14 February 2025

LIVERPOOL BOYS AND GIRLS HIGH SCHOOL UPGRADE PROJECT

1. EXECUTIVE SUMMARY

The aim of this report is to provide insights into the impacts of constructing the Liverpool Boys and Girls High School Upgrade on the aviation operations into and out of any aerodromes and of the Liverpool Hospital Helicopter Landing Site (HLS). The report analyses the likely impact of the completed building and any associated construction cranes on aviation activities.

No specific approvals will be required from the aviation regulatory bodies.

The Liverpool Boys and Girls High School Upgrade building construction cranes will impact aviation safety in relation to Liverpool Hospital HLS.

Liaison with the Liverpool Hospital will be required to facilitate the direction and realignment of the temporary HLS approach and departure lighting.

Appropriate aviation lighting for HLS protection will be necessary on construction cranes.

2. Introduction

This Aviation Impact Assessment has been prepared by Resolution Response Pty Ltd (T/A AviPro) on behalf the NSW Department of Education (the Applicant) to assess the potential environmental impacts that could arise from the redevelopment of the Liverpool Boys High School and Liverpool Girls High School, at 18 Forbes Street, Liverpool NSW, 2170 (the site).

This report has been prepared to address the coordination aspects associated with prescribed/protected airspace in the vicinity of the HLS at the Liverpool Hospital due to the establishment and site design of the new Liverpool Boys and Girls High School Upgrade Project. It is intended to inform design and planning.

This report accompanies a Review of Environment Factors that seeks approval for redeveloping the Liverpool Boys and Liverpool Girls High Schools into a single co-educational school, including:

- [redacted]
- Construction and operation of a six-storey school building, including school hall and gymnasium;
- Associated parking and building services;
- Tree removal;
- Associated landscaping and play spaces;
- Augmentation of service infrastructure; and
- Associated off-site infrastructure works to support the school, including (but not limited to) services, kiss and drop point and pedestrian crossings.

Refer to the Review of Environmental Factors prepared by Ethos Urban for a full description of works.

This Report provides the aviation REF detail and an Aviation Impact Statement as it applies to the adjacent Liverpool Hospital Helicopter Landing Site (HLS).

2.1. Site Description

The development site is located at 18 Forbes Street, Liverpool, within the Liverpool Local Government Area (**LGA**). The site is legally described as Lot 1 DP1137425 and has a total area of approximately 74,973m^2.

The site comprises a broadly rectangular portion of land which currently contains the existing Liverpool Boys High School, Liverpool Girls High School, and the Gulyangarri Public School, which commenced operations in January 2024 and is located to the east of the wider site.

The site's western portion contains Liverpool Boys High School and Liverpool Girls High School. Liverpool Girls High School in the site's southwest comprises three, two-storey buildings. Liverpool Boys High School in the site's northwest, comprises approximately four, two-storey buildings, with adjacent at-grade carparking and various sports courts.

An aerial image of the site is shown below:

Figure 1: Site Aerial - Source: Nearmap, edits by Ethos Urban

2.3 Statement of Significance

Based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed development, it is determined that:

- The extent and nature of potential impacts are moderate, and will not have significant adverse effects on the locality, community, and the environment;

Based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed development, it is determined that:

- Potential impacts can be appropriately mitigated or managed to ensure that there is minimal effect on the locality, community.

2.4. Review of Environmental Factors (REF) Compliance

In preparing this report, the REF Compliance requirements have been addressed as described in Table 1 below.

Condition Description: Existing helipad/helicopter operations during construction	Paragraph Reference
Prior to commencement of construction, independent advice is required to review and confirm that helipad/helicopter operations on the hospital site remain of safe operation during construction.	Section 2
The review should consider the expected construction methodology, including lighting and cranes, and where necessary, recommend any amendments to the construction management to ensure safe on-going helicopter operations.	See Section 5

Table 1: Review of Environmental Factors Compliance - Aviation

2.5. Consultant Declaration – Significant Impacts

Following is the AviPro Consultant Statement:

- Once completed, there are no significant adverse effects on helicopter access to the Liverpool Hospital HLS.
- The Liverpool Boys and Girls High School Upgrade building, once constructed, will not intrude into any OLS.
- The Liverpool Boys and Girls High School Upgrade building, once constructed, will not intrude into any PANS-OPS surfaces.
- The Liverpool Boys and Girls High School Upgrade building, once constructed, will not intrude into any RTCC.
- The Liverpool Boys and Girls High School Upgrade building, once constructed, will not impact the Liverpool Hospital HLS approach and departure paths.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will not intrude into any OLS.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will not intrude into any PANS-OPS surfaces.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will not intrude into any RTCC.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will intrude into the present Liverpool Hospital northern HLS approach and departure path.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will require aviation-standard obstacle lighting for HLS protection.

3. BACKGROUND

3.1 Introduction

This Aviation Impact Assessment Report has been prepared by AviPro on behalf of Department of Education (DoE) to assess the potential environmental impacts that could arise from infrastructure works at 18 Forbes Street, Liverpool, 2170 (the site).

This report has been prepared to identify any potential impacts as a consequence of the Liverpool Boys and Girls High School Upgrade development on helicopter operations at the Liverpool Hospital and associated helicopter

landing Site (HLS). This report accompanies a Review of Environmental Factors (REF) for the construction and operation of the Liverpool Boys and Girls High School Upgrade.

AviPro has been engaged to provide advice regarding the aviation specific impacts that the Liverpool Boys and Girls High School Upgrade development will have on the prescribed/protected airspace at any aerodromes in the vicinity and the HLS at the adjacent Liverpool Hospital. This includes an assessment of the impacts caused by the construction crane(s).

3.2 Background Material

Reference material provided by EBRS in support of the report include early planning designs and concept drawings.

3.3 Methodology

Criteria from all relevant references were assessed, with the Guidelines used as the primary tool.

3.4 Consultant Qualifications and Experience

AviPro has been a consultant to NSW Health Infrastructure and DoE for almost 20 years, and under current ownership for over eight years. CVs of those responsible for the development of this report are available upon request.

3.5 Explanation of Terms

Aircraft. Refers to both aeroplanes (fixed wing) and helicopters (rotorcraft).

Approach and Departure Path (IFR). The flight track helicopters follow when landing at or departing from the FATO of an HLS under the Instrument Flight Rules. The IFR approach and departure path extends upwards and outwards from the edge of the FATO safety area with an obstacle free gradient of 2.60/4.5%/ 1:22.2 (22.2 units horizontal in 1 unit vertical), to a height of 152m above the FATO at a distance of ~3,386 m. The approach and departure path commences at the forward edge of the FATO safety area at a width of 34m, and increases in width uniformly to 152m m above the elevation of FATO surface at a distance of ~3,386 m.

Approach/Departure Path (VFR). The flight track helicopters follow when landing at or departing from the FATO of an HLS. Updated standards to align with ICAO requirements now has the VFR (day and) night approach and departure path extending upwards from the forward edge of the FATO safety area with an obstacle free gradient of 2.60/4.5%/ 1:22.2 (22.2 units horizontal in 1 unit vertical), to a height of 152m above the FATO at a distance of ~3,386 m. The approach and departure path commences at the forward edge of the FATO safety area at a width of 34m, and expands uniformly, laterally at an angle of 8.70/15%/1:12.8 to a total width of 140 m, then remains parallel to a distance of ~3,386m, where the height is 152 m above the elevation of FATO surface.

Design Helicopter. The Leonardo Helicopters AW139 contracted to the NSW Ambulance. The type reflects the latest generation Performance Class 1 capable helicopters used in HEMS and reflects the maximum weight and maximum contact load/minimum contact area. The design helicopter has a maximum all up mass of 7 tonnes, however for HLS design purposes it is assumed the helicopter will never exceed 6.8 tonnes on the HLS.

D Value (Overall Length). The distance from the tip of the main rotor tip plane path to the tip of the tail rotor tip plane path or the fin if further aft, of the Design Helicopter.

Elevated Helicopter Landing Site. An HLS located on a roof top or some other elevated structure where the Ground Effect Area/Touchdown and Lift-off Area (TLOF) is at least 2.5m above ground level.

Final Approach. The reduction of height and airspeed to arrive over a predetermined point above the FATO of an HLS.

Final Approach and Takeoff Area (FATO). A defined area over which the final phase of the approach to a hover, or a landing is completed and from which the takeoff is initiated. For the purposes of these guidelines, the specification of 1.5 x D Value or Overall Length of the Design Helicopter is used and equates to 25m. diameter. Area to be load bearing.

Ground Taxi. The surface movement of a wheeled helicopter under its own power with wheels touching the ground.

Hazard to Air Navigation. Any object having a substantial adverse effect upon the safe and efficient use of the navigable airspace by aircraft, upon the operation of air navigation facilities, or upon existing or planned airport/heliport capacity.

Helicopter Landing Site (HLS). One or more may also be known as a Heliport. The area of land, water or a structure used or intended to be used for the landing and takeoff of helicopters, together with appurtenant buildings and facilities.

Helicopter Landing Site Elevation. At an HLS without a precision approach, the HLS elevation is the highest point of the FATO expressed as the distance above mean sea level.

Helicopter Landing Site PC1 Survey Reference Point. A position at the forward edge of the FATO safety area in the centre of the approach and departure path, from which the PC1 survey at 2.6º (4.5%) is initiated.

Helicopter Landing Site Reference Point (HRP). The geographic position of the HLS expressed as the latitude and longitude at the centre of the FATO.

Hospital Helicopter Landing Site. HLS limited to serving helicopters engaged in air ambulance, or other hospital related functions.

Note:

A designated HLS located at a hospital or medical facility is an emergency services HLS and not a medical emergency site.

Heliport. Two or more co-existing helicopter landing sites (HLS). There are no implications for operating a heliport as opposed to an HLS, other than having a “Heliport Operations Manual” rather than an “HLS Operations Manual” which would address the various interactions and interoperability (aviation, clinical etc) at the dual sites.

Hover Taxi. The movement of a helicopter above the surface, generally at a wheel/skid height of approximately one metre. For facility design purposes, a skid-equipped helicopter is assumed to hover-taxi.

Landing and Lift Off Area (LLA). A load-bearing, nominally paved area, normally located in the centre of the TLOF, on which helicopters land and lift off. Minimum dimensions are based upon a 1 x metre clearance around the undercarriage contact points of the Design Helicopter.

Lift Off. To raise the helicopter into the air.

Movement. A landing or a lift-off of a helicopter.

Object Identification Surface. The OIS are a set of imaginary surfaces associated with a heliport. They define the volume of airspace that should ideally be kept free from obstacles in order to minimise the danger to a helicopter during an entirely visual approach.

Obstacle Limitation Surface. The OLS are a set of imaginary surfaces associated with an aerodrome. They define the volume of airspace that should ideally be kept free from obstacles in order to minimise the danger to aircraft during an entirely visual approach.

Obstruction to Air Navigation. Any fixed or mobile object, including a parked helicopter, which impinges the approach/departure surface or the transitional surfaces.

Parking Pad. The paved centre portion of a parking position, normally adjacent to an HLS.

Performance Class 1 (PC1). Similar to Category A requirements. For a rotorcraft, means the class of rotorcraft operations where, in the event of failure of the critical power unit, performance is available to enable the rotorcraft to land within the rejected take-off distance available, or safely continue the flight to an appropriate landing area, depending on when the failure occurs. For an elevated HLS, the reject area is that area within the FATO (25 m. diameter) and therefore this area is to be load bearing. PC1 also requires CASA approved flight path surveys to/from the HLS.

Performance Class 2 (PC2). For a rotorcraft, means the class of rotorcraft operations where, in the event of failure of the critical power unit, performance is available to enable the rotorcraft to safety continue the flight, except when the failure occurs early during the take-off manoeuvres, in which case a forced landing may be required. PC2 also requires CASA approved flight path surveys to/from the HLS.

Performance Class 2 With Exposure (PC2WE). PC2WE is very similar to PC2 as mentioned above. The primary difference is that there need not be any provision for a suitable forced landing area during the take-off and landing phases of flight, within the designated exposure period for the rotorcraft. PC2WE offers operators

alternative mitigation strategies based on: a defined exposure time limit, demonstrated engine reliability, engine maintenance standards, pilot procedures and training, and operator risk assessments. Specific approval to operate with exposure is required from CASA and will require a number of mitigation strategies from the operator to gain that approval.

Performance Class 3 (PC3). For a rotorcraft, means the class of rotorcraft operations where, in the event of failure of the critical power unit at any time during the flight, a forced landing:

in the case of multi-engine rotorcraft – may be required; or

in the case of single-engine rotorcraft – will be required.

Pilot Activated Lighting (PAL). A PAL system utilises a hospital-based VHF radio and timed switching device, activated by the pilot via a radio transmission on a pre-set frequency, to turn on the associated HLS lighting.

Prior Permission Required (PPR) HLS. An HLS developed for exclusive use of the owner and persons authorized by the owner, i.e. a hospital-based emergency services HLS.

Note:

The HLS owner and the HEMS operator are to ensure that all pilots are thoroughly knowledgeable with the HLS (including such features as approach/departure path characteristics, preferred heading, facility limitations, lighting, obstacles in the area, size of the facility, etc.). This is addressed as part of the HLS commissioning process.

Rotor Downwash. The volume of air moved downward by the action of the rotating main rotor blades. When this air strikes the ground or some other surface, it causes a turbulent outflow of air from beneath the helicopter.

Safety Area. A defined area on an HLS surrounding the FATO intended to reduce the risk of damage to helicopters accidentally diverging from the FATO. This area should be free of objects, other than those frangible mounted objects required for air navigation purposes. The Safety Area for the Design Helicopter extends 4.5 m. beyond the FATO perimeter forming a 34 m. X 34 m. square or a 34m. diameter circle.

Safety Net. Surrounds the outer edge of a rooftop HLS. It is to be a minimum of 1.5 m. wide and have a load carrying capacity of not less than 122 kg/m2. The outer edge is not to project above the HLS deck, and slope back and down to the deck edge at approximately 10 degrees, and not more than 20 degrees. Both the inside and outside edges of the safety net are to be secured to a solid structure.

Shielded Obstruction. A proposed or existing obstruction that does not need to be marked or lit due to its close proximity to another obstruction whose highest point is at the same or higher elevation.

Standard HLS. A place that may be used as an aerodrome for helicopter operations by day and night.

Take off. To accelerate and commence climb at the relevant climb speed.

Take off Position. A load bearing, generally paved area, normally located on the centreline and at the edge of the TLOF, from which the helicopter takes off. Typically, there are two such positions at the edge of the TLOF, one for each of two takeoff or arrival directions.

Touchdown and Lift-off Area (TLOF). A load bearing, generally paved area, normally centred in the FATO, on which the helicopter lands or takes off, and that provides ground effect for a helicopter rotor system. Size is based on 1 x main rotor diameter of Design Helicopter, and is 14m diameter.

Transitional Surfaces. Starts from the side edges of the FATO safety area parallel to the approach and departure path centre line, and extends upwards and outwards (to the sides) at a slope of 2:1 (two-units horizontal in one-unit vertical or 26.6°) to a height of 45m above the elevation of the FATO surface. Further, from the forward edge of the side transitional surfaces, the transitional surface joins the outer edges of the approach and departure surface, and proceeds upwards and outwards until the outer edges are 152m wide at ~3386m which corresponds with the end of the approach and departure surface.

Unshielded Obstruction. A proposed or existing obstruction that may need to be marked or lit since it is not in close proximity to another marked and lit obstruction whose highest point is at the same or higher elevation.

3.6 Applicable Abbreviations

Acronym	Meaning
AC	US FAA Advisory Circular
ACC	Aeromedical Control Centre (HQ Eveleigh). Responsible for control and tasking of HEMS

Acronym	Meaning
CASA	Civil Aviation Safety Authority (Australia)
CASRs	Civil Aviation Safety Regulations (1998) Australia
DCP	Development Control Plan
DDO	Design and Development Overlay
FAA	Federal Aviation Administration, USA
FATO	Final approach and Take-Off Area (1.5 x helicopter length)
FARA	Final Approach Reference Area
GPS	Global Positioning System
HEMS	Helicopter Emergency Medical Service
HLS	Helicopter Landing Site
HLSRO	HLS Reporting Officer (Airservices requirement)
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions - requiring flight under IFR
L	Length (also referred to as Overall Length), in relation to a helicopter, the total distance between the main rotor and tail rotor tip plane paths when rotating
LDP	Landing Decision Point (Category A/Performance Class 1 operations)
LEP	Local Environment Plan
LGA	Local Government Area
Liverpool Boys and Girls High School Upgrade	Liverpool Girls and Boys High School
LHAP	Liverpool Health and Academic Precinct
LLA	Landing and Lift Off Area. Solid surface meeting dynamic loading requirements, with undercarriage contact points + I metre in all directions
MoH	Ministry of Health NSW
MRI	Magnetic Resonance Imagers
MTOW	Maximum Take Off Weight
NOTAM	Notice to Airmen. Issued by Airservices in relation to airspace and navigation warnings
NVG	Night Vision Goggle(s)
OIS	Object Identification Surface(s) (Heliport/HLS)
OLS	Obstacle Limitation Surface(s) (Aerodrome)
PC1	Performance Class 1
PC2	Performance Class 2
PC3	Performance Class 3
RD	Main Rotor Diameter
REF	Review of Environmental Factors
RTCC	Radar Terrain Clearance Chart
SARPS	Standards and Recommended Practices developed by ICAO and promulgated in the Annexes to the Convention of International Civil Aviation
TDP	Takeoff Decision Point (Category A/Performance Class 1 operations)
TLOF	Touch Down and Lift Off Area. Load bearing min. 1 x main rotor diameter.
VFR	Visual Flight Rules
VHF	Very High Frequency radio
VMC	Visual Meteorological Conditions - allowing flight under VFR
V_{TOSS}	Take off Safety Speed

Table 2: Abbreviations

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4. GENERAL AIRSPACE REQUIREMENTS AND CONSIDERATIONS

Purpose of this Section

It is important that the reader has a good understanding of the fundamentals of airspace protection for aerodromes and heliports/HLS in order to be able to understand the analysis later in this report. Section 3 provides this general overview.

Airspace Regulation in Australia - Aerodromes

Approvals will be required if primary prescribed airspace could be impinged. The normal contact for this process is through the local aerodrome operator who in most cases outside of the major international airports, is the local Council.

Primary prescribed airspace includes an airport's Obstacle Limitation Surfaces (OLS) involving a set of imaginary surfaces associated with an aerodrome that should be kept free of obstacles. Additionally, the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) surfaces that takes account of the airspace associated with aircraft instrument procedures, must be considered.

Airspace Management in Australia – Heliports and Helicopter Landing Sites

Currently within Australia, there are no "standard" rules or regulations applicable to the design, construction, or placement of HLSs. There may however be local council planning, location and movement approvals required. The appropriate national regulatory guidance at present for the use of HLSs is Civil Aviation Safety Regulation (CASR) 91.410 which places the onus on the helicopter pilot to determine the suitability of a landing site.

CASR 139.R will ultimately govern the regulation of HLSs within Australia. In the meantime, CASA, the regulator of aviation in Australia has issued a new Advisory Circular (AC) 139.R-01 v1.0 Guidelines for heliports - design and operation to provide "guidance in the planning, design, and operation of heliports to support the safe and efficient operation of helicopters…" and to prepare for the introduction of CASR 139.R.

Because no Federal or State (NSW) legislation is in place to protect VFR approach and departure paths associated with hospital HLS', in May 2018, the Commonwealth Department of Infrastructure, Transport, Regional Development and Communications issued Guideline H: Protecting Strategically Important Helicopter Landing Sites under the National Airports Safeguarding Framework (NASF). Whilst this publication has no legal effect in NSW as yet, its content is gradually being aligned within the NSW MoH Guidelines for Hospital Helicopter Landing Sites in NSW.

State Government Requirements

The various legislative/regulatory requirements relating to HLS' in NSW are complex. Current regulation excludes emergency service landing sites from the definition of "designated development" in the Environmental Planning and Assessment Regulation (which otherwise includes most HLS'). Generally, hospital HLS' are considered "ancillary-uses" to hospital purposes and are thus not separate "development". The same cannot necessarily be said about off-site emergency medical HLS, e.g. local sports fields. To ensure that all requirements are met, close consultation with a NSW Ambulance approved Aviation Consultant should be maintained throughout the design and construction phases.

Local Government Requirements

Local Government requirements for airspace protection, if they exist, will be contained within the Local Environment Plan (LEP).

Local Government requirements for airspace protection at aerodromes emanate from the Airports Act 1996 and the Airports (Protection of Airspace) Regulations 1996.

The Airports (Protection of Airspace) Regulations 1996 differentiate between short-term (less than 3 months) and long-term controlled activities. The Regulations provide for the airport operator to approve short-term controlled activities that penetrate the OLS, and for the Commonwealth Department of Infrastructure, Transport, Regional Development and Communications for approval of long-term controlled activities and those short-term controlled activities referred to it by the airport operator. However, the airport operator must refer short-term PANS-OPS infringements to the Department for approval. Long term intrusions of the PANS-OPS surface are prohibited.

Additional requirements for airspace protection at heliports and HLS', if they exist, may be contained within the LGA's Development Control Plan (DCP).

Obstacle Limitation Surfaces

The objective of the OLS is to define a volume of airspace in proximity to the airport which should be kept free of obstacles that may endanger aircraft in visual operations, or during the visual stages of an instrument approach.

The intention is not to restrict or prohibit all obstacles, but to ensure that either existing or potential obstacles are examined for their impact on aircraft operations and that their presence is properly taken into account. Since they are relevant to visual operations, it may sometimes be sufficient to ensure that the obstacle is conspicuous to pilots, and this may require that the obstacle be marked or lit.

In reality, there is little issue with breaching the OLS as pilots will be visual with the obstruction and can work on “see and avoid” principles. OLS at a multi-runway aerodrome look akin to Figure 2 below:

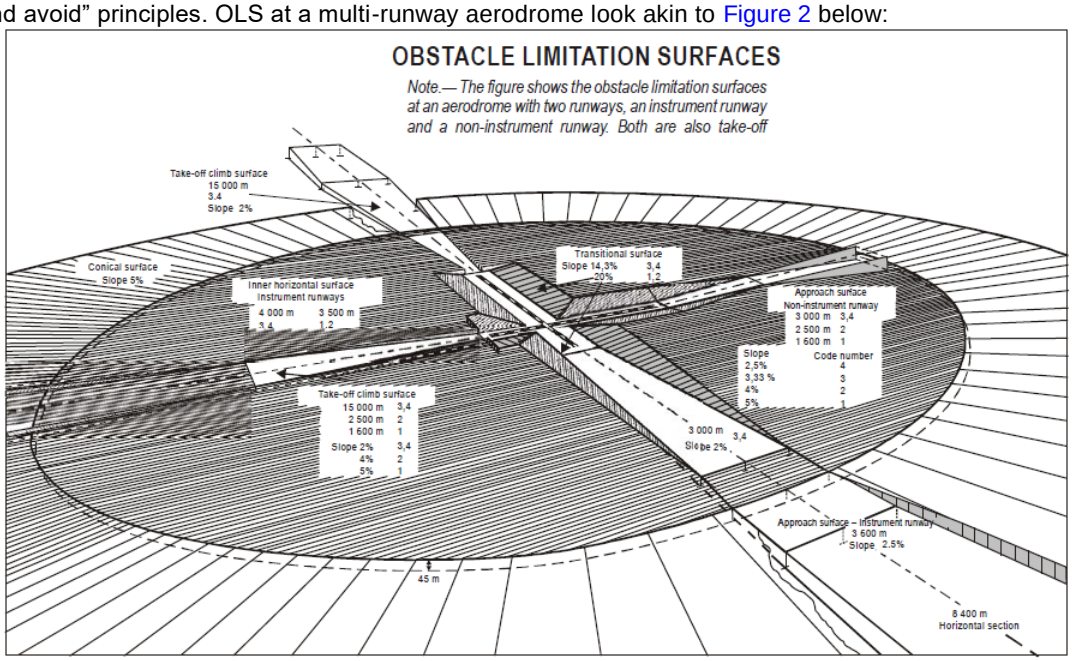

Figure 2: Example of Obstacle Limitation Surfaces

Procedures for Air Navigation – Aircraft Operations (PANS-OPS) Surfaces

PANS-OPS surfaces detail essential areas and obstacle clearance requirements for the achievement of safe, regular instrument flight operations.

The instrument flight procedures enable pilots to either descend from the high enroute environment of cruise type flight to establish visual contact with the landing runway, or climb from the runway to the enroute environment, with a prescribed safe margin above terrain and obstacles, by use of aircraft instruments and radio navigation aids or GPS in conditions where the pilot cannot maintain visual contact with the terrain and obstacles due to inclement weather conditions.

Pilots must be protected against protrusions into the PANS-OPS surfaces as they have no way of avoiding obstructions if they get off track and they cannot see such obstructions.

PANS-OPS surfaces are constructed differently to OLS however they serve a similar purpose. An example of PANS-OPS surfaces is in Figure 3.

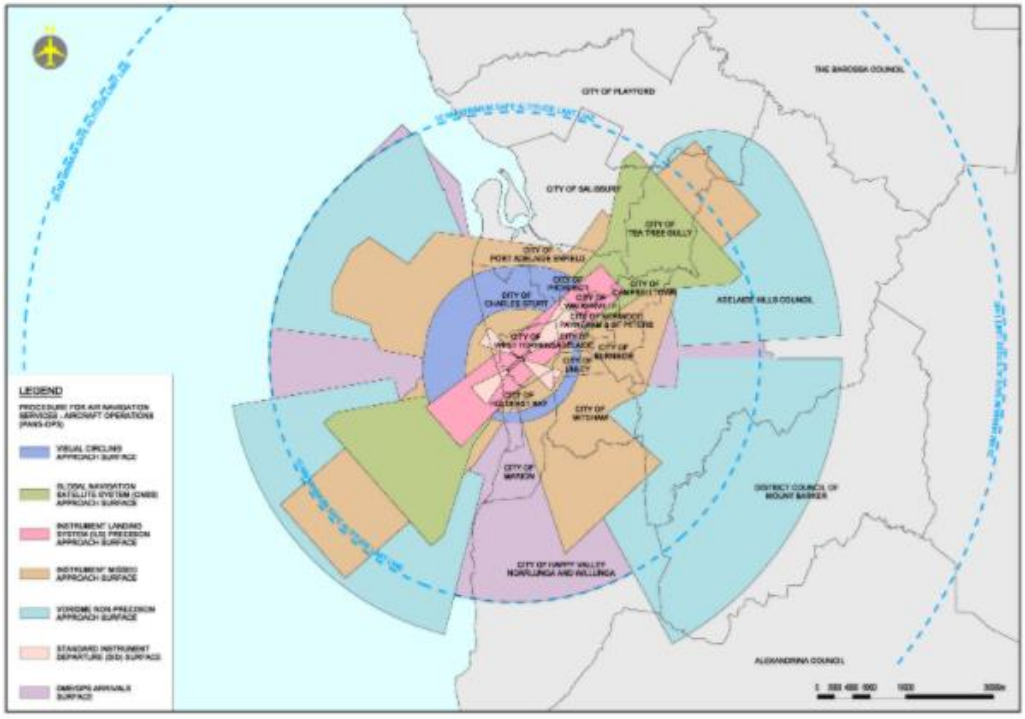

Figure 3: Example of PANS-OPS Surfaces

Radar Terrain Clearance Charts

The Radar Terrain Clearance Chart defines an area in the vicinity of an aerodrome, in which the minimum safe levels allocated by an Air Traffic Controller (ATC) vectoring Instrument Flight Rules (IFR) flights with Primary and/or Secondary Surveillance RADAR equipment have been predetermined. The figure shown on the chart is the lowest altitude which an ATC may assign to a pilot. An example of an RTCC is in Figure 4 below:

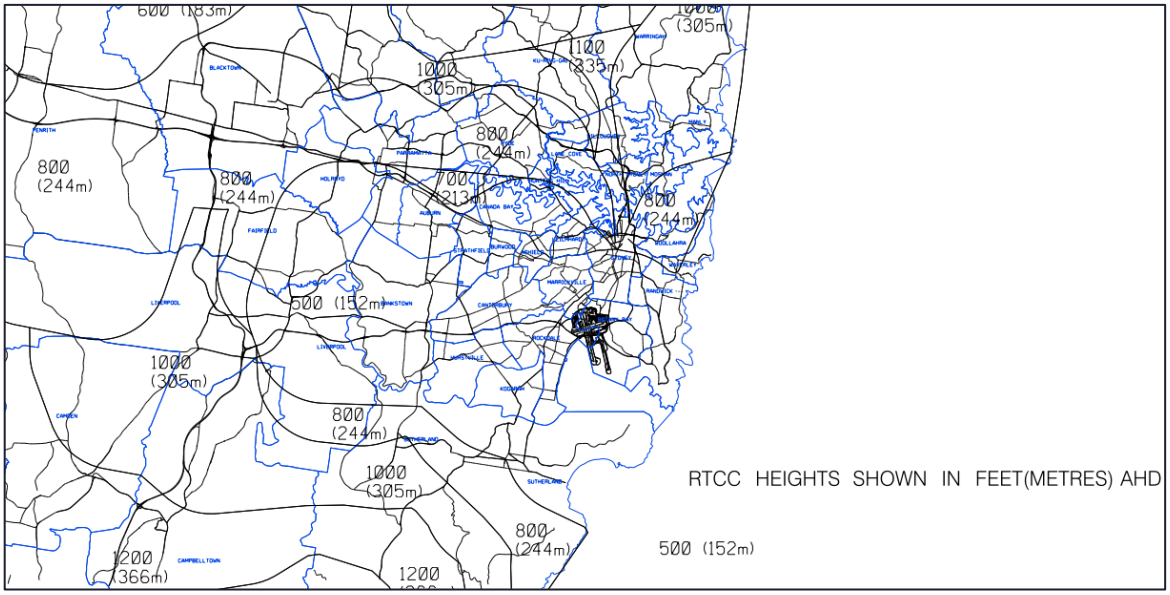

Figure 4: Example of a Radar Terrain Clearance Chart (RTCC)

Approach and Departure Paths

The purpose of approach and departure path is to provide a portion of airspace sufficiently clear of hazards to allow safe approaches to, and departures from, the HLS. Approach and departure paths can be designed for both visual (VFR) use by day and by night using different criteria; and for instrument (IFR) flight (also by day and night, albeit there are no differences in design requirements).

VFR approach and departure paths should be such that there are no downwind operations and crosswind operations are kept to a minimum. To accomplish this, an HLS must have more than one path which provides an additional safety margin and operational flexibility.

The preferred flight approach and departure path should where possible, be aligned with the predominant, prevailing wind when taking account of potential obstacles. Other approach and departure paths should also be based on an assessment of the average, prevailing winds and potential obstacles. The separation between approach and departure paths should not be less than 135°, and should preferably be 180°.

VFR Approach and Departure (Take-off Climb) Surface

VFR approach and departure surfaces can be designed for both day and night operations. Because all NSW hospital HLS' are required to be capable of both day and night use, the night tolerances are always used. A (day and) night approach and departure surface starts at the forward edge of the FATO safety area and slopes upward at 2.60/4.5%/1:22.2 (22.2 units horizontal in 1 unit vertical) for a distance of ~3,386 m. The approach and departure path commences at a width of 34 m and expands uniformly, laterally at an angle of 8.70/15%/1:12.8 to a width of 140 m, then remains parallel to a distance of 3,386 m, where the height is 152 m above the elevation of FATO surface. The VFR approach and departure paths are to be obstacle free. It is important to achieve the 2.6^0/4.5%/1:22.2 obstacle free slope to account for the performance requirements of one engine inoperative (OEI) flight following an emergency. See Figures 5 and 6 below.

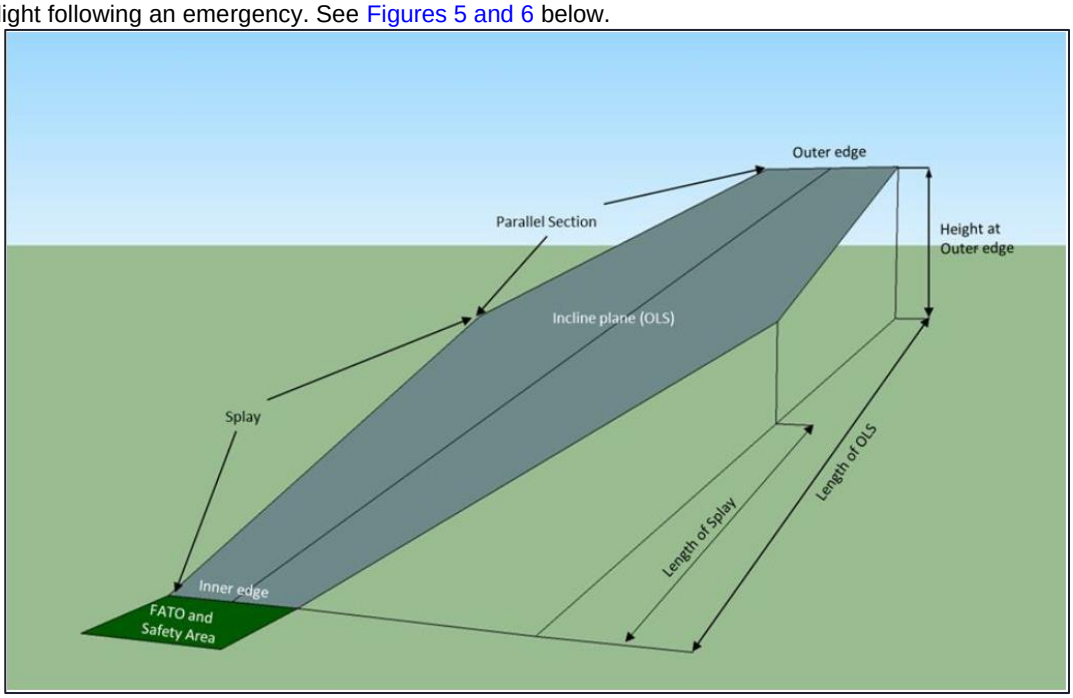

Figure 5: HLS VFR Approach and Departure Surfaces (1)

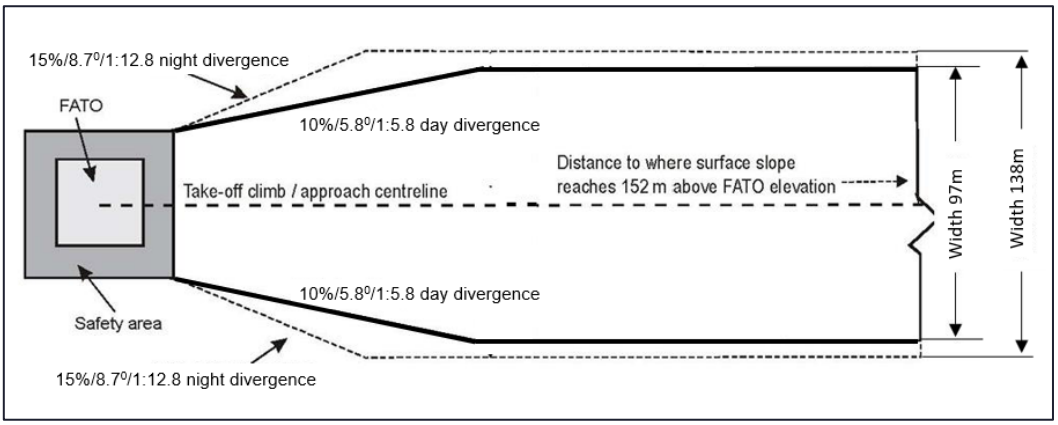

Figure 6: HLS VFR Approach and Departure Surfaces (2)

There are no transitional surfaces for VFR approach and departure paths.

Protected Side Slope

A VFR-only HLS is to be provided with at least one, and preferably two, protected side slopes, rising at 45^0 from the edge of the safety area and extending to a distance of 10m. See Figure 7. Due to the proximity of lift lobbies and other infrastructure, it is often difficult to provide the second protected side slope.

The surface of a protected side slope must not be penetrated by obstacles.

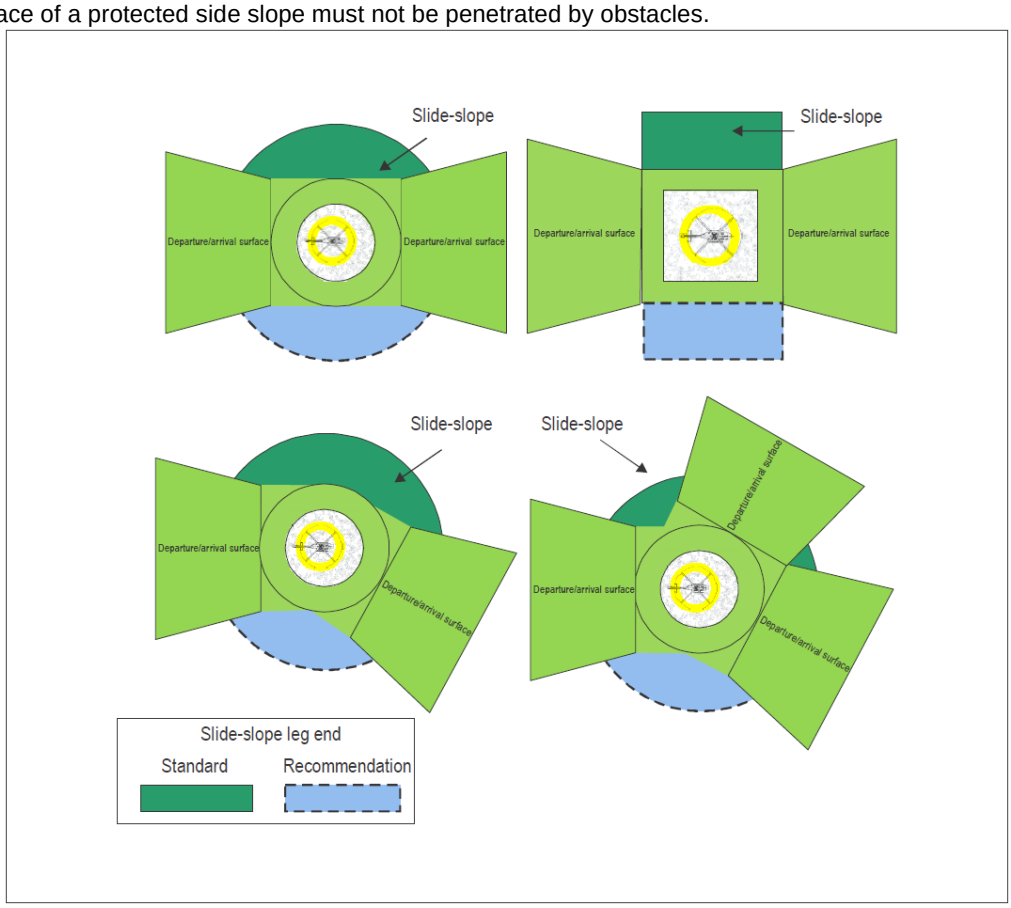

Figure 7: Protected Side Slopes

IFR Approach and Departure Paths

NSW has very few hospital HLS' with instrument approaches, however this can change at any time depending on needs and priorities. To that end, all NSW hospital HLS' should be surveyed so as to permit IFR operations, whether immediately or at some time in the future.

The IFR approach and departure surface, like the VFR approach and departure surface, commences at the safety area edge. They diverge uniformly to a width of 152m at 3,386m from the safety area edge (approximately 1:45).

The FATO transitional surfaces start from the edges of the FATO and safety area, parallel to the approach and departure path centre line, and extend outwards (from the sides of the FATO and safety area) at a slope of 1:2 (2 units horizontal in 1 unit vertical or 26.6°). They provide very similar protection at an IFR-capable HLS as the protected side slope does at a VFR-only HLS; but extend 45m above FATO level (rather than 10m). The approach and departure transitional surfaces commence at the forward edge of the safety area, overlaid over the approach and departure surface; and from the outer edges of the approach and departure surface. The outer sides are 76m from the centreline, i.e. the outer edges are 152m wide. The approach and departure transitional surfaces extend to the end of the approach and departure surface at 3,386m.

Note:
The transitional surface is not applied on the safety area edge opposite the Approach/Departure surface.

The approach and departure surface is to be free of penetrations. Any penetration of the transitional surface is to be considered a hazard.

Figure 8 illustrates the IFR Approach/Departure and Transitional surfaces.

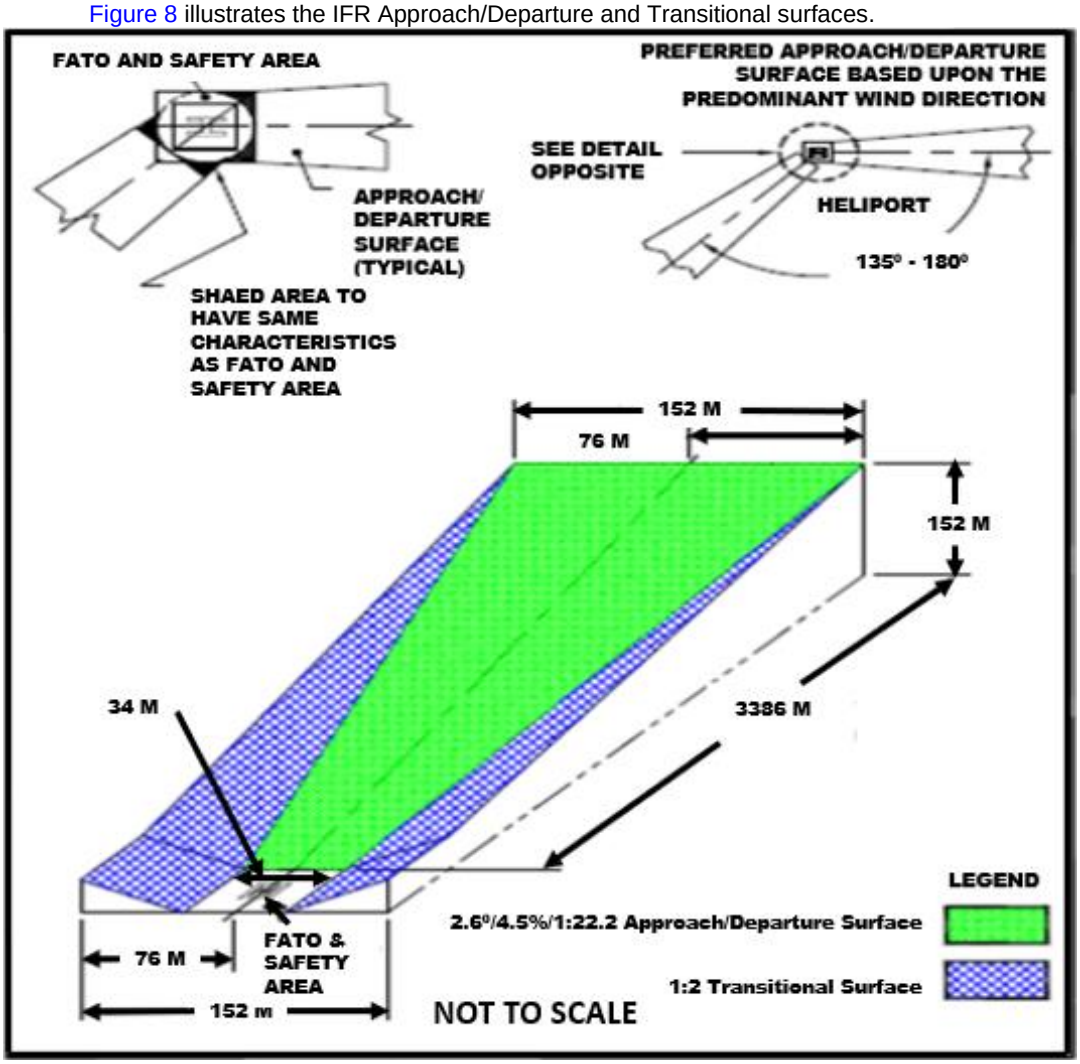

Figure 8: HLS IFR Approach/Departure and Transitional Surfaces

Visual Segment of a Point-in-Space Approach/Departure Procedure

ICAO Doc 9261 Heliport Manual, Part 2, Chapter 4, Section 4.2 addresses this highly specialised requirement. It will not apply at the majority of NSW hospitals.

Object Identification Surfaces (OIS)

Where possible, the Object Identification Surfaces (OIS) are to remain free of obstructions. However, at most hospital HLS, particularly at ground level, existing obstacles and infrastructure do not allow this. Clear OIS can normally only be accommodated at a "new" rural hospital "green field" location or on a roof top HLS which is high above the surroundings.

The object identification surfaces can be described as:

- Under the IFR approach and departure surface, the object identification surface starts from the outside edge of the FATO safety area and extends horizontally out for a distance of ~700m. From this point, the OIS extends out for an additional distance ~2,686m while rising on a 2.6º or 1:22.2 slope (22.2 units horizontal in 1 unit vertical). From the point ~700m from the FATO safety area perimeter, the OIS is ~30 m. beneath the approach and departure surface.
- In all directions from the safety area, except under the approach/ departure paths, the OIS starts at the safety area perimeter and extends out horizontally for a distance of ~30m.
- The width of the OIS extends outwards as a function of distance from the edge of the safety area. From the safety area perimeter, the OIS diverges from each side of the IFR approach and departure

path. At the outer end of the surface, the OIS extends laterally ~60 m from each side of the IFR approach and departure path. See Figure 9.

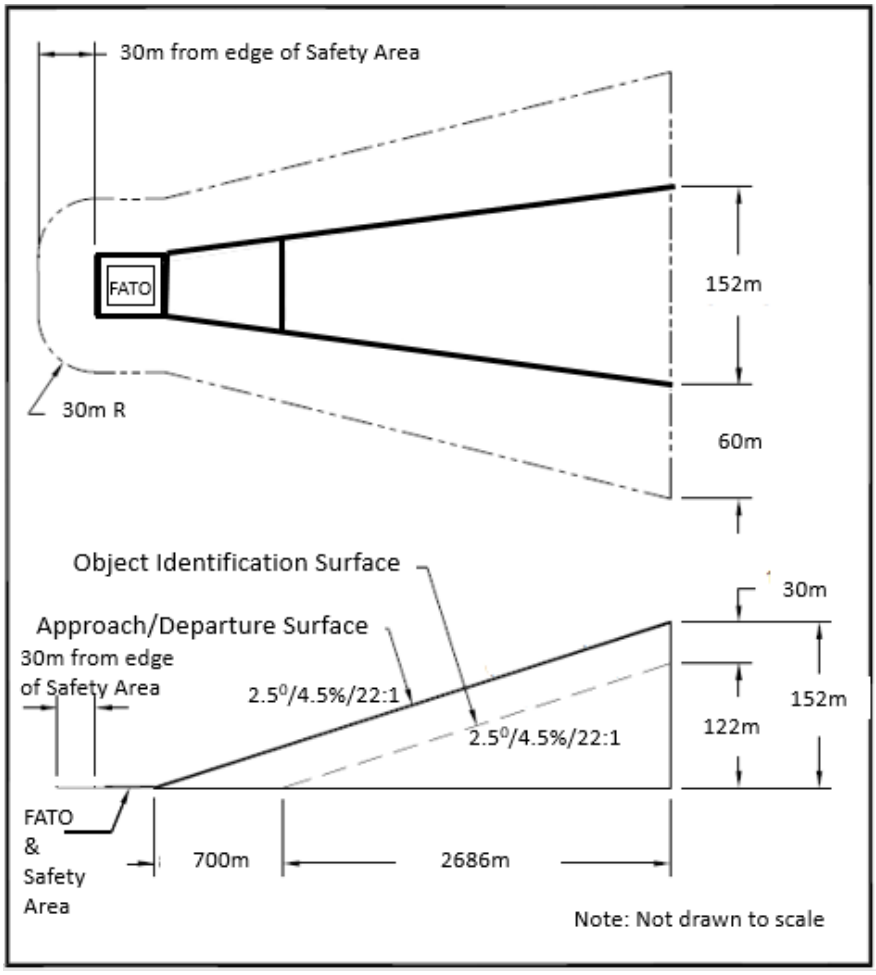

Figure 9: Object Identification Surfaces

Category A Backup Procedure

A Category A back-up procedure, i.e. without a lateral component, is one of the PC1 HLS profiles provided in RFMs along with the dimensions of the backup area. Category A The backup procedure is depicted in Figure 10 below.

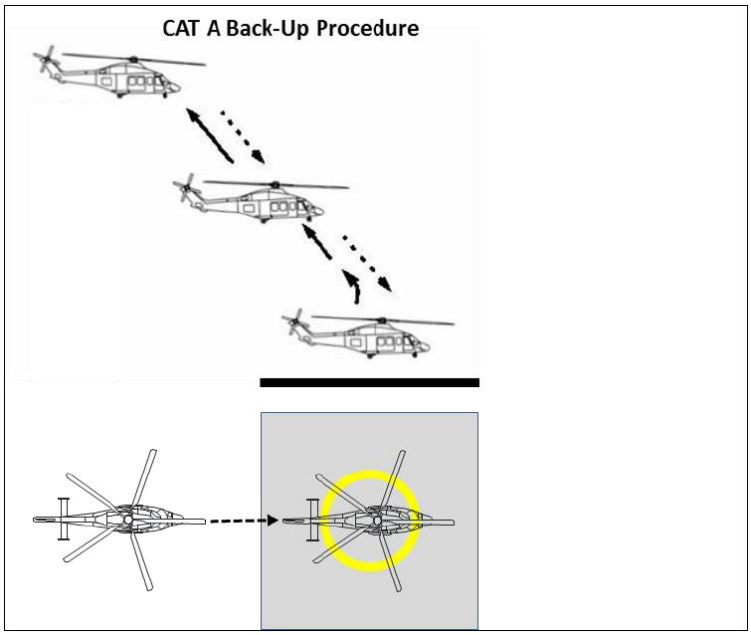

Figure 10: Category A Backup Procedure Profile

The back-up area should consist of two elements: an ascent/descent path/surface and an obstacle limitation surface. The dimensions of these are normally contained in tabular form in the Category A supplement of the RFM. For NSW hospitals which are to be both day and night capable, the splay is to be 15%. Where the backup area is coincident with a reciprocal VFR approach and departure surface, no additional airspace protection measures will be required. Where the back-up area does not overlay the VFR approach and departure surface, a specific ascent/descent path/surface and obstacle limitation surface will need to be surveyed. See Figure 11 below.

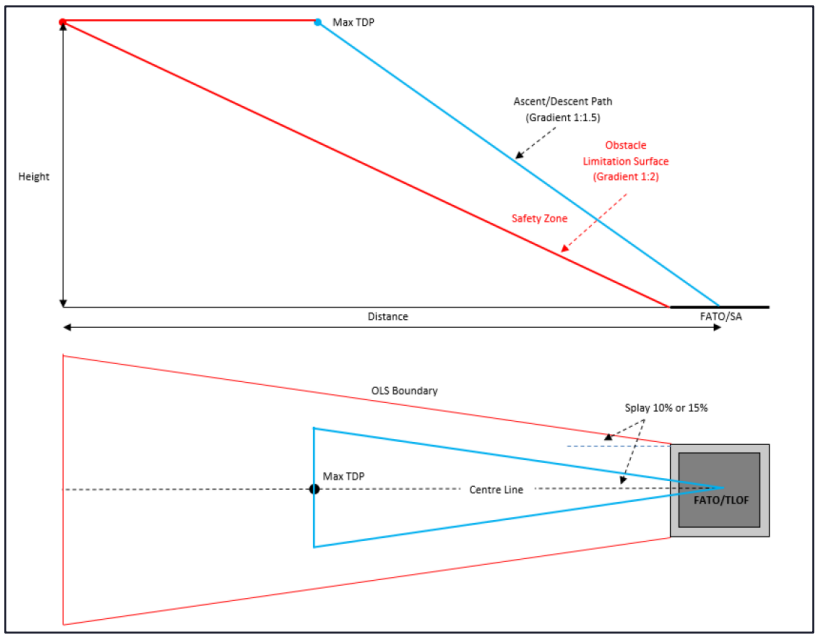

Figure 11: Category A Backup Procedure Surfaces

Obstructions on or in the Vicinity of the HLS

The adverse effect of an object presumed or determined to be a hazard to air navigation may be mitigated by:

- Removing the object.
- Altering the object, e.g. reducing its height.
- Marking and/or lighting the object, provided that the object would not be a hazard to air navigation if it were marked and lit.

An example of an obstruction light required close to the HLS would be that required to be positioned on the top of the windsock. Other obstacles in close proximity to the HLS deck may include radio aerials or exhaust stacks etc. attached to the main building, other buildings in the vicinity such as a lift lobby, or stand alone. All such obstacles are required to have red obstacle lights fitted.

Obstructions in close Proximity but Outside/Below the Approach/Departure Surface

Unmarked wires, antennas, poles, mobile phone towers, and similar objects are often difficult to see even in the best daylight weather, and in time for a pilot to successfully take evasive action. While pilots can avoid such objects during enroute operations by flying well above them, approaches and departures require operations near the ground where obstacles may be in close proximity. Where possible obstructions are to be moved, however if this is impractical, markings and/or obstruction lighting is to be placed upon them.

5. SPECIFIC LIVERPOOL BOYS & GIRLS HIGH SCHOOL PROJECT CONSIDERATIONS

The Liverpool Boys and Girls High School Upgrade Building Location

The location of the lot of the proposed Liverpool Boys and Girls High School Upgrade building footprint is shown in Figure 12 below. It is approximately 500m from the Liverpool Hospital HLS.

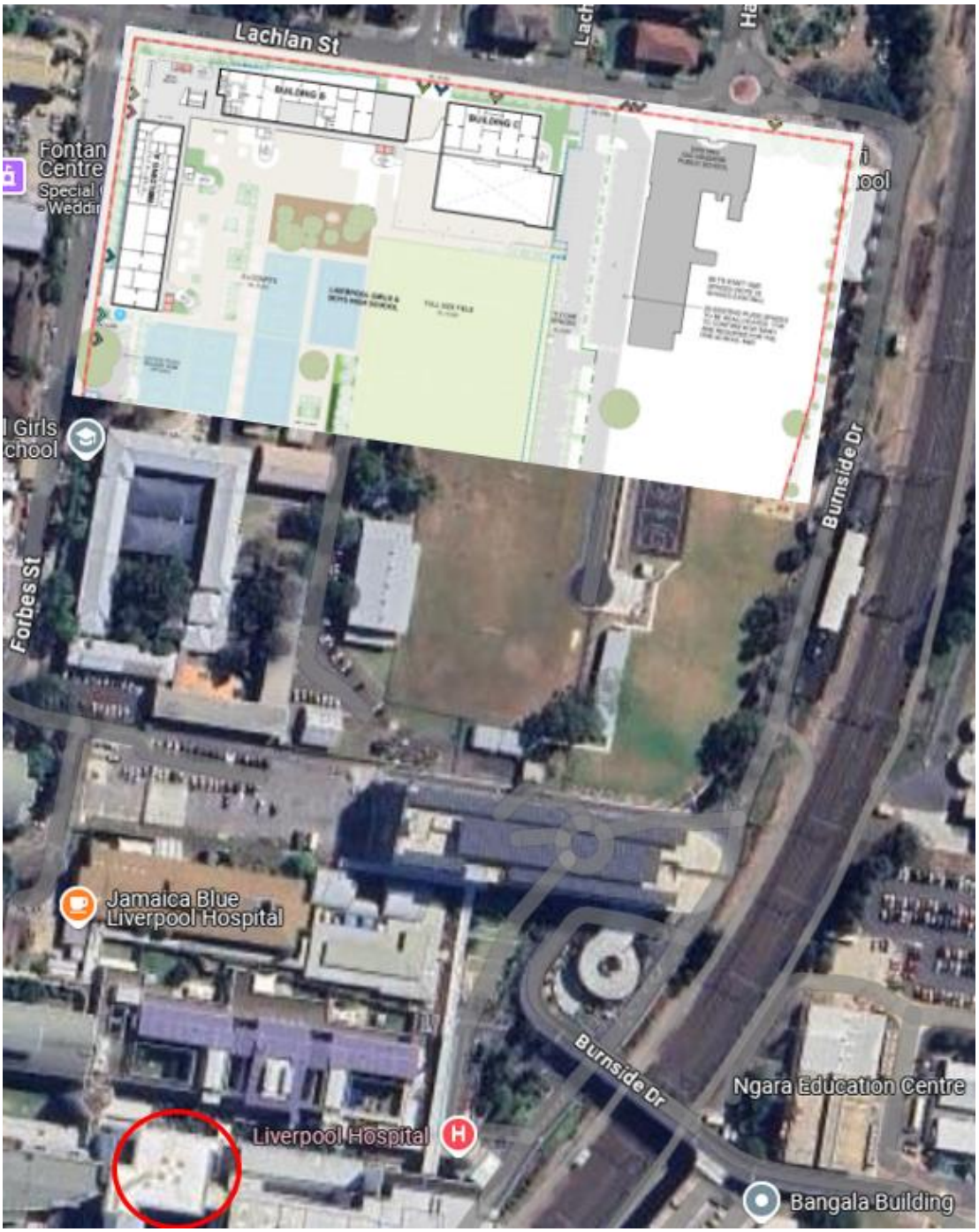

Figure 12: Location of the Proposed Liverpool Boys and Girls High School Upgrade Development

The Liverpool Boys and Girls High School Upgrade Building Elevation

Ground level at the site is approximately 14.75m above mean sea level (RL 14.75 or 14.75 AHD). The highest point of the rooftop of the Liverpool Boys and Girls High School Upgrade will be at RL 33.50. See Figure 13 below. The designated elevation of the Liverpool Hospital HLS is 135 ft (~41.32 metres or ~RL 41.32) above

mean sea level. The elevation of the Liverpool Boys and Girls High School Upgrade building will be 7.82m below that of the Liverpool Hospital HLS.

Figure 13: Elevation of the Liverpool Boys and Girls High School Upgrade Building

Liverpool Hospital HLS Approach and Departure paths

The normal east west flight path associated with the Hospital HLS is east/west. During the Liverpool Health and Academic Precinct (LHAP) development (Stages 1 and 2), this flight path has been replaced by a northern flight path (directly overhead the Liverpool Boys and Girls High School Upgrade site) due to cranes which will remain in use until late 2027. Therefore, as the Liverpool Boys and Girls High School Upgrade site is scheduled to commence during 2025, the cranes associated with the site will directly impact helicopter access to the Liverpool Hospital HLS using the temporary northern flight path.

The current temporary northern Liverpool Hospital HLS approach and departure path is shown in Figure 14. The present temporary northern flight path is planned until late 2027 after which it will revert to a western flight path.

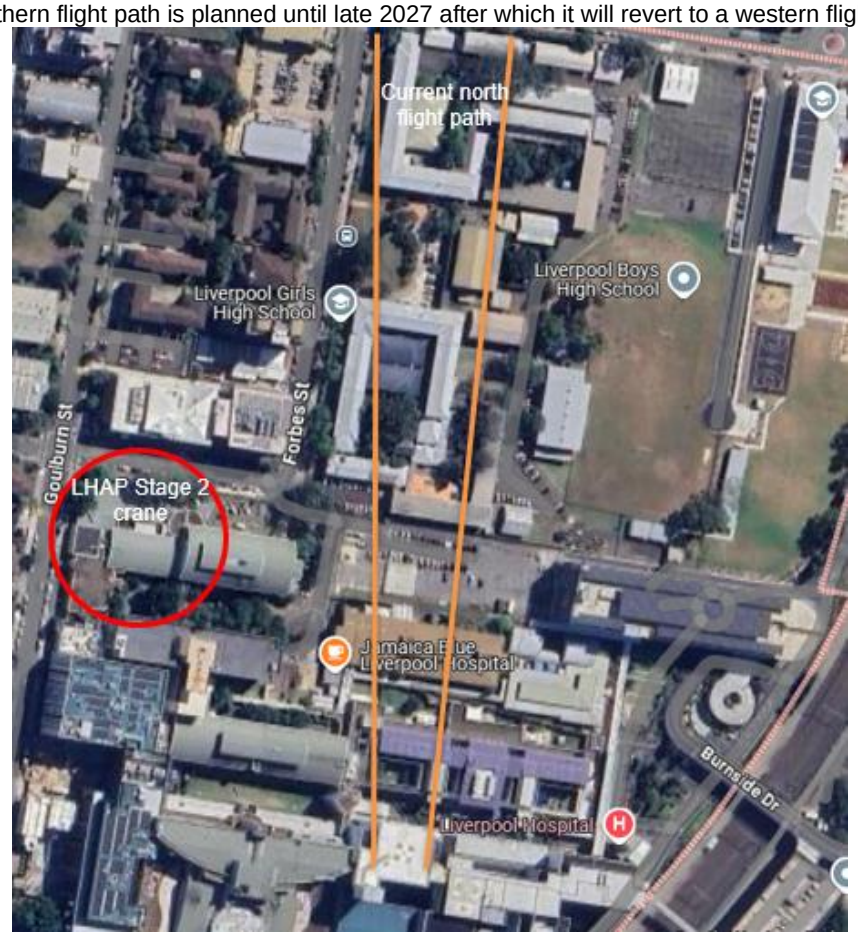

Figure 14: Current Liverpool Hospital HLS Northern Approach and Departure Path

Given the timelines of the two programs (LHAP until end 28, and Liverpool Boys and Girls High School Upgrade from 2025) overlap, a flight path will need to be realigned away from both project cranes. This realignment will also require the movement of the temporary approach/departure path HLS lighting (Figure 15).

Figure 15: Temporary flight path direction lights – requiring relocation

Figure 16 illustrates the new temporary flight path due to the impact of crane arcs for the LHAP project and the Liverpool Boys and Girls High School Upgrade project.

Figure 16: Potential new eastern Approach and Departure Path (purple)

Impact of Liverpool Boys and Girls High School Upgrade Building on Liverpool Hospital HLS Approach & Departure paths

Approach and departure paths for the Liverpool Hospital HLS will not be impacted by the position of the Liverpool Boys and Girls High School Upgrade building. It is the cranes used during construction that will necessitate a flight path realignment.

Construction Crane Considerations

The Guidelines require cranes to be lit when “in the vicinity” of a Hospital HLS. The illumination requirements for cranes in the vicinity of a Hospital HLS are detailed below.

As a minimum for all tower (hammerhead) cranes:

- top of crane A frame or cabin: medium intensity flashing red obstruction light.
- both ends of Jib: medium intensity flashing red obstruction light
- along Jib: line of white LED fluro on a PE cell along the full length of the jib, and
- tower section: stairway lights or spot lights attached to the top of the tower pointing down and onto the tower (not up into pilot eyes).

As a minimum for all luffing cranes:

- top of crane A-frame or cabin: medium intensity red obstruction light
- end of Jib: medium intensity red obstruction light
- along Jib: line of white LED fluro on a PE cell along the full length of the jib
- tower section: stairway lights or spot lights attached to the top of the tower pointing down and onto the tower (not up into pilot eyes)

The LED jib fluro lights are to be LED weather proof emergency fluros controlled via a PE cell with a minimum 90-minute battery back-up.

Liverpool Airspace

The Liverpool Hospital Campus sits below an area covered by the Sydney Visual Terminal Chart (VTC). The VTC, in Figure 17 below, shows that the Liverpool Boys and Girls High School Upgrade project location (red dot) is below controlled airspace, which has a lower level of 2500ft or approximately 762m above mean sea level (equates to RL 762 or 762 AHD).

Figure 17: Liverpool Airspace

Western Sydney Airport Locations

The location of the Liverpool Boys and Girls High School Upgrade development and associated cranes is located between a number of aviation operations centres as seen in Figure 18 below.

Figure 18: Airport locations in Western Sydney

The significance of Figure 18 is that the Liverpool Boys and Girls High School Upgrade development needs to be checked against the protected airspace areas associated with the following airports:

- Sydney Kingsford Smith Airport
- Bankstown Airport,
- Western Sydney Airport, and
- Holsworthy Airport (Military).

The Sydney OLS Overlay

The Sydney Aerodrome OLS is depicted in Figure 19 below. The approximate location of the Liverpool Boys and Girls High School Upgrade is indicated.

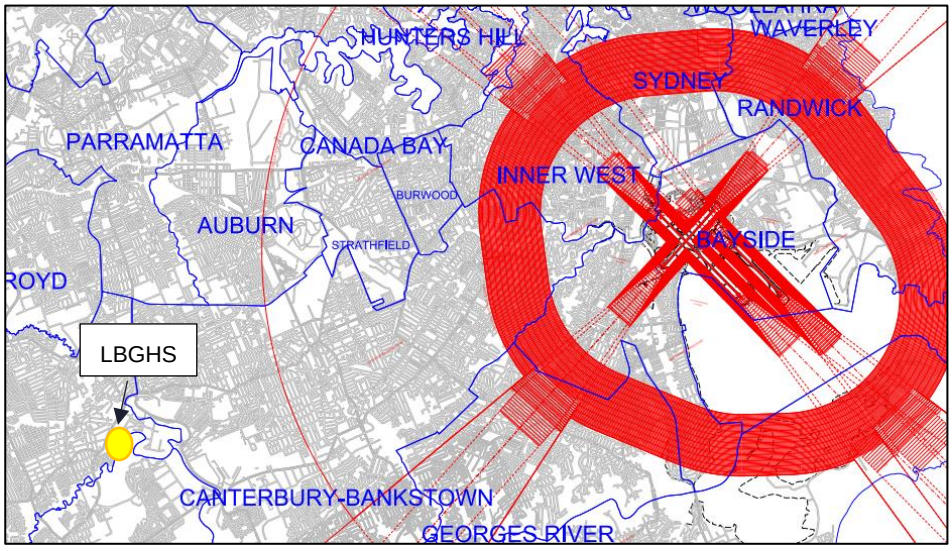

Figure 19: Sydney Airport Obstacle Limitation Surfaces

Sydney Kingsford Smith OLS will not be impacted by the Liverpool Boys and Girls High School Upgrade development.

The Sydney PANS-OPS Overlay

The Sydney Aerodrome PANS-OPS overlay is depicted in Figure 20. The approximate location of the Liverpool Boys and Girls High School Upgrade is indicated.

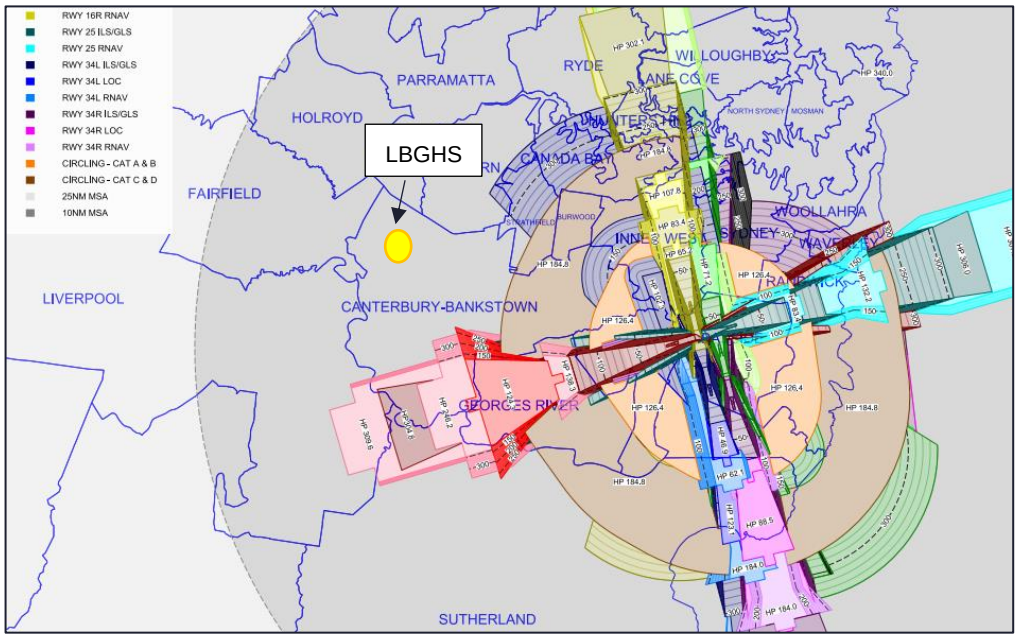

Figure 20: Sydney Airport PANS-OPS Surfaces

Sydney Kingsford Smith Airport PANS-OPS is not impacted by the Liverpool Boys and Girls High School Upgrade development.

The Bankstown Airport OLS Overlay

The Bankstown Aerodrome OLS overlay is depicted in Figure 21 below. The approximate location of the Liverpool Boys and Girls High School Upgrade is indicated and is located outside the inner horizontal surface.

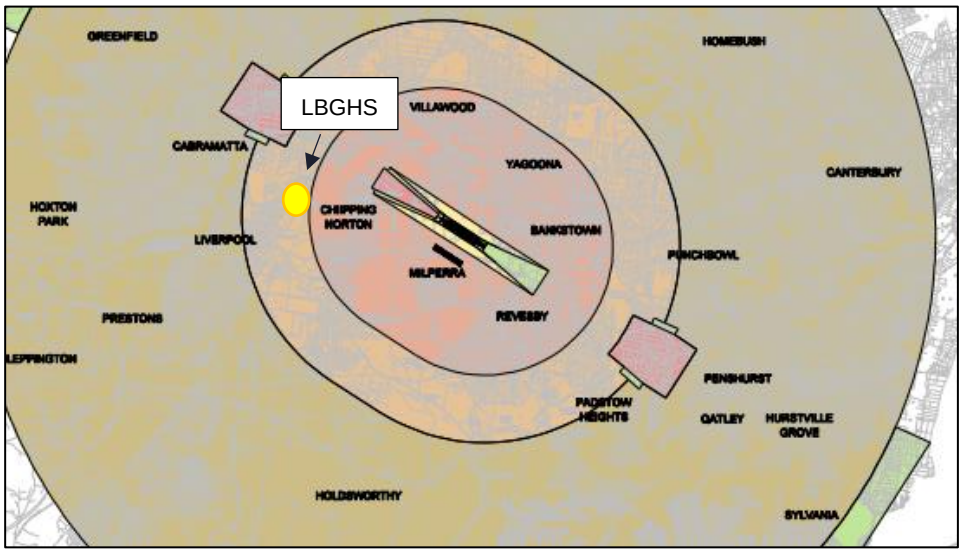

Figure 21: Bankstown Airport OLS Surfaces

The Bankstown OLS is not impacted by the Liverpool Boys and Girls High School Upgrade development.

The Bankstown Airport PANS-OPS Overlay

The Bankstown Aerodrome PANS-OPS overlay is depicted in Figure 22 below. The approximate location of the Liverpool Boys and Girls High School Upgrade is indicated.

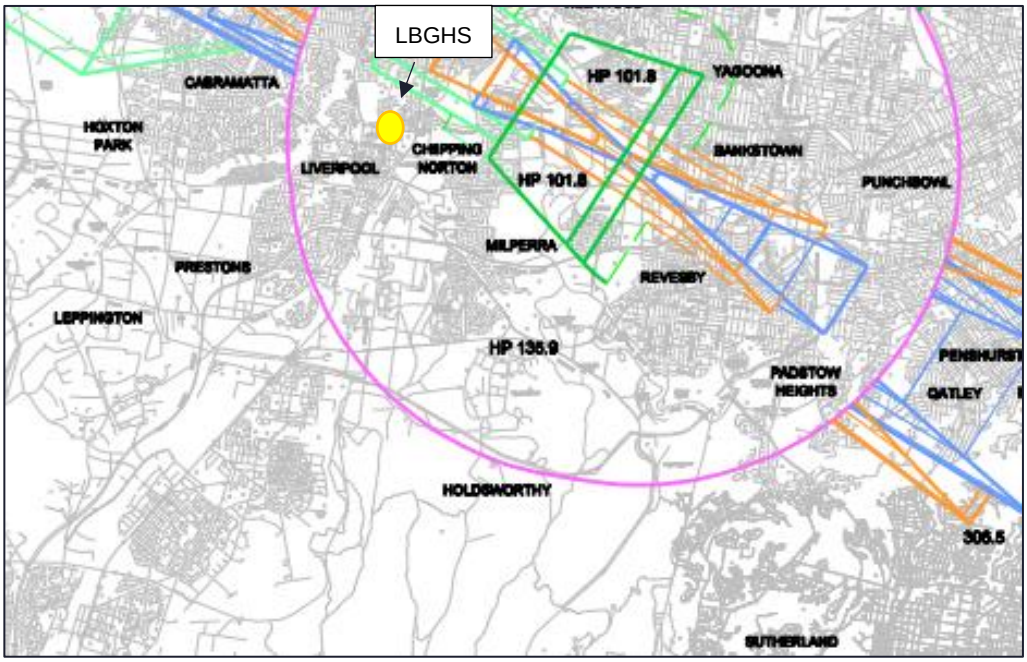

Figure 22: Bankstown Airport PANS-OPS Surfaces

The Bankstown Airport PANS OPS is not impacted by the Liverpool Boys and Girls High School Upgrade development.

The New Western Sydney Airport OLS Overlay

The OLS associated with the new Western Sydney Airports depicted in Figure 23 below, over the Liverpool site do not present any constraints for this development. The approximate location of the Liverpool Boys and Girls High School Upgrade is indicated.

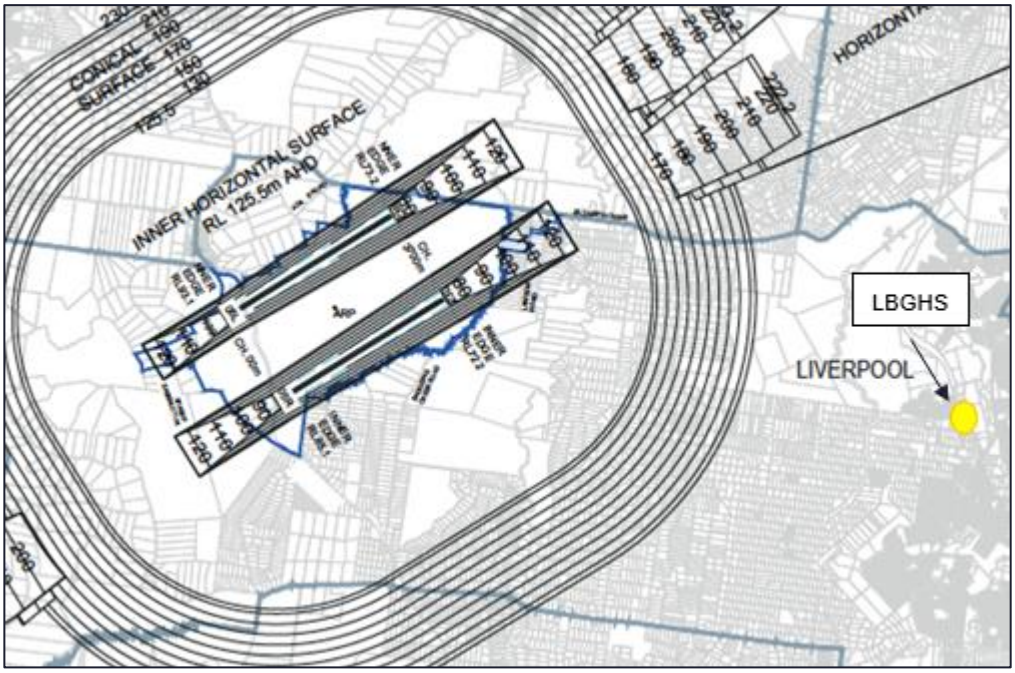

Figure 23: OLS (proposed) for the Western Sydney Airport

The Western Sydney Airport OLS is not impacted by the Liverpool Boys and Girls High School Upgrade development.

The New Western Sydney Airport Flight Path Plan

Analysis of the closest flight paths (Runway 23 daytime arrivals and departures) illustrates that the flight paths will not be impacted by the Liverpool Boys and Girls High School Upgrade development.

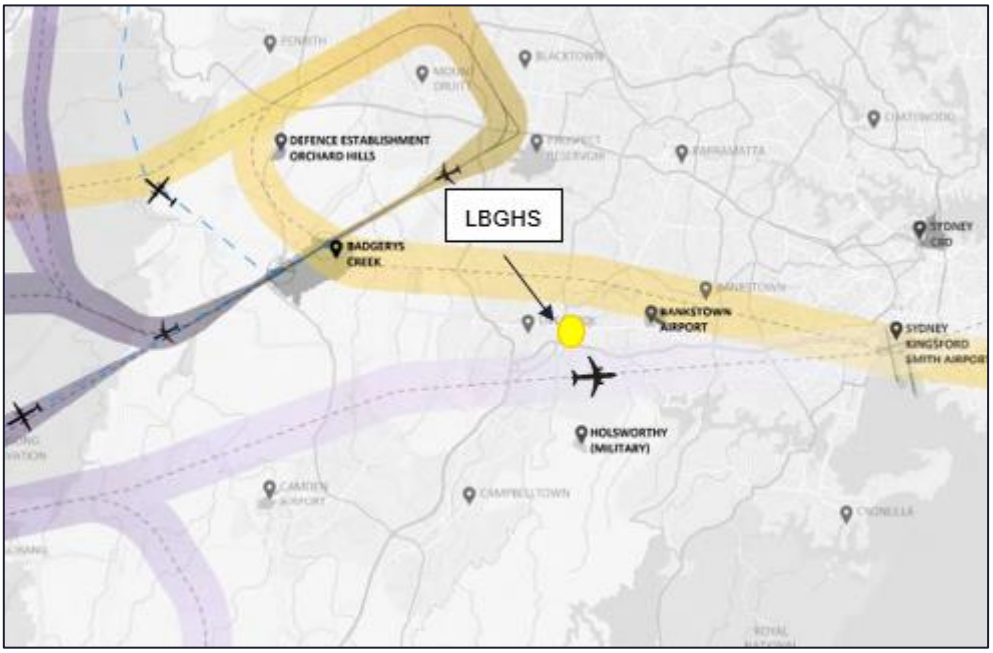

Figure 24: Proposed Western Sydney Airport Flight Paths (R23)

The Sydney Radar Terrain Clearance Chart (RTCC) Overlay

The Sydney Aerodrome RTCC overlay is depicted in Figure 25 below. The approximate location of the Liverpool Boys and Girls High School Upgrade is shown.

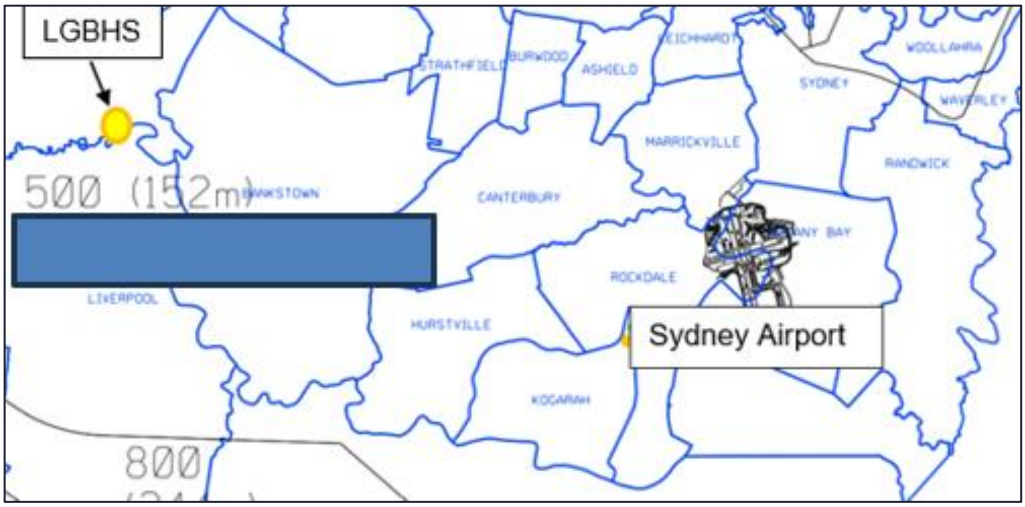

Figure 25: Liverpool Boys and Girls High School Upgrade the Sydney RTCC

The Sydney Airport RTCC levels are not impacted by the Liverpool Boys and Girls High School Upgrade development.

Holsworthy Aerodrome R555 (Military).

The Holsworthy helicopter base is located within a Restricted Area R555 from surface to 1,500'AMSL. As such, any OLS or other airspace surfaces remain within that Restricted Area. The Liverpool Boys and Girls High School Upgrade development is outside Restricted Area R555 and therefore are not impacted by the Liverpool Boys and Girls High School Upgrade development.

Deductions: Airspace, Cranes, Obstructions and HLS

The following key deductions can be made:

- The Liverpool Boys and Girls High School Upgrade building, once constructed, will not intrude into any OLS.
- The Liverpool Boys and Girls High School Upgrade building, once constructed, will not intrude into any PANS-OPS surfaces.
- The Liverpool Boys and Girls High School Upgrade building, once constructed, will not intrude into any RTCC.
- The Liverpool Boys and Girls High School Upgrade building, once constructed, will not impact the Liverpool Hospital HLS approach and departure paths.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will not intrude into any OLS.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will not intrude into any PANS-OPS surfaces.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will not intrude into any RTCC.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will intrude into the present Liverpool Hospital northern HLS approach and departure path.
- The Liverpool Boys and Girls High School Upgrade building construction crane(s) will require aviation-standard obstacle lighting for HLS protection.

Authority Consultation

No consultation has been undertaken with any airspace authorities or any airport or other aviation stakeholders in relation to this proposed development.

Risk and Mitigations

Risk	Mitigation
Cranes during construction impact the northern flight path	Realign the northern flight path to the east (only available option given Cat A back-up limitations. Realignment of temporary lighting will be required. An operational notification will be required for the helicopter network.
Cranes will be obstructions near HLS	Aviation-standard obstacle lighting for construction crane(s) are routine issues that are considered on all projects in the vicinity of helicopter landing sites or helicopter routes.

Conclusion

The Liverpool Boys and Girls High School Upgrade building construction cranes will impact aviation safety in relation to Liverpool Hospital HLS (para 4.3). Liaison with the Liverpool Hospital will be required to facilitate the direction and realignment of the temporary HLS approach and departure lighting.

Appropriate aviation lighting for HLS protection will be necessary on construction cranes.

Recommendations

The Liverpool Boys and Girls High School Upgrade program liaise with Asset Management of the Liverpool Hospital to ensure the direction and realignment of the HLS flightpath approach and departure temporary lighting.

Ensure that the proposed Liverpool Boys and Girls High School Upgrade building development construction tower crane(s) is/are fitted with the obstacle lighting described in para 4.5.

REF REPORTING REQUIREMENTS - AVIATION

Aviation and Airspace Requirements

This Section provides a response to the REF reporting requirement 24.2 specific to this development.

24	Aviation	Report Section
24.1	*If the development proposes a helicopter landing site (HLS), assess its potential impacts on the flight paths of any nearby airport, airfield or HLS.*	5
24.2	*If the site contains or is adjacent to an HLS, assess the impacts of the development on that HLS.*	5

Table 4: Expected Secretary's Environmental Assessment Requirements – Aviation

Mitigation Measures

The following Table describes the two mitigation measures required for the continued access to the Liverpool Hospital HLS during the construction of Liverpool Boys and Girls High School.

Project Stage ***Design (D) Construction (C) Operation (O)***	**Mitigation Measures**	**Relevant Section of Report**
C	Realign the northern flight path to the east (only available option given Cat A back-up limitations. Realignment of temporary lighting will be required. An operational notification will be required for the helicopter network.	Section 5
C	Aviation-standard obstacle lighting for construction crane(s) are routine issues that are considered on all projects in the vicinity of helicopter landing sites or helicopter routes.	Section 5