tgcs thompson gcs

Aviation Assessment for a Development at 26 Elizabeth Street, Liverpool

Final Report

Binah Constructions PTY LTD

Prepared by Thompson GCS

6 November 2018

Thompson GCS Pty Ltd
Po Box 7608
St Kilda Road
Victoria 8004
Australia

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Glossary

AGL	Above Ground Level
AHD	Australian Height Datum
ARP	Aerodrome Reference Point
ATC	Air Traffic Control
BAL	Bankstown Airport Limited
C	Centre
CAAP	Civil Aviation Advisory Publication
CASA	Civil Aviation Safety Authority
CBD	Central Business District
CSTH	Choppers South
DDO	Design Development Overlay
DIRDC	Department of Infrastructure, Regional Development and Cities
DME	Distance Measurement Equipment
FT	Feet
HLS	Helicopter Landing Site
IFR	Instrument Flight Rules
Km	Kilometres
L	Left
m	Metres
MOS	Manual of Standards
NASF	National Airports Safeguarding Framework
nm	Nautical Miles
NSW	New South Wales
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services-Operations
PDU	Procedure Design Unit
R	Right
BAL	Bankstown Airport Corporation Ltd
VFR	Visual Flight Rules

Executive Summary

- Binah Construction Pty Ltd is seeking to construct a building at 26 Elizabeth Street, Liverpool to a maximum height of 135.7m AHD. The crane that will undertake construction to a maximum height of 148.1m AHD and an operating radius of 66.5m. This report provides information about the potential height of the building and crane, taking into account aviation related issues.

- Building developments in the Liverpool area are impacted by the protected airspace restrictions defined for Bankstown Airport. They may also be impacted by helicopter operations at the Liverpool Hospital helipad.

- The 26 Elizabeth Street development site is located approximately 3.2nm west Bankstown Airport. At this position, the height of the PANS-OPS is 135.9m AHD, while the height of the obstacle limitation surface (OLS) is 110m AHD. Therefore, the proposed building to a maximum height of 135.7m AHD will penetrate the OLS by 25.7m. It will, however, remain 12.2m beneath the PANS-OPS surface.

- At a height of 148.1m AHD the construction crane will penetrate the Bankstown OLS by 38.1m. It will also penetrate the PANS-OPS surface for three months. The dates of penetration will be detailed once detailed construction plans are developed. Outside the dates when a penetration of the PANS-OPS surface will occur, the crane will operate up to, but not penetrate, this surface. Crane operations associated with another development in Liverpool have been approved to penetrate the PANS-OPS surface to a similar height.

- The crane penetration of the PANS-OPS surface requires the Bankstown circling minima to increase from 750ft to 790ft. This increase will not materially impact the safety and regularity of air transport operations. The development will also not impact VFR aircraft or helicopter operations at Bankstown.

- Planning NSW have adopted the National Safeguarding Framework (NASF) Guideline H: Protecting Strategically Important Helicopter Landing Sites (HLS), to protect hospital helipads and flight paths from encroachment of buildings and crane operations.

- The 26 Elizabeth Street development site is located 425m from the edge of the Liverpool Hospital helipad. Its crane shaft, located to the northwest corner of the development site, is 435m from the edge of the helipad. The crane boom extends to 378m from the helipad edge. Four flight paths have been designated for helicopter operations i.e., 300°m/120°m and 145°m/325°m. Only the flight paths 300°m/120°m, to the northwest

of the helipad, are applicable to the 26 Elizabeth Street development. NASF Guideline H established an OLS 69m either site of the flight path centreline. The 300°m/120°m flight path centreline is approximately 251m north of the development site. Therefore, the building is approximately 182m beyond the outer extremity of the OLS boundary. The crane, with an operating radius of 66.5m, is approximately 115m from the OLS boundary. As a result, the building and crane will not impact on the designated flight paths for the Liverpool Hospital helipad.

- NASF Guideline H Clause 81 includes definition of a 240m area surrounding the helipad, applied by the State of Victoria, to provide protection for helicopters manoeuvring into wind to land or immediately after take-off. The building at 425m and crane at 378m, respectively, from the edge of the Liverpool Hospital helipad are both beyond the 240m manoeuvring radius. In the case of helicopters departing or arriving overhead the development site, obstacle clearance, based on the AW139 back-up profile, can be achieved for the building and the crane boom.

- Lighting placed on the building and crane will enable helicopter pilots to identify and keep clear of the building and crane.

- Planning controls are applied to the north of Elizabeth Street, in part to protect helicopter operations at the Liverpool Hospital helipad, which limit developments to 35m AGL. In addition, the Liverpool business area has a number of other high-rise developments south of Elizabeth Street, although the 26 Elizabeth Street is closest to the Liverpool Hospital helipad.

- At a distance of 3.2nm from Bankstown Airport and 23.5km from Sydney Airport, the 26 Elizabeth Street development will not impact air traffic control radar systems, navigation aids or communications equipment.

- Taking account of the clearance from the designated flight paths and the manoeuvring radius, we conclude that the building and crane at 26 Elizabeth Street will not impact helicopter operations at the Liverpool Hospital helipad. They will also not impact IFR or VFR aircraft or helicopter operations at Bankstown Airport.

1.0 Introduction

Binah Construction Pty Ltd is seeking approval for the construction of a building to be located on a site at 26 Elizabeth Street, Liverpool NSW. The maximum height of the proposed development is 135.7m AHD. This development site is located approximately 3.2nm west of Bankstown Airport and 425m west of the Liverpool Hospital helipad.

The proposed development will penetrate the Bankstown Airport obstacle limitation surface (OLS). Crane operations also mean that approval is required for a temporary penetration of the Bankstown PANS-OPS surface. In addition, emergency helicopter operations take place at the Liverpool Hospital helipad. Therefore, an assessment is needed to determine whether the development at 26 Elizabeth Street could present a risk to aircraft and helicopter operations taking place at Bankstown Airport and the Liverpool Hospital helipad.

This report details the height of the prescribed airspace above the proposed development site at 26 Elizabeth Street then presents an assessment on the impact on aircraft and helicopter operations at Bankstown Airport and Liverpool Hospital. It includes: legislative context; methodology for the study; location of the building and crane relative to prescribed airspace; impact of the development on Bankstown aircraft operations; helicopter operations at the Liverpool Hospital helipad; lighting controls; and Liverpool City Council building approvals.

2.0 Legislative Context

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

Prescribed airspace around an airport includes the obstacle limitation surface (OLS) and the PANS-OPS surface. An OLS provides general protection for aircraft operations around an airport. The PANS-OPS surface protects the airspace used by aircraft flying instrument approach procedures. A permanent obstruction, in this case a building, can be approved to penetrate the OLS. Permanent obstructions cannot be approved when their height penetrates the PANS-OPS surface. The Airports Act provides provision for temporary obstructions e.g., construction cranes to penetrate the PANS-OPS surface for a duration not exceeding three months. This

temporary penetration of the PANS-OPS surface requires the support of the airport owner. It must also not materially impact aircraft operations.

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

The Department of Infrastructure, Regional Development and Cities (DIRDC) ultimately grant approval for the building and crane to penetrate prescribed airspace. Should the development not be approved by DIRDC, there is also an appeal process to the Administrative Appeals Tribunal.

Planning NSW have recently adopted the National Airports Safeguarding Framework (NASF) Guideline H: Protecting Strategically Important Helicopter Landing Sites, to protect hospital helipads and flight paths from the encroachment of building developments and crane operations. The planning authority will forward a building development or crane application, in the vicinity of a hospital helipad, to Air Ambulance NSW to confirm that helicopter operations will not be impacted.

3.0 Methodology

This section provides an overview of the methodology to determine the impact on prescribed airspace and aircraft operations at Bankstown Hospital of the proposed building development at 26 Elizabeth Street, Liverpool. It also provides an assessment on the impact of helicopter operations at the Liverpool Hospital helipad.

Airspace over the Liverpool business district is impacted by the prescribed airspace defined for Bankstown Airport. It governs the maximum permissible heights for buildings in the Liverpool business district. Estimates of the height of the OLS and PANS-OPS surface were sourced from planning information maintained by BAL.

In order to explore the safety impact on aircraft and helicopter operations of the proposed development at 26 Elizabeth Street, discussions and/or information was

obtained from Airservices Bankstown control tower manager. Information on helicopter flight paths serving the Liverpool Hospital helipad was sourced from Avipro, through Air Ambulance New South Wales.

Information on other high-rise developments in the Liverpool area was sourced from Liverpool City Council's principal planner. The online Liverpool City Council portal was also used to source planning information about high-rise developments.

4.0 Location of Proposed Building and Crane Relative to Bankstown Prescribed Airspace

This section details the position of the building and crane along with their impact on the Bankstown Airport PANS-OPS surface and OLS.

4.1 Position Details of Building

The proposed building will be constructed to a maximum height of 135.7m AHD. Attachment 1 provides an elevation diagram of the building.

Table 1 below details the position coordinates of each corner of the building:

Table 1: Building Position Coordinates

Position	Position Coordinates
Northwest corner of building	E: 308291.952; N: 6244710.171
Northeast corner of building	E: 308315.554; N: 6244707.033
Southeast corner of building	E: 308309.565; N: 6244661.976
Southwest corner of building	E: 308285.963; N: 6244665.113

Attachment 2 presents a diagram presenting the position coordinates of the building.

4.2 Position Details and Operating Radius of Crane

A hammerhead crane to a maximum height of 148.1m AHD will undertake construction. Attachment 1 provides an elevation diagram of the crane.

The crane shaft is located at the northwest corner of the development site. Position coordinates of the crane shaft are:

E: 308282.096; N: 6244714.531.

The operating radius of the crane is 66.5m.

4.3 Building Height in Relation to the Bankstown PANS-OPS Surface

The height of the PANS-OPS surface overhead the proposed development at 26 Elizabeth Street is governed by the Bankstown Airport circling approach for 11C/29C. Based on BAL planning information, the height of the PANS-OPS surface over the proposed development at 26 Elizabeth Street is 135.9m AHD. Airservices' Procedure Design Unit (PDU) will confirm the height of the PANS-OPS surface during their evaluation of the application.

A permanent obstruction is not permitted to penetrate the PANS-OPS surface. The proposed 26 Elizabeth Street development, to a maximum height of 135.7m AHD, is 0.2m beneath the PANS-OPS surface.

4.4 Crane Height in Relation to PANS-OPS Surface

A maximum crane operating height of 148.1m AHD will penetrate the PANS-OPS surface by 12.2m.

Temporary obstructions e.g., cranes may be permitted to penetrate the PANS-OPS surface for a maximum duration of three months provided support is gained from BAL and there is no impact on the safety and regularity of air transport operations.

Construction is planned to commence in June 2020 and extend for around two years. A penetration of the PANS-OPS surface will take place for three months. The dates of this PANS-OPS penetration will be confirmed once detailed construction plans are prepared. Outside the penetration of the PANS-OPS surface, the crane will operate up to 135.9m AHD but not penetrate the PANS-OPS surface.

4.5 Building Height in Relation to Bankstown Obstacle Limitation Surface (OLS)

The proposed development at 26 Elizabeth Street is located in the conical surface of the Bankstown OLS. Permanent obstructions may be approved to penetrate the OLS under the Airports (Protection of Airspace) Act 1996. At this position, the height of the OLS is 110m AHD.

At a height of 135.7m the proposed 26 Elizabeth Street building will penetrate the OLS by 25.7m.

4.6 Crane Height in Relation to Bankstown OLS

The crane to a maximum height of 148.1m AHD will penetrate the OLS by 38.1m.

To address potential concerns of federal agencies, Air Ambulance NSW and Liverpool City Council, an evaluation of potential issues at Bankstown Airport and the Liverpool Hospital helipad is presented below in section 5.0.

5.0 Impact of Development on Bankstown Airport Operations

This section critiques the impact of the proposed building and crane at 26 Elizabeth Street on aircraft and helicopter operations at Bankstown Airport.

5.1 IFR Aircraft Operations

The proposed building is located in the area providing protection for IFR aircraft undertaking a circling approach to land Runway 11C/29C. Since the proposed development is beneath the PANS-OPS surface it will not impact the circling approach.

To enable a 12.2m penetration of the PANS-OPS surface for crane operations, the circling minima of 750ft must increase by 40ft to 790ft. Approval has been granted for other developments in the Liverpool area to penetrate the PANS-OPS surface, thereby increasing the circling minima. This includes a crane at 420-446 Macquarie Street approved to operate up to a maximum height of 145.97m AHD. The requested crane penetration at 26 Elizabeth Street is 2.13m higher than at Macquarie Street. As a result, the crane penetration of the PANS-OPS surface is unlikely to impact the operation of IFR aircraft at Bankstown.

5.2 VFR Aircraft and Helicopter Operations

The proposed development is located approximately 2.95nm west of the Runway 11R threshold.

Fixed wing aircraft in the circuit are required to operate at an altitude of 1,000ft AHD and remain within a 2nm radius of the Bankstown aerodrome reference point (ARP). Aircraft operating in the Runway 11R circuit, therefore, are clear to the east of the proposed development.

Helicopter circuit operations take place at 700ft AHD to the north of Runway 11L/29R. They take place on the opposite side of the airport to the proposed 26 Elizabeth Street development.

VFR aircraft approach Bankstown Airport from the south and west to land Runway 11C/11L track overhead 2RN broadcast station, Liverpool CBD then Warwick Farm racecourse. Although this track may take aircraft overhead the proposed development they are required to operate at 1,000ft AHD until commencing decent to land. The point of decent is typically in the vicinity of Warwick Farm racecourse. Therefore, aircraft are at least 554ft above the proposed development and crane on this route.

VFR aircraft departing Runway 11L/C are required to climb to 1,500ft AHD when leaving Bankstown. The normal climb profile of aircraft will mean that they are above the development at 26 Elizabeth Street.

VFR aircraft departing Runway 29R/C to the west are normally required to track runway heading to 3nm and climb to 1,000ft AHD. On some occasions, aircraft are cleared to turn onto a southwest heading. Although they may make an earlier turn, the aircraft will reach 1,000ft AHD prior to the Liverpool business district.

Helicopters arriving from the west track 2RN (Radio station mast) to CSTH (Chopper South), 2.1nm south of the Bankstown ARP. This track keeps helicopters clear to the south of the development at 26 Elizabeth Street. Departing helicopters to the south and west also depart via CSTH climbing to 700ft AHD. The track and height of the departing helicopters keeps them clear of the proposed development.

5.3 Summary

The building, being below the PANS-OPS surface, will not impact IFR operations. A crane to a maximum height of 148.1m AHD will penetrate the PANS-OPS surface by 12.2m for three months. This penetration of the PANS-OPS surface will require the Bankstown circling minima to increase by 40ft to become 790ft.

Fixed wing aircraft and helicopter circuit operations at Bankstown Airport are clear to the east of the proposed development. Aircraft joining from the west to join Runway 11C/L fly overhead the development but are vertically clear. Departing aircraft from either Runway 11C/L or 29C/R will be clear above the development. Helicopters either arriving or departing Bankstown will track to the south of 26 Elizabeth Street.

6.0 Helicopter Operations at Liverpool Hospital

In this section, we analyse the impact of the building and crane at 26 Elizabeth Street on helicopter operations at the Liverpool Hospital helipad.

6.1 Nature of Helicopter Operations

Operations at the Liverpool Hospital helipad are conducted by Air Ambulance NSW utilising AW139 helicopters. AW139 are high performing twin-engine helicopters. Day and night time operations take place.

6.2 Height and Position of the Liverpool Hospital Helipad

The height of the helipad is 130ft (39.6m) AHD.

The building is located approximately 425m west of the Liverpool Hospital helipad.

Attachment 1 illustrates that the crane shaft is located on the northwest corner of the development site. The crane shaft is located approximately 435m from the edge of the Liverpool Hospital helipad. With an operating radius of 66.5m, the boom of the crane remains approximately 378.5m from the edge of the helipad.

6.3 Liverpool Hospital Helipad Helicopter Flight Paths

Four arrival and departure flight paths have been designated for the helicopters operating at the Liverpool Hospital helipad. These flight paths are:

- To/from the northwest: 300°m/120°m;
- To/from the south east: 145°m/325°m.

Attachment 3 presents a diagram of the helipad flight paths relative to the development at 26 Elizabeth Street. It shows that only the flight path to the northwest is in proximity to the development site.

In addition to the four approach and departure flight paths, depending on wind conditions, helicopters may approach and depart the Liverpool Hospital helipad in any direction.

6.4 Application of National Airports Safeguarding Framework (NASF) Guideline H

Planning NSW have recently adopted the National Airports Safeguarding Framework (NASF) Guideline H: Protecting Strategically Important Helicopter Landing Sites, to prevent the encroachment of building and crane operations on hospital helipads.

Guideline H incorporates the parameters detailed in CASA document CAAP 92-2(2), Guidelines for the Establishment of Onshore Helicopter Landing Sites, (February 2014). CAAP 92-2(2) details recommended standards for the design of a helicopter landing site (HLS). Below is an assessment of the building and crane at 26 Elizabeth Street in relation to these standards.

6.4.1 Horizontal Dimensions of Obstacle Limitation Surface

CAAP 92-2(2) provides for the width of the approach/departure area to be 10 times the rotor diameter. The AW139 helicopter has a rotor diameter of 13.8m. Therefore, the overall width of the approach/departure path is 138m, which extends 69m either side of the centreline.

The helicopter flight path to/from the north west (300°m) is closest to the proposed 26 Elizabeth Street development. At the point where the flight path is perpendicular to the building, a helicopter is approximately 251m north of the development. Considering the guidelines in CAAP 92-2(2), the building will be 182m beyond the outer extremity of the OLS horizontal boundary.

Taking account of a crane radius of 66.5m, the maximum horizontal extent of the crane is approximately 115m beyond the outer extremity of the OLS established either side of the 300°m flight path.

Both the building and crane are well clear of the 145°m track to the southeast of the Liverpool Hospital helipad.

Attachment 3 depicts the flight paths to the Liverpool Hospital helipad relative to the development site at 26 Elizabeth Street.

6.4.2 Impact of Building and Crane on Other Helicopter Tracks

On occasions helicopters arriving or departing the Liverpool Hospital helipad may choose not to follow the 300°m/120°m approach path. In these circumstances, the building may impact flight paths approximately between 272°m and 253°m from the helipad. This calculation applies the 69m OLS horizontal clearance from the edges of the building, as detailed in CAAP 92-2(2). The proposed crane may impact tracks between 251°m and 283°m. These figures take account of a crane operating radius of 66.5m.

Clause 81 of NASF Guideline H describes the application of an inner Design Development Overlay (DDO) within 240m of a hospital helipad by the State of Victoria. This inner DDO provides protection from encroachment from buildings and cranes to enable the helicopters to manoeuvre into wind to land or for take-off.

The crane shaft at 26 Elizabeth Street is approximately 435m from the edge of the Liverpool Hospital helipad. Taking account of an operating radius of 66.5m, the crane boom is 378.5m from the edge of the helipad. The eastern edge of the building is 425m from the helipad. This means that both the building and crane building are both beyond the 240m manoeuvring area.

Should a helicopter wish to depart directly overhead the 26 Elizabeth Street development, it would need to adopt a back-up climb profile after lift-off prior to heading toward the west. There are no obstructions to the east of the helipad that would prevent a back-up climb profile being undertaken after lift-off.

6.5 Summary

The 26 Elizabeth Street building and crane are horizontally clear of the designated helicopter flight paths for the Liverpool Hospital helipad. Should a helicopter seek to depart to the west over the development site it would need to apply the back-up climb profile after take-off.

7.0 Probable Building and Crane Lighting Requirements

CASA will require that the building and crane be lit due to both penetrating the Bankstown OLS. These lighting requirements will be detailed in the building and crane approvals issued by DIRDC. Air Ambulance may also stipulate lighting requirements for the building and crane due to the proximity of the helipad. These lighting requirements should be expected to include:

- The building to be obstacle lit by medium intensity steady red lights at the highest point of the building, in accordance with Manual of Standards (MOS) Part 139 subsections 9.4.7 and 9.4.3;
- Cranes to be lit with medium intensity red lighting at night, placed at the highest point of the crane and able to be observed in a 360 degree radius as per section 9.4 of MOS;
- Cranes must be marked (red and white) in accordance with MOS Part 139 subsection 9.10.2. OR lit with medium intensity flashing white lights as per subsection 9.4.

In addition to CASA lighting requirements, Air Ambulance NSW are likely to stipulate additional measures. These may include:

- Flashing red medium intensity obstacle lights be placed at the tip of the boom and rear of the crane, with these lights being operational during night time hours;

- Flashing white medium intensity obstacle lights be placed at the tip of the of the boom and rear of the crane, with these lights being operational during day time hours; and
- Floodlighting of the crane shaft.

8.0 Liverpool City Council Building Planning Approvals

In this section, we described the planning controls implemented by the Liverpool City Council in part to protect helicopter flight paths for the Liverpool Hospital helipad. We also detail other high-rise developments approved for the Liverpool business district. This information was sourced from Liverpool City Council's principal planner, their planning portal and Bankstown Airport Limited's general manager aviation.

8.1 Liverpool Planning Controls

Liverpool City Council have established height controls for developments, in part to provide protection for Liverpool Hospital helicopter flight paths. North of the Westfield Shopping Centre on Elizabeth Street is zoned R4 where the development height is capped at 35m AHD. This R4 zone prevents developments encroaching on the northwest flight path to the Liverpool Hospital helipad. The southern side of Elizabeth Street is zoned B3/B4, which has no limitations on development height.

8.2 Other High-rise Developments

At least three other high-rise developments have been approved in the Liverpool business area. These developments are:

8.2.1 420 Macquarie Street

A development and construction crane have been approved at 420 Macquarie Street. The building is being constructed to a maximum height of 127.03m AHD, with the construction crane approved to a maximum operating height of 145.97m AHD. This development is approximately 1,440m south west of the Liverpool Hospital helipad.

At a height of 145.97m AHD, the maximum crane height penetrates the PANS-OPS surface at Bankstown Airport. A penetration of the PANS-OPS by 10.07m requires the circling minima at Bankstown Airport to be increased by the same height.

8.2.2 387 Macquarie Street

A development at 387 Macquarie Street was approved to a maximum height of 105.7m AHD. The maximum crane height is not known. This development is approximately 1240m south west of the Liverpool Hospital helipad.

8.2.3 7-13 Norfolk Street

A development at 7-13 Norfolk Street was approved to a maximum height of 96.5m AHD. The maximum crane height is not known. This development is approximately 1,170m South west of the Liverpool Hospital helipad.

8.3 Summary

The proposed development at 26 Elizabeth Street is located to the south of the planning zone that, in part, provides protection for flight paths to the northwest of the Liverpool Hospital helipad. At least three other high-rise developments have been approved for the Liverpool business area, although 26 Elizabeth Street is the closest to the Liverpool Hospital helipad.

The construction crane at 420 Macquarie Street has been approved to penetrate the Bankstown PANS-OPS surface for a duration of three months. This penetration has necessitated the circling minima to be raised. It is a similar height to the crane penetration at 26 Elizabeth Street.

9.0 Impact on Navigation Aids and Radar Performance

Secondary surveillance radar is the main technology used by air traffic controllers to provide separation between aircraft. Overlapping secondary surveillance radar coverage exists overhead Liverpool. This means the proposed development at 26 Elizabeth Street will not impact secondary radar performance.

Primary radar is used to detect aircraft that do not have an operational transponder. The proposed development at 26 Elizabeth Street is located 23.5km from the primary radar antenna at Sydney Airport. At this distance, primary radar coverage will not be impacted by this development.

At a distance of approximately 3.2nm west of Bankstown Airport, the proposed 26 Elizabeth Street development will not impact on the performance of navigation aids located on the airport.

10.0 Conclusion

This report is an assessment of the issues that may impact aircraft and helicopter activities at Bankstown Airport and the Liverpool Hospital helipad from the building and crane at 26 Elizabeth Street, Liverpool.

The height of the Bankstown OLS at the position of 26 Elizabeth Street is 110m AHD, while the PANS-OPS surface is 135.9m AHD. At a maximum height of 135.7m AHD, the proposed building will penetrate the OLS by 25.7m but will remain 12.2m beneath the PANS-OPS surface.

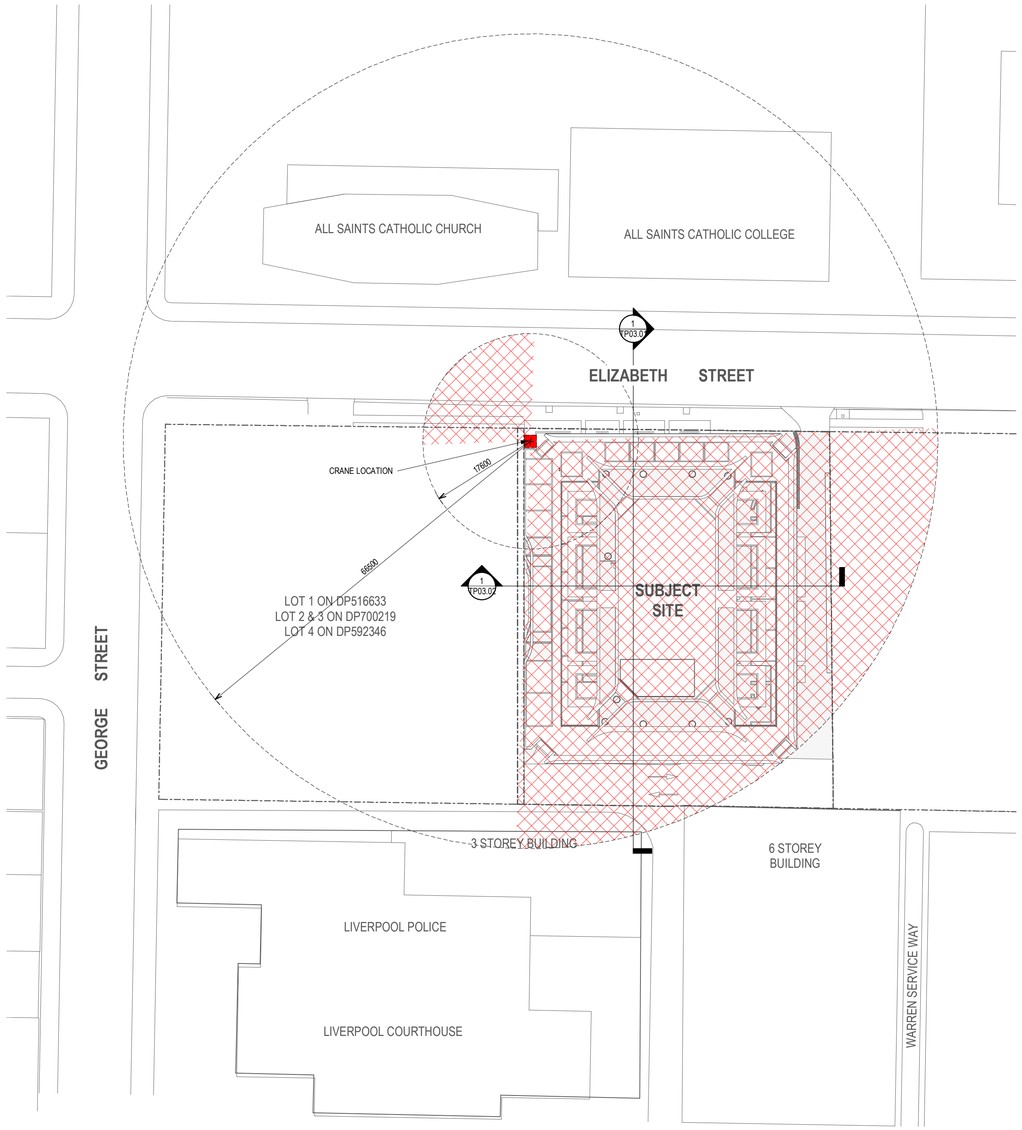
A crane to a maximum height of 148.1m AHD will penetrate the OLS by 38.1m. It will also penetrate the PANS-OPS surface by 12.2m AHD for three months. The dates of the three month penetration will be determined once detailed construction plans are prepared. A crane penetration of the PANS-OPS surface has been approved for another development to a similar height.

Following an assessment of aircraft and helicopter activities, we conclude that the proposed development at 26 Elizabeth Street will not impact operations at Bankstown Airport.

This report has applied guidelines detailed in NASF Guideline H. The report has confirmed that the building and crane are clear of designated helicopter flight paths

to the Liverpool Hospital helipad, as well as the area protecting helicopters manoeuvring into wind to land or immediately after take-off. In the case of helicopters departing or arriving overhead the development site, obstacle clearance can be achieved for the building and crane by flying the back-up profile immediately after lift-off.

Taking account of the clearance from the designated flight paths and the manoeuvring radius we conclude that the building and crane at 26 Elizabeth Street will not impact helicopter operations at the Liverpool Hospital helipad. The building and crane will not materially impact IFR and VFR operations at Bankstown Airport.



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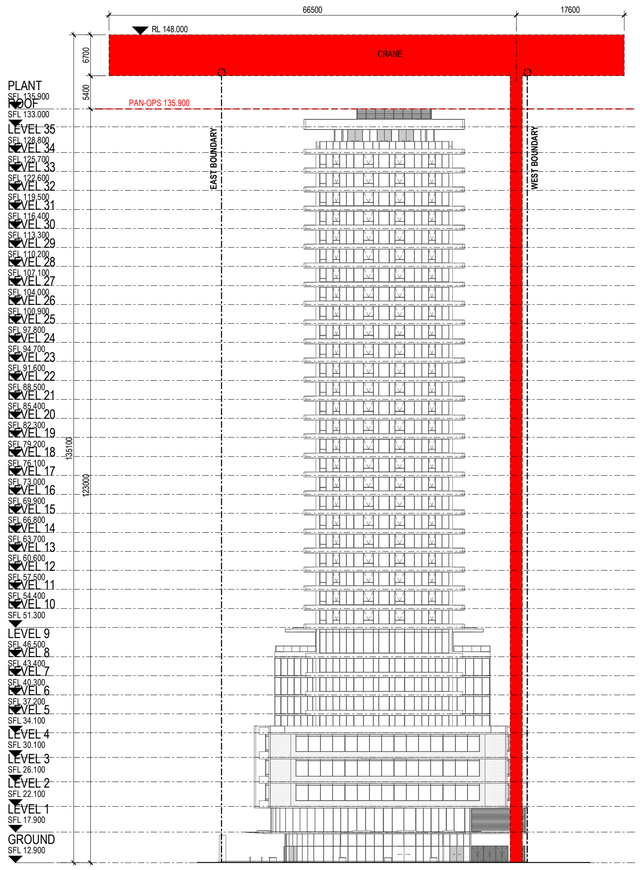

2 CRANE ELEVATION - NORTH
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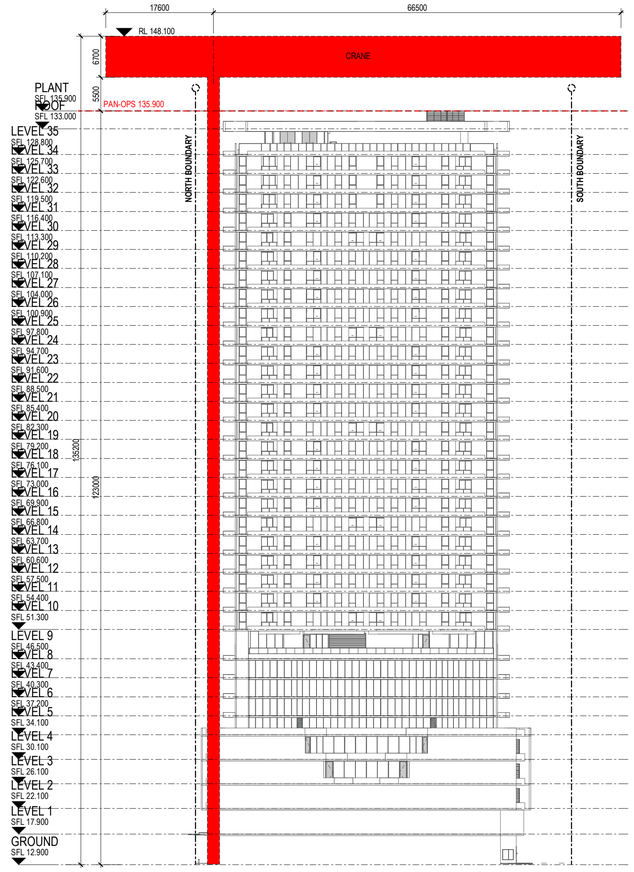

3 CRANE ELEVATION - WEST
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PRELIMINARY

Revisions

P1	29.08.18	ISSUE FOR INFORMATION	MG
P2	08.11.18	AVIATION ISSUE	NE

8/11/2018 10:45:47 AM

Project: ELIZABETH STREET
Drawing: CRANE LOCATION
Project No: 218004
Date: 29/08/18
Author: MG
Scale: @ A1: 1 : 500
Drawing No.: TP09.20 P2

26 ELIZABETH STREET
LIVERPOOL

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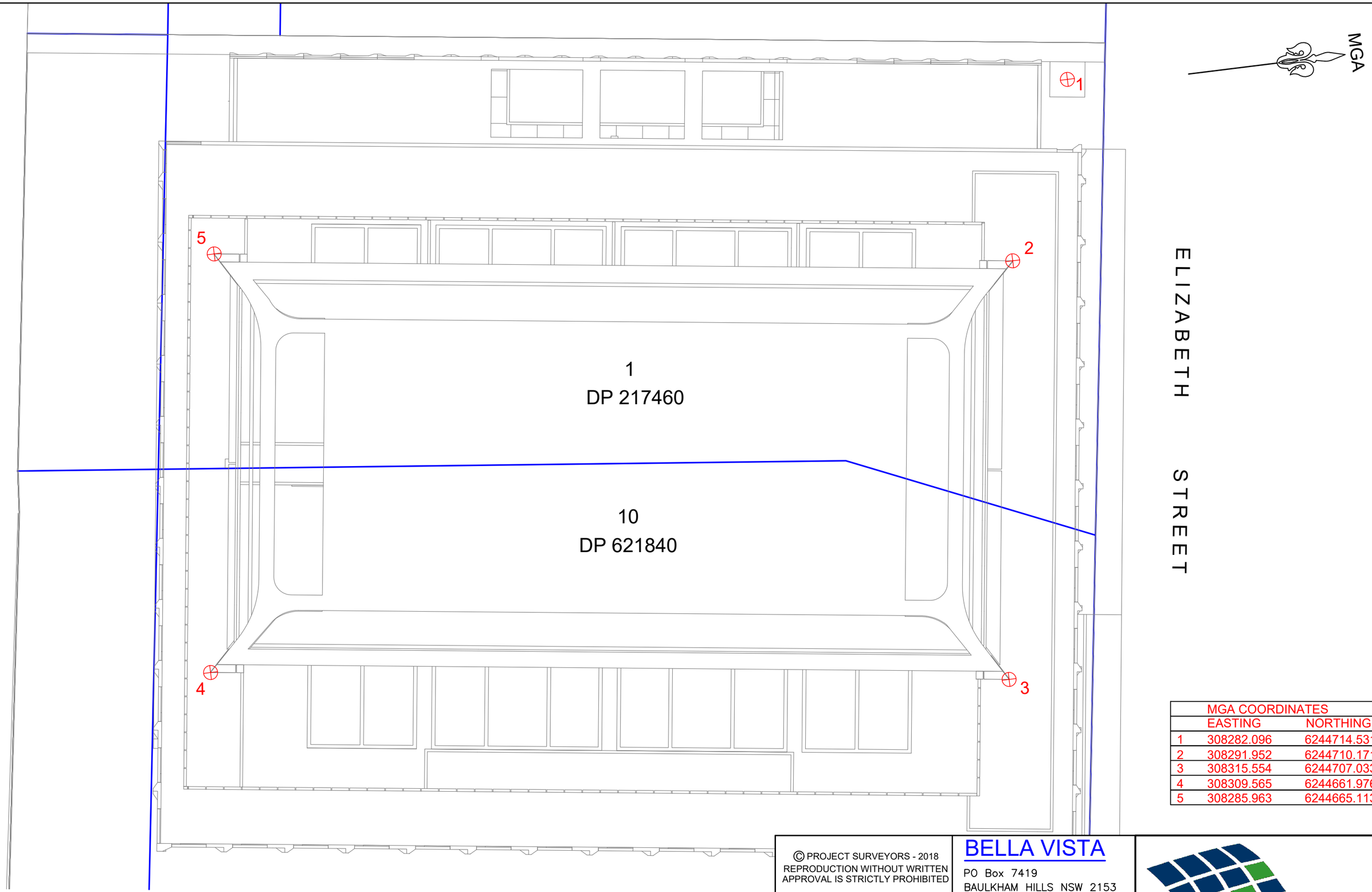

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4	308309.565	6244661.976
5	308285.963	6244665.113

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BELLA VISTA
PO Box 7419
BAULKHAM HILLS NSW 2153
SUITE 405, LEVEL 4
14 LEXINGTON DRIVE
BELLA VISTA NSW 2153
PHONE : 9056 1900
email: office@projectsurveyors.com.au
www.projectsurveyors.com.au
ABN 20 068 433 974

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26 Elizabeth Street and Liverpool Hospital Helipad

Legend

300 Mag
Flight Path

Liverpool

26 Elizabeth St

Development Site

145 Mag
Flight Path

Lake Moore

Google Earth

N

500 m