
- Site 2: The Inner Horizontal Surface (IHS) of 51 m AHD; and
- Site 3: The Conical Surface (CS) of 52 m AHD to 56 m AHD

Although not shown on the OLS chart, the existing water tower which is 43 m south of Site 2, is in the IHS of 51 m AHD.

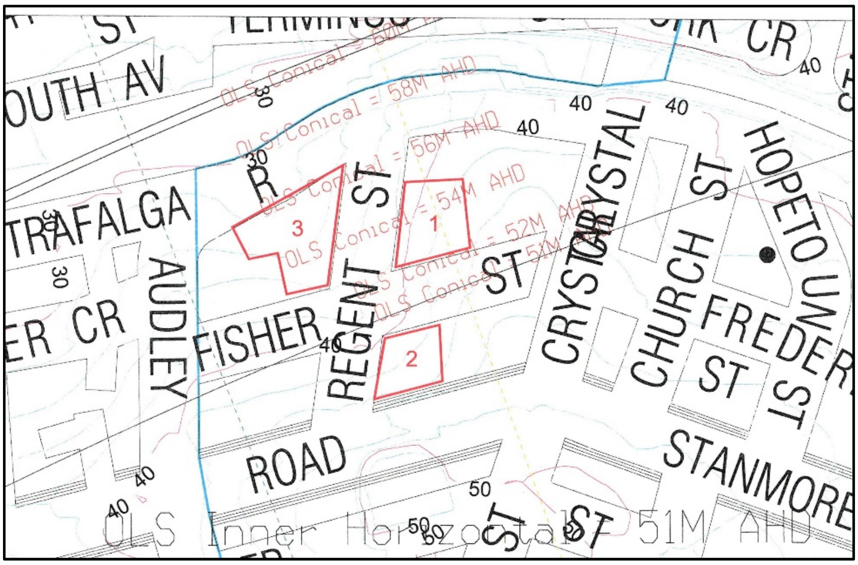


Figure 4.1 Sydney Airport OLS Surfaces

At a building height of 69.5 m AHD and crane height of 74.5 m AHD, the buildings and cranes at the 3 sites will penetrate the IHS and CS OLS surfaces as shown in Table 4.1. The penetration of the IHS by the water tower is also shown.

	m	ft
Maximum Building AHD	69.5	229
Maximum Crane AHD	74.5	245
Site 2 IHS	51	168
Building Penetration	**18.5**	**61**
Crane Penetration	**23.5**	**78**
Site 1CS MAX Height	55	181
Building Penetration	**14.5**	**48**
Crane Penetration	**19.5**	**64**
Site 3 CS MAX Height	56	184
Building Penetration	**13.5**	**45**
Crane Penetration	**-32.5**	**-107**
Crane Penetration	**18.5**	**61**
Water Tower IHS	51	168
Tower AHD	**76.04**	**250**
Tower Penetration	**25.04**	**83**

Table 4.1 Penetrations of IHS and CS

There are procedures for obtaining approval to penetrate the IHS and CS, and these are discussed in Section 5. However, there are other OLS surfaces above those shown on the SACL chart, which are the RWY 16R Approach surface, and RWY 34L Take-Off Climb surface.

It is necessary to calculate the heights of these surfaces to confirm that the proposed building and crane heights do not penetrate these surfaces if approval is given to penetrate the IHS and CS. The surface heights have been calculated in accordance with CASA MOS Part 139 Aerodromes, and ICAO Annex 14 Aerodromes.

RWY 16R Approach Surface

Table 4.2 shows the calculation for the Approach Surface Height, which is 87.23 m AHD.

The maximum building height of 69.5 m AHD and crane height of 74.5 m AHD will not penetrate the 87.23 m AHD Approach surface.

Site 1 Dist from THR	Surface Start	1st Sect	Slope	2nd sect	Slope	Height at site abv THR	APP OLS AHD
	60		2%		2.50%		2.13
4064	4004	3000	60	1004	25.1	85.1	**87.23**

Table 4.2 RWY 16R Approach Surface Calculation

RWY 34L Take-off Climb Surface

Table 4.3 shows the calculation for the RWY 34R Take-off Climb (TOC) Surface height, which is 82.21 m AHD.

Site 1 Dist from THR	Surface Start	Slope	Height at site abv THR	TOC OLS AHD
	60	2%		2.13
4064	4004	80.08	80.08	**82.21**

Table 4.3 RWY 34L Take-off Climb (TOC) Surface Calculation

The maximum building height of 69.5 m AHD and crane height of 74.5 m AHD will not penetrate the 82.21 m AHD Take-off Climb surface.

5. Penetration of the OLS IHS and CS

As discussed in Section 4, the maximum building and crane height will penetrate the IHS and CS.

The conditions for OLS IHS and CS penetration are discussed in the following sections which also include an aeronautical study and safety case.

PENETRATION OF THE INNER HORIZONTAL SURFACE – ICAO DOCUMENT REFERENCES

ICAO Airport Services Manual Part 6 Control of Obstacles states in Para 1.2.2.4:

In assessing the operational effect of proposed new construction, tall structures would not be of immediate significance if they are proposed to be located in:

a) *An area already substantially obstructed by terrain or existing structures of equivalent height*
b) *An area which would be safely avoided by prescribed procedures associated with navigational guidance where appropriate*

The Inner Horizontal Surface and Conical Surface can be penetrated in accordance with the recommendations of ICAO Doc ANNEX 14 Volume 1 Aerodrome Design and Operations, Para 4.2.20, which states:

> *New objects or extensions of existing objects should not be permitted above the Conical Surface and the Inner Horizontal Surface except when, in the opinion of the appropriate authority, an object would be shielded by an existing immovable object, or after an aeronautical study it is determined that the object would not adversely affect safety or significantly affect the regularity of operations of aeroplanes.*

As part of this assessment, a basic aeronautical study and safety case has been conducted by the consultants to show that the proposed building to a height of 69.5 m AHD and crane height of 74.5 m AHD *“would not adversely affect safety or significantly affect the regularity of operations of aeroplanes.”*

AERONAUTICAL STUDY PRECEDENTS

It is common for both the Inner Horizontal and Conical Surfaces to be penetrated at many airports in the world, especially those located close to metropolitan areas.

The control towers at most of the new airport developments in Asia (Bangkok, Kuala Lumpur, Jakarta, Singapore, Incheon, Beijing etc.), and Brisbane in Australia all penetrate the Inner Horizontal Surface.

Numerous penetrations of both the Inner Horizontal and Conical Surfaces occur in the vicinity of Sydney Airport.

IMPACT ON INSTRUMENT APPROACH PROCEDURES

The Inner Horizontal and Conical Surfaces were originally established by ICAO to protect the obstacle clearance of aircraft circling the airport in visual flight conditions prior to landing. When these surfaces were first established in the 1950s and 1960s, the majority of airports and aircraft were not equipped for straight in approaches, and circling approaches were necessary.

With the implementation and extensive use of procedures for approaches aligned with the runway (ILS, GLS, RNP, RNAV (GNSS), VOR and Locator) the use of circling approaches has decreased considerably.

All of the Sydney Airport Runways are served by published straight in approaches including ILS, GLS, and RNAV (GNSS).

Circling approaches (if permitted) would only be required for aircraft initially making straight in approaches in the unlikely event of a change of runway due to significant weather (mainly wind velocity) and changes or changes in serviceability of ground or airborne navigation equipment.

Although circling approaches are not used significantly at Sydney, the site development to the elevation proposed was examined in the study to confirm that there would be no changes required to the circling minimum altitudes.

EXAMINATION OF CIRCLING APPROACHES

Notes: In the Aeronautical Information Publication (AIP) all distances are shown in Nautical Miles (nm) and Altitudes in feet (ft) for instrument flight procedures. Displays to pilots are in the same format. The aircraft category (CAT) depends on a number of aircraft performance parameters, and is published in the ICAO PANS-OPS document.

The minimum altitudes published for circling approaches at Sydney are:

- CAT A and B aircraft: 710 ft AMSL, and
- CAT C and D aircraft: 1000 ft AMSL.

Circling is not permitted following many of the straight in approach procedures.

All jet aircraft and all aircraft above 5,700 kg maximum take-off weight (MTOW) are subject to noise abatement procedures, which limit flight paths at Sydney. This means that these aircraft cannot do circling approaches.

PANS-OPS CIRCLING AREA CRITERIA

The circling area radiuses from the runway thresholds and Minimum Obstacle Clearance (MOC) for circling approaches are published in the PANS-OPS document, as follows:

- CAT A and B: Area radius 2.66 nm, MOC 295 ft, and
- CAT C and D: Area radius 5.28 nm, MOC 394 ft.

As the site is located 2.21 nm from the threshold of RWY 16R (the nearest threshold), it is located in the circling area for all aircraft categories.

APPLICATION OF MOC

Table 5.1 shows the application of the MOC to the maximum building heights AHD of 229 ft and 245 ft during construction.

	m	ft
Maximum Building AHD	69.5	229
Maximum Crane AHD	74.5	245
Circling Alt A&B		710
MOC A&B		295
Bldg + MOC A+B		**524**
Crane +MOC A&B		**540**
Circling Alt C&D		1000
MOC C&D		394
Bldg + MOC C+D		**623**
Crane + MOC C&D		**639**

Table 5.1 Application of MOC to Building and Crane Heights

IMPACT ON CIRCLING MINIMUM ALTITUDES

CAT A and B:

Published minimum circling altitude is 710 ft. Building elevation + MOC is 524 ft and 540 ft during construction.

<u>There is no impact on the CAT A and B circling altitude.</u>

CAT C and D:

Published minimum circling altitude is 1000 ft. Building elevation + MOC is 623 ft and 639 ft during construction.

There is no impact on the CAT C and D circling altitude.

CONCLUSION OF AERONAUTICAL STUDY AND SAFETY CASE

The penetration of the OLS Inner Horizontal and Conical Surfaces by the building and construction cranes will not impact on the circling altitudes at Sydney and will *"not adversely affect safety or significantly affect the regularity of operations of aeroplanes."*

6. PANS-OPS Surfaces

Figure 6.1 is based on the SACL published PANS-OPS chart, and shows that the PANS-OPS surface height is 62.2 m AHD over sites 1 and 2, and over most of Site 3.

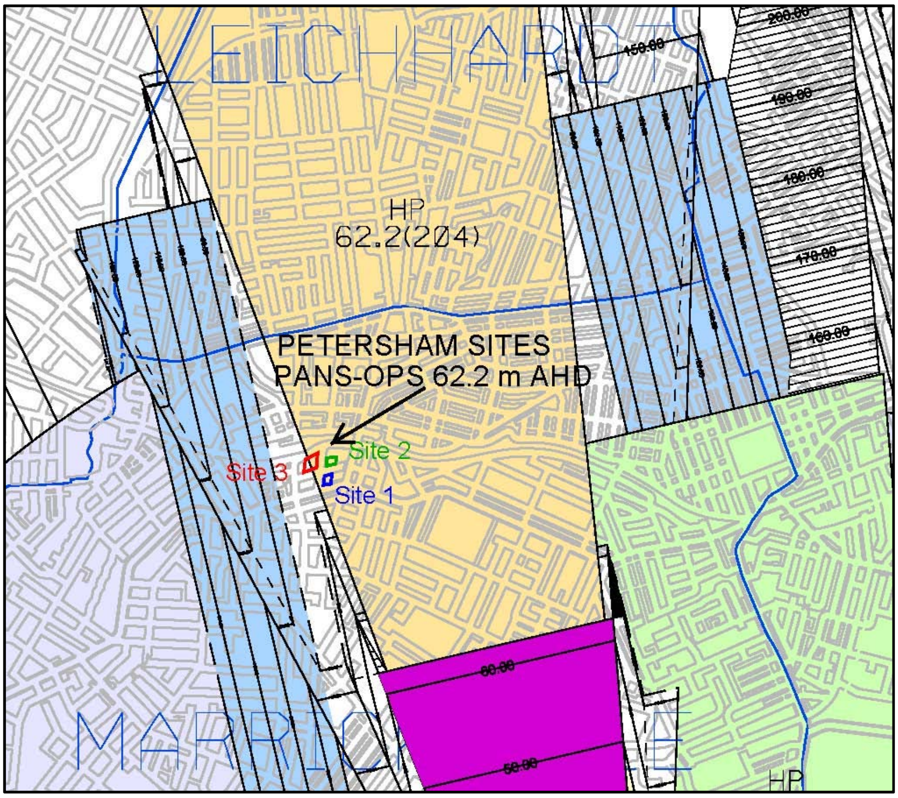


Figure 6.1 Sydney Airport PANS-OPS surfaces

SACL has advised that the PANS-OPS surface chart is being reviewed, however a publication date is not available.

Pending the result of this review, the consultants propose that the PANS-OPS surface in the vicinity of the 3 sites cannot be less than 76.04 m AHD, due to the nearby existing water tower at that height located 43 m south of Site 2, in the yellow shaded area in Figure 6.1.

According to the legend for the PANS-OPS chart, this yellow shaded area with a PANS-OPS surface of 62.2 M AHD is for the RWY 16R LOC/DME approach. According to the YSSY ILS or LOC RWY 16R approach published in the AIP DAP, the LOC lowest descent altitude is 600 ft between 4.1 nm and 2.1 nm from the IKS DME, located on the airport at the RWY 16R GP installation.

The nearest boundary of Site 2 from the IKS DME site is 2.36 nm, and is nominally within the 4.1 to 2.1 nm distance from the IKS DME. The DME tolerance at 2.1 DME is .25 nm. When this is applied to 2.1 DME the result is 2.35 nm. The Sites are within the 4.1nm to 2.1 nm 600 ft lowest descent area.

When the final approach MOC of 246 ft is applied to 600 ft, the PANS-OPS surface is 354 ft or 107.9 m AHD.

The building height at 69.5 m AHD and crane height at 74.5 m are below the RWY 16R LOC/DME PANS-OPS surface of 107.9 m AHD.

In addition to the current PANS-OPS surfaces (being amended) there are other PANS-OPS surfaces which are not shown on the current PANS-OPS chart. These are discussed below.

RWY 16R RNAV-Z (GNSS) LNAV/VNAV

This procedure will be published in the AIP DAP on 09 November 2017.

For the LNAV procedure, descent to the MDA of 520 ft AHD is made at 3 nm from the SYDNM waypoint at the RWY 16R threshold. The nearest boundary of Site 2 is 2.2 nm from SYDNM, within 3 nm of this waypoint.

When the final approach MOC of 246 ft is applied to 520 ft, the PANS-OPS surface is 274 ft or 83.5 m AHD.

The Final Approach Surface (FAS) for the VNAV procedure has been calculated in accordance with ICAO Doc 8168 PANS-OPS Chapter 4 BARO-VNAV.

The FAS angle is calculated as 2.86°, distance to the site from the threshold is 4360 m and distance to the FAS origin from the THR is 1871 m.

The height at the FAS at the site is 4360-1871* TAN 2.86 = 124.34 m.

The building height at 69.5 m AHD and crane height at 74.5 m are below the RWY 16R RNAV (GNSS) LNAV PANS-OPS surface of 83.5 m AHD and also below the VNAV PANS-OPS surface of 124.34 m

VISUAL SEGMENT SURFACE (VSS) OF THE APPROACH PROCEDURE

Another PANS-OPS surface, is that for the visual segment of the RWY 16R straight in approach procedures. This is described in Para 5.4.6 in ICAO Doc 8168 PANS-OPS.

All of the RWY 16R approaches have a promulgated approach angle of 3°. The VSS has a slope of 1.12° less than the procedure slope of 3°, which results in a VSS of 1.88°. This is measured from the RWY threshold (THR) height of 2.13 m AHD and starts at the THR distance – 60 m. The VSS height at the nearest Petersham site is calculated as follows:

Petersham site 2 distance from the RWY 16R THR – 60 m = 4015 m
VSS height above the THR = 4015 X TAN 1.88° = 131.79 m + 2.13 m THR height = 133.9 m AHD.

The building height at 69.5 m AHD and crane height at 74.5 m are below the VSS height of 133.9 m AHD

SUMMARY OF PANS-OPS SURFACE HEIGHTS

The lowest PANS-OPS height has been determined as 83.5 m AHD, applicable to the RWY 16R RNAV-Z (GNSS) LNAV approach.

In any case the lowest surface cannot be lower than the height of the existing water tower at 76.04 m, which is 44 m south of Site 2.

The building height at 69.5 m AHD and crane height at 74.5 m are below the lowest PANS-OPS surface height of 83.5 m AHD and the water tower height of 74.5 m AHD.

7. Prescribed Surfaces for Navigation Aids

Figure 7.1 is based on the SACL chart for Prescribed Surfaces for navigation aids at Sydney Airport. The Petersham sites are off this chart, and there will not be any impact on the Sydney Airport Navigation Aids.

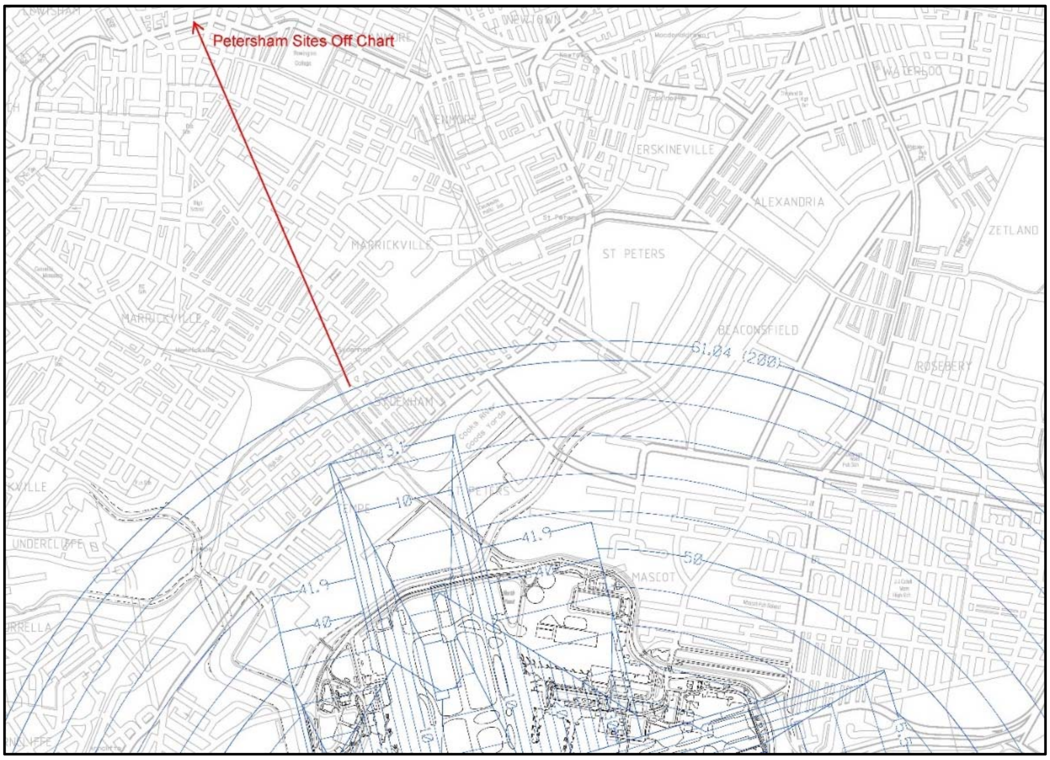


Figure 7.1 Prescribed Surfaces for Navigation Aids

8. Surfaces for Airspace Surveillance Systems

Airspace Surveillance Systems for the Sydney Basin Airspace include the Sydney Airport Terminal Area Radar (TAR), comprising of Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR) which is located on the airport 6440 m from the Petersham buildings site, at an antenna elevation of 38.2 m AHD

There is another TAR located at Cecil Park, 29.695 km from the Petersham buildings site, at an antenna elevation of 200.51 m AHD.

Clearance Requirements for RADARS

CASA Manual of Standards (MOS) Part 139 Aerodromes publishes the clearance requirements for radars. The section of the MOS that applies to the development site is:

> *11.1.14.4*
>
> *The following clearance requirements are to be maintained:*
>
> *(a) No intrusion within 1 km of the radar into a height surface 5 m below the bottom of the antenna. No intrusion between the radar and the possible location of any desired targets, i.e. roughly speaking above 0.5 degrees elevation at any distance.*
>
> *(b) No metallic or other electrical reflective surfaces anywhere which subtend an angle of more than 0.5 degrees when viewed from the radar, e.g. fences, power lines, tanks as well as many buildings. All overhead power lines within 1 km must be aligned radially from the radar or be located at least 10 degrees below horizontal from the antenna.*

Clearance Requirements for the Sydney TAR

The elevation of the Sydney TAR antenna is 38.2 m AHD, and the distance to the development site is 6440 m. The elevation of a 0.5° plane from the antenna at the site is:

> 6440 x Tan 0.5° = 56.2 m + TAR elevation of 38.2 m = 94.4 m AHD.

As the maximum building height is 69.5 m AHD, the protection surface for the Sydney Airport TAR will not be penetrated.

Clearance Requirements for the Cecil Park TAR

The elevation of the Cecil Park TAR antenna is 200.51 m AHD, and the distance to the buildings site is 29695 m. The elevation of a 0.5° plane from the antenna at the site is:

> 29695 x Tan 0.5° = 259 m + TAR elevation of 200.51 m = 459.51 m AHD.

As the maximum building height is 69.5 m AHD, the protection surface for the Cecil Park TAR will not be penetrated.

Conclusions of Airspace Surveillance Systems Clearance Requirements

The maximum building height of 69.5 m AHD will not penetrate the clearance requirements for the Airspace Surveillance Systems located at Sydney Airport and Cecil Park.

9. Illuminated Signage

Illuminated signage at roof top level is proposed for the Site 3 building, and the signage will be on the Trafalgar Street and Regent Street sides of the building (see Figure 3.2). The signage will not face directly towards the airport.

Figure 9.1 is based on an extract from the CASA MOS Part 139 Aerodromes Chapter 9 Page 9-142, and shows the restrictions of light sources within 6 km of an airport.

The Site 3 building is 4161 m from the RWY 16R threshold, and at a 3°slope the height is 218 m at Site 3, well below the roof top height of 69.5 m AHD.

The proposed illuminated signage will not impact on operations at Sydney Airport.

Manual of Standards Part 139—Aerodromes

Chapter 9:
Visual Aids Provided by Aerodrome Lighting

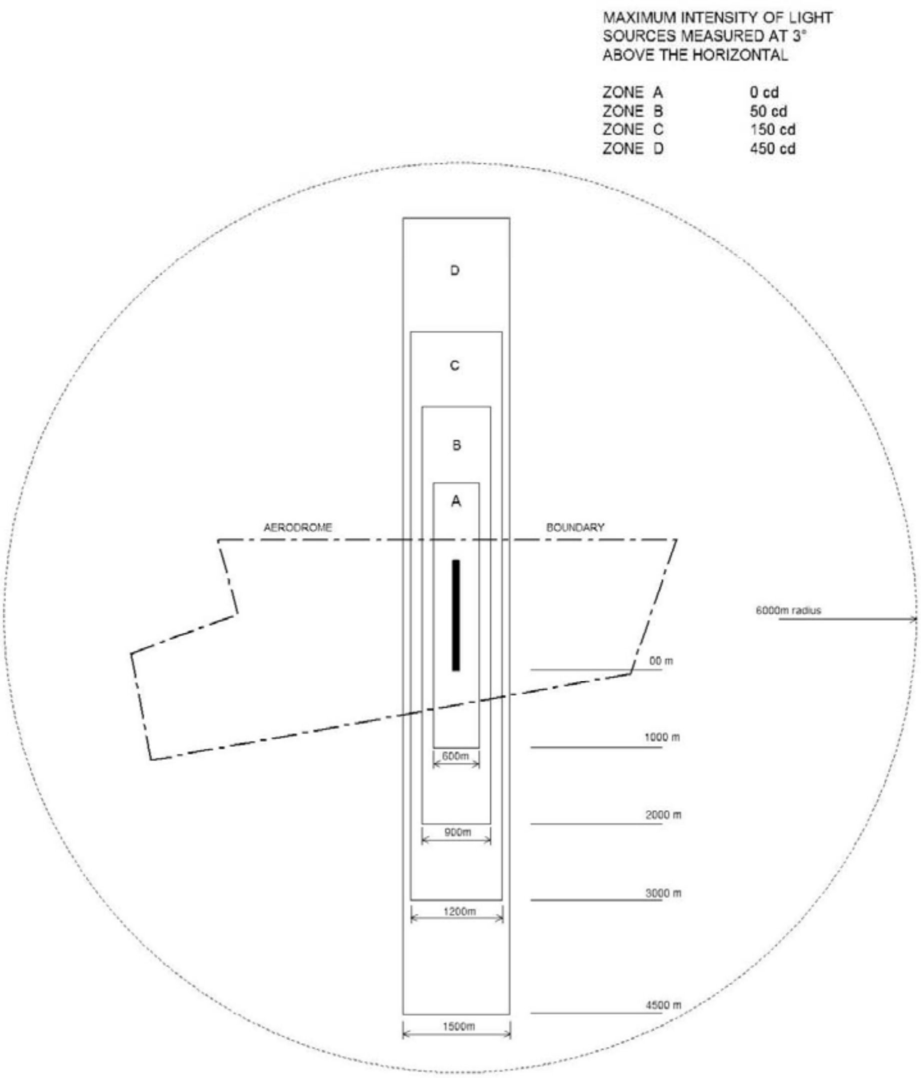


Figure 9.1 Restrictions on Lighting within 6 km of an Airport

10. Plume Rise Assessment

Roof top exhaust plume rises in excess of 4.3 m/s will require a plume rise assessment that will be conducted by CASA. If the rise is less, then no assessment will be required.

11. Contingency Procedures – Engine inoperative Flight Paths

Aircraft operators are required to implement contingency procedures for engine inoperative flight paths. These procedures, whilst requiring approval by CASA, are not available publicly.

SACL will refer the proposed development location and heights to aircraft operators for their comments. SACL will advise if there is an impact and if a variation is required to the building and/or crane heights.

12. Conclusions

This Aeronautical Impact Assessment has been prepared for DeiCorp Projects Petersham Pty Ltd for the proposed building developments at the following three sites in Petersham NSW:

- Site 1: 3-7 Regent St;
- Site 2: 13-17 Regent St; and
- Site 3: 287-309 Trafalgar St.

The Prescribed Airspace Protection Surfaces published by Sydney Airport Corporation Limited (SACL) were examined in relation to the proposed maximum building height of 69.5 m AHD and crane height of 74.5 m AHD.

Obstacle Limitation Surfaces (OLS)

The AIA concludes that the buildings and crane will penetrate the OLS Inner Horizontal Surface (IHS) and Conical Surface (CS) as follows:

- Site 1: The Conical Surface (CS) of 52 m AHD to 55 m AHD;
- Site 2: The Inner Horizontal Surface (IHS) of 51 m AHD; and
- Site 3: The Conical Surface (CS) of 52 m AHD to 56 m AHD

An Aeronautical Study and Safety Case was conducted to show that the penetrations of the IHS and CS will not impact on the circling altitudes at Sydney and will *"not adversely affect safety or significantly affect the regularity of operations of aeroplanes."*

Submissions for approvals to penetrate the OLS surfaces will be sent to SACL which will refer these to the Department of Industry and Regional Development (DIRD), the Civil Aviation Safety Authority (CASA), Airservices Australia (AsA) and aircraft operators for comment.

The following OLS will not be penetrated:

- The RWY 16R Approach surface of 87.23 m AHD, and
- The RWY 34L Take-off Climb surface of 82.21 m AHD.

PANS-OPS Surfaces

The published PANS-OPS surface of 62.2 m AHD will be penetrated. SACL has advised that the PANS-OPS surface chart is being reviewed

Pending the result of this review, the consultants propose that the PANS-OPS surface in the vicinity of the 3 sites cannot be less than 76.04 m AHD, due to the existing water tower at that height located 43 m south of Site 2.

The consultants have calculated the following PANS-OPS surface heights which are **not** penetrated. These heights will require confirmation by Airservices Australia:

- RWY 16R RNAV-Z (GNSS) LNAV Approach 83.82 m AHD;
- RWY 16R LOC/DME Approach surface of 107.9 m AHD;
- RWY 16R RNAV (GNSS) VNAV Approach FAS of 124.34 m AHD; and
- RWY 16R Visual Segment Surface (VSS) of 133.9 m AHD

Navigation Aids and Airspace Surveillance Protection

The protection surfaces for navigation aids and radar surveillance sensors will not be impacted.

Illuminated Signage

The proposed illuminated signage on the Site 3 building will not impact on operations at Sydney Airport.

Roof Top Exhaust Plumes

Roof top exhaust plume rises in excess of 4.3 m/s will require a plume rise assessment that will be conducted by CASA. If the rise is less, then no assessment will be required.

Contingency Procedures

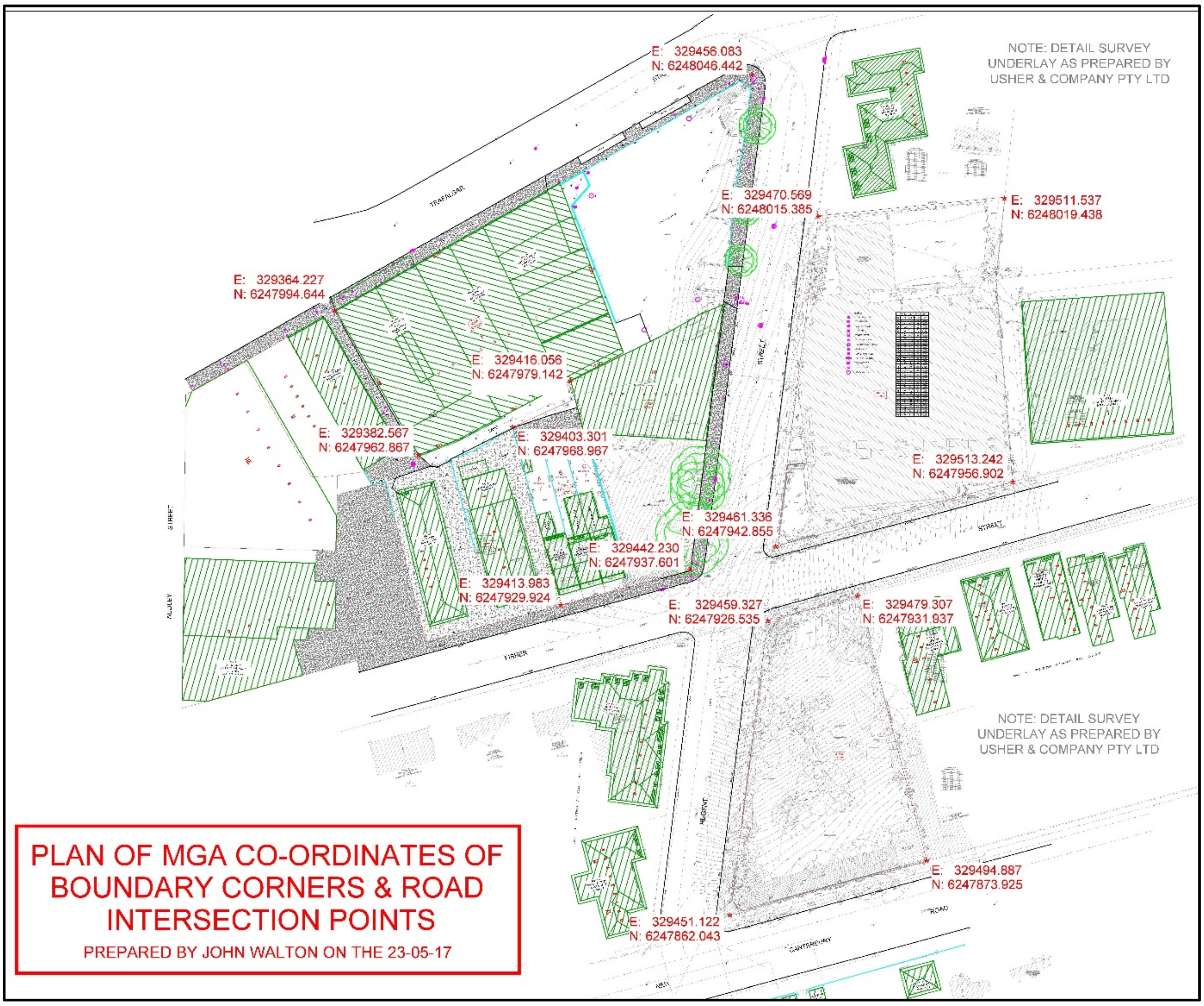
SACL will refer the proposed development location and heights to aircraft operators for their comments regarding impacts on engine inoperative contingency procedures. SACL will advise if there is an impact and if a variation is required to the building and/or crane heights.

APPENDICES

APPENDIX A

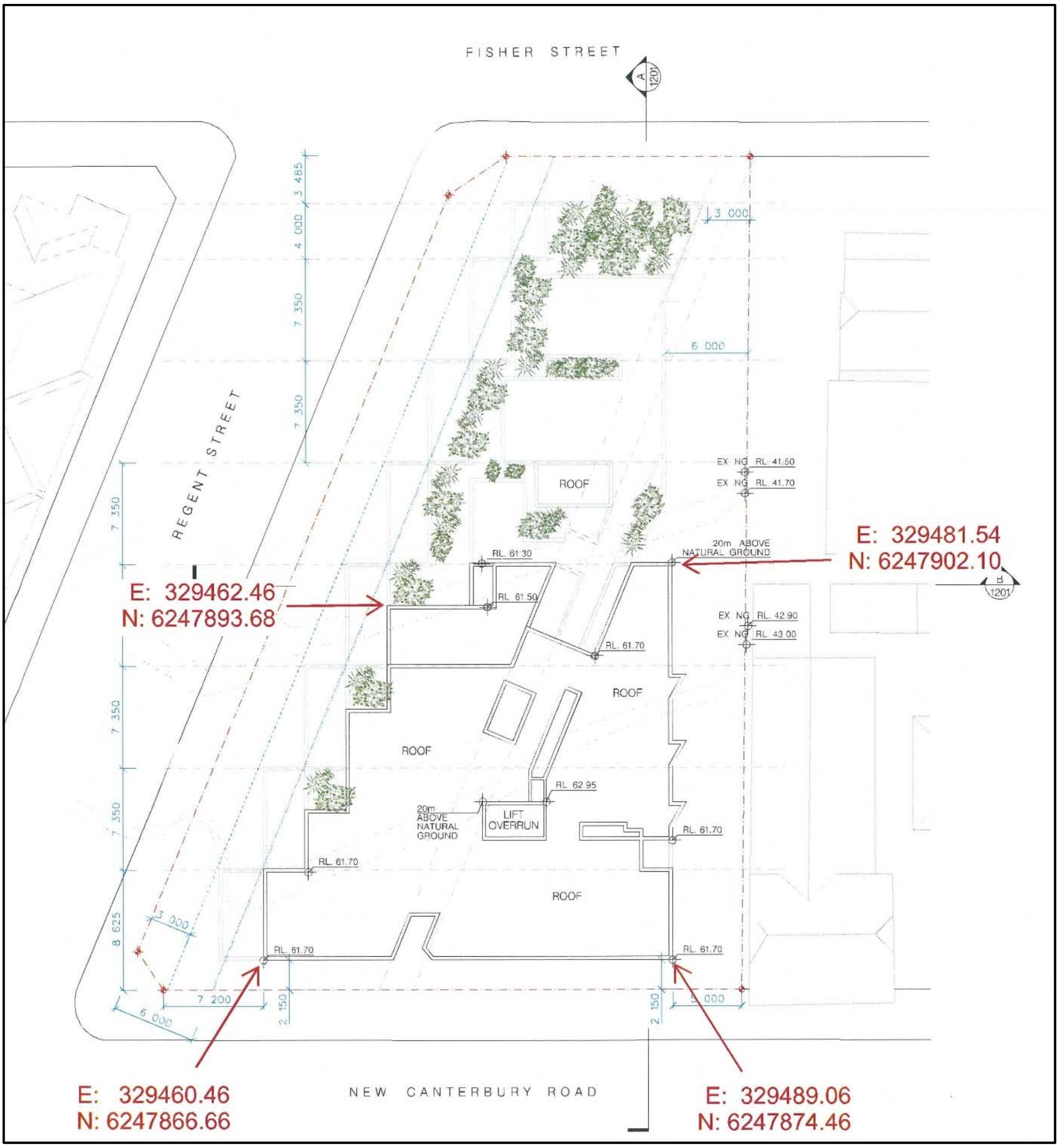
Site Coordinates and Location Plan

Petersham, NSW



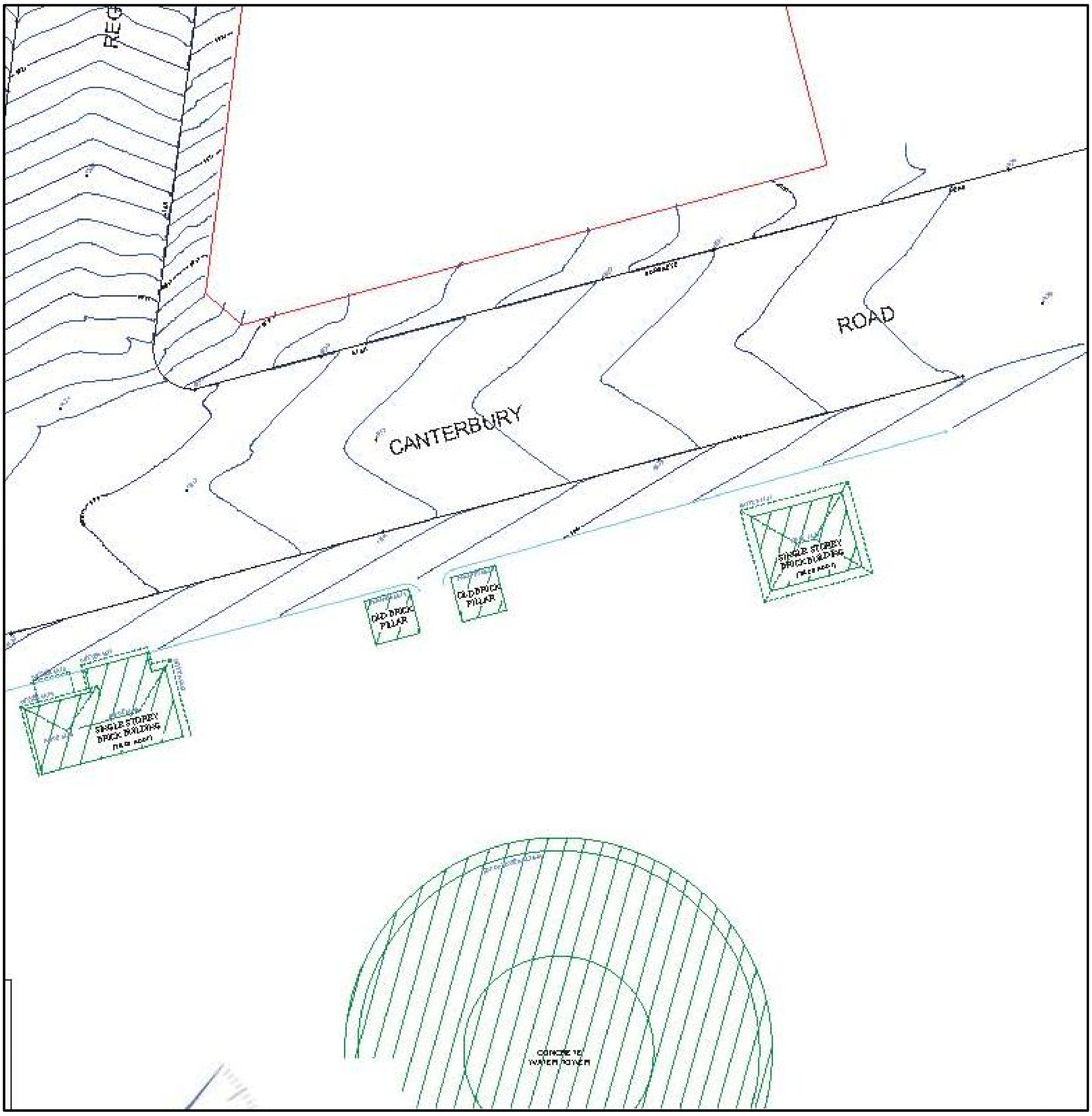
APPENDIX B

Building Coordinates for Site 2



APPENDIX C

Surveyed Height of the Water Tower



APPENDIX D

GLOSSARY OF AERONAUTICAL TERMS AND ABBREVIATIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

LSALT (Lowest Safe Altitudes) are published for each low level air route segment. Their purpose is to allow pilots of aircraft that suffer a system failure to descend to the LSALT to ensure terrain or obstacle clearance in IMC where the pilot cannot see the terrain or obstacles due to cloud or poor visibility conditions. It is an altitude that is at least 1,000 feet above any obstacle or terrain within a defined safety buffer region around a particular route that a pilot might fly.

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

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

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

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

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

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

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

Regulations (Civil Aviation Safety Regulations)

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

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

ABBREVIATIONS

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

Abbreviation	Meaning
AC	Advisory Circular (document support CAR 1998)
ACFT	Aircraft
AD	Aerodrome
AHD	Australian Height Datum
AHT	Aircraft height
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Service
Alt	Altitude
AMSL	Above Mean Sea Level
APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
BRA	Building Restricted Area (for GP)
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
DAP	Departure and Approach Procedures (charts published by AsA)
DER	Departure End of (the) Runway
DEVELMT	Development
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DIT	Department of Infrastructure and Transport. (Formerly Dept. of Infrastructure, Transport, Regional Development and Local Government and Department of Transport and Regional Services (DoTARS))
DOTARS	See DIT above
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	Enroute Supplement Australia
FAF	Final Approach Fix
FAP	Final Approach Point
ft	feet
GBAS	Ground Based Augmentation System (satellite precision landing system)
GNSS	Global Navigation Satellite System
GP	Glide Path
IAS	Indicated Airspeed

Abbreviation	Meaning
ICAO	International Civil Aviation Organisation
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System
ISA	International Standard Atmosphere
km	kilometres
kt	Knot (one nautical mile per hour)
LAT	Latitude
LLZ	Localizer
LONG	Longitude
m	metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOS	Manual of Standards, published by CASA
MSA	Minimum Sector Altitude
MVA	Minimum Vector Altitude
NASAG	National Airports Safeguarding Advisory Group
NDB	Non Directional Beacon
NE	North East
NM	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in nautical miles)
NNE	North North East
NOTAM	NOtice To AirMen
OAS	Obstacle Assessment Surface
OCA	Obstacle Clearance Altitude
OCH	Obstacle Clearance Height
OHS	Outer Horizontal Surface
OIS	Obstacle Identification Surface
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services – Operations, ICAO Doc 8168
PBN	Performance Based Navigation
PRM	Precision Runway Monitor
QNH	An altimeter setting relative to height above mean sea level
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes — replaced by the MOS Part 139 — Aerodromes
RPT	Regular Public Transport
RTCC	Radar Terrain Clearance Chart
RWY	Runway
SFC	Surface
SID	Standard Instrument Departure
SOC	Start Of Climb

Abbreviation	Meaning
STAR	Standard ARrival
TAR	Terminal Approach Radar
TAS	True Air Speed
THR	Threshold (Runway)
TNA	Turn Altitude
TODA	Take-Off Distance Available
V_n	aircraft critical Velocity reference
VOR	Very high frequency Omni directional Range
WAC	World Aeronautical Chart