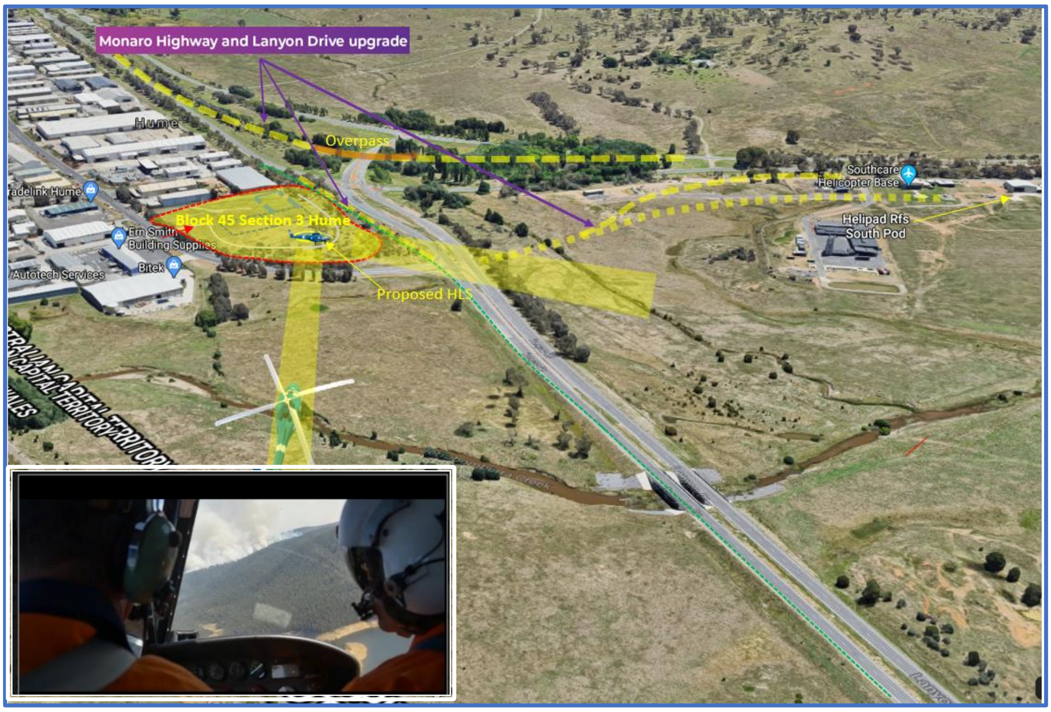

HELICOPTER OPERATION ASSESSMENT – INCLUDING FLIGHT PATH ASSESSMENT

TRG Bushfire Response Operation Base and Training Centre Block 45 Section 3 Hume ACT.

Abstract

Within Australia, there are no laws or regulations applicable to the design, construction, or placement of HLS. The relevant current legislation for the use of HLS is Civil Aviation Regulation (CAR) 92 which places the onus on the helicopter pilot to determine the suitability of a landing site.

Document Status				
Version	Author	Reviewer	Approved for issue	Date
Final 1	RHT	CT	Chris Townsend	March 2022

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Appendix

Appendix A Site Plans

EXPLANATION OF TERMS

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

Approach/Departure Path (VFR). The flight track helicopters follow when landing at or departing from the FATO of a HLS. Updated standards to align with ICAO recommendations now has the VFR Approach/Departure path extending outwards from the edge of the FATO with an obstacle free gradient of 2.5º or 4.5% or 1:22 vertical to horizontal, measured from the edge of the FATO to a height initially of 500 feet above the FATO at ~3,500 m. The previous standard involved an obstacle free gradient of 7.5º or 12.5% or 1:8 vertical to horizontal, measured from the edge of the FATO to a height initially of 500 feet above the FATO at ~1,200 m. The path may be curved left or right to avoid obstacles or to take advantage of a better approach or departure path. Changes in direction by day below 300 feet should be avoided and there should be no changes in direction below 500 feet at night.

Design Helicopter. The Bell 206L4 is identified to be a Performance Class 1 (PC1) rotorcraft. For a rotorcraft means the class of operations where, in the event of failure of an engine, 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.

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

Final Approach and Take-off 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 take-off is initiated. For the purposes of these guidelines, the US FAA AC specification of 1.5 x Length Overall of the Design Helicopter is used. 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 take-off 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 Imaginary Surfaces. The imaginary planes, centred about the FATO and the approach/departure paths, which identify the objects to be evaluated to determine whether the objects should be removed, lowered, and/or marked and lit – or the approach/departure paths realigned.

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

Hover Taxi. The movement of a wheeled or skid-equipped 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 Position. Also known as the Landing and Lift-off Area (LLA). A loadbearing, 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.

Length (Overall) (L). 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.

Landing and Lift Off Area (LLA). Also known as the Landing Position. A loadbearing, 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 a helicopter.

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 a 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.

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 manoeuvre, in which case a forced landing may be required.

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: a) in the case of multi-engine rotorcraft – may be required; or b) in the case of single-engine rotorcraft – will be required. Pilot Activated Lighting (PAL).

Prior Permission Required (PPR) HLS. A 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 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.).

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 a HLS surrounding the FATO intended to reduce the risk of damage to helicopters accidentally diverging from the FATO (0.3 x RD of the Design Helicopter). This area should be free of objects, other than those frangible mounted objects required for air navigation purposes. Slope should be not more than 3° or 5%.

Shielded Obstruction. A proposed or existing obstruction that does not need to be marked or lit due to its 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 take-off 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.

Transitional Surfaces. Starts from the edges of the FATO parallel to the flight path centre line, and from the outer edges of approach/departure surface and extends outwards at a slope of 2:1 (2 units horizontal in 1 unit vertical) for ~75 m. from the centreline. The transitional surfaces start at the edge of the FATO opposite the approach/departure surfaces and extend to the end of the approach/departure surface at 3,500 m.

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

1.0 Introduction

1.1 Overview

This report is an assessment of helicopter operations and in particular an assessment of flight paths / helicopter landing/departure site as part of the proposed TRG Bushfire Response and Training Centre.

The Environment, Planning and Sustainable Development Directorate (EPSDD) provided a Scoping Document (EIS Scoping Document 202000027 @ March 24, 2021) for the EIS that specifically outlines the specialist study requirements for the EIS.

1.2 Purpose of this report and background

The overall purpose of the report is to assess the hazards and risks associated with proposed helicopter operations within the proposed development and include this assessment as part of an Environmental Impact Statement (EIS) in support of a Development Application (DA) on block 45 section 3 Hume ACT.

Specifically, this report is to address the risks associated with helicopter operations outlined in Table 1 below which outlines the scoping document requirements.

Table 1: Scoping Document requirements – Hazards and Risks

Scoping Document Requirement	Requirement Detail	Section where requirement is addressed.
8.1.12 Hazards and Risk	Additional risks must be relating to:	
	- pilot light distraction from existing streetlights and nearby by traffic lights	This report.
	- Flight path to and from the site	This report
	- Windshear	This report
	- Turbulence	This report
	- Rotor wash	See separate report
	- wildlife and bird strike	See separate report
	- Flight path survey and flight path approach and take off splay	This report
	- Describe any refuelling of fuel storage facilities on the site, providing details around capacities and safety management procedures.	This report

1.2 Report Objective

The objective of this assessment is to address the hazards and risks associated with the operation of the helicopter proposed to support the facility as defined in the scope application.

Scope of this report

To address the scoping document requirements detailed in Table 1 pertaining to the operation of the helicopter. The following scope of work was performed:

- Review of applicable regulatory requirements / guidelines associated with helicopter operations.
- Location of the helicopter landing and departure site
- Helicopter land site requirements
- Propose flight paths
- Obstacle assessment
- Characterisation of the meteorology and air quality data for the local area.
- Identification and details of the nearest receptors
- Assess key risks associated with operation of the helicopter

Please note, helicopter rotor wash, visual assessment. Wildlife/bird strike and air quality emissions are addressed in separate reports.

1.3 Documents Consulted

- ❖ Scoping Document Under Division 8.2.2 of the *Planning and Development ACT 2007*, for an Emergency Services, Maintenance and Training Facility, Application number 202000027.
- ❖ Civil Aviation Organization (ICAO) Annex 14, Vol II, Heliports,
- ❖ Australian CASA Civil Aviation Advisory Publication (CAAP) 92-2 (2) Guidelines for the Establishment and Operation of Onshore Helicopter Landing Sites,
- ❖ National Airports Safeguarding Framework Guideline H – Protecting Strategically Important Helicopter Landing Sites, and
- ❖ NSW Health GL2020_014 Guidelines for NSW Hospital HLS of 1 July 2020
- ❖ *The Airports Act and the Airports (Protection of Airspace) Regulations 1996*

2.0 Project Background

2.1 Project Description

The site is identified as Block 45 Section 3 Hume and is located at the southwestern corner of Sheppard Street and Lanyon Drive (Figure 1) and Figure 2 regional map.

Block 45 Section 3 Hume is zoned NUZ1 Broadacre and is subject to the Main Avenues and Approach Routes overlay in the ACT Territory Plan.

The proposed development and use of the site, as described below, are permissible uses in this zone under the Zone Development Table; Emergency Services Facility and Educational Establishment, as well as ancillary use, uses definitions in the Territory Plan.

Figure 1 Development site showing nearest ACT residence - Block 45 Section 3 Hume Source Sixmaps.

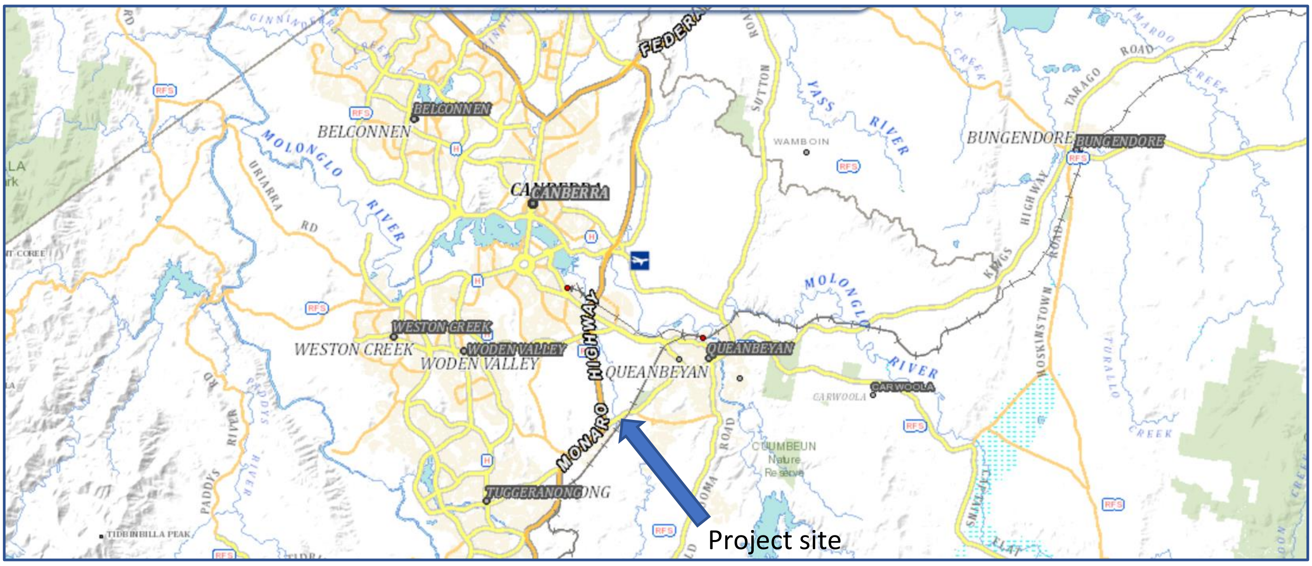


Figure 2 Project Site Regional Map Source Sixmaps.

Intended use for Block 45 involves an application to purchase and develop the land for the purposes of developing infrastructure (Figure 3) to support emergency services for bush fire response activities, training, forestry, and related services, including a helicopter landing site and with ancillary uses supporting these functions which comprise repairs and maintenance of plant and equipment.

Based on a preliminary concept plan for the site (Figure 3), the proposed development would involve the following features (including preliminary estimates of the development footprint for each element): - approx. 3030 m^2 of buildings for offices, training and associated uses, - approx. 3600m^2 hardstand, for vehicle parking and manoeuvring, - 3,000m^2 storage yard for Forestrack, - 2,000m^2 (or thereabouts) Emergency Services Training Area, - 7,600m^2 identified for future possible development (longer term planning to ensure site remains viable in a changing city, regional and global context).

Some of the trees located in the north-eastern portion of the site will require removal to facilitate safe take-off and landing of the helicopter, however it is expected that many of the existing trees could be retained as detailed in the landscape Plan (refer to DA Plans).

The proposed HLS shown in figure 3 is located approx. 30m from the north and east site boundaries, allowing for a managed safety zone in accordance with guidelines for the establishment of HLS. The HLS would have line marking painted on its surface, in the form of broken white lines along the outer edges. The touchdown and lift- off area (TLOF) would be marked by a yellow painted circle. Yellow double headed arrows (approach/departure markings) would be painted onto the HLS surface.

The flying of helicopters in an out of the site for the foreseeable future will primarily be to fly machines in and out for maintenance and refurbishment associated with bush fire response/surveillance. This is expected to be at a maximum of 30-35 flights per month or an average 2 in-and-out flights per day on average.

Normal operating hours of the facility would be 7am – 5.30 pm Mon – Friday.

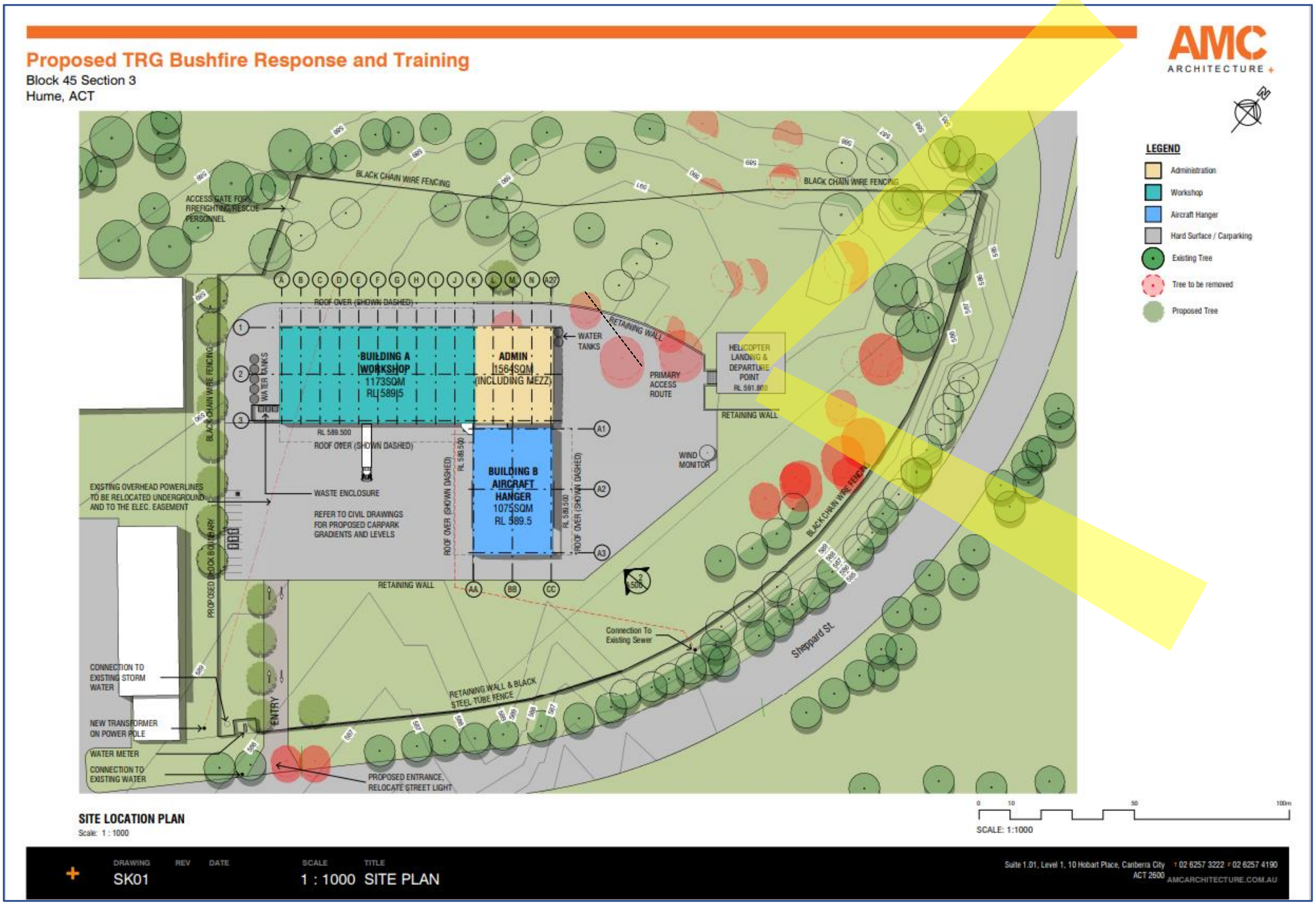


Figure 3 Site Plan illustrating preferred helicopter flight paths

The Civil Aviation Safety Authority (CASA) have published 'Guidelines for the establishment and operation of onshore Helicopter Landing Sites' CAAP 92-2(2), February 2014 (CASA Guidelines). The guidelines provide guidance, interpretation, and explanation to the aviation industry, including setting out factors that may be used to determine the suitability of a place for the landing and taking-off of helicopters. The CASA Guidelines rely on the pilot in command to have sound piloting skills and sound airmanship, and that visual meteorological conditions exist for flight.

The proposed Helipad design below pertains to a design helicopter, being 12.92 m for the BELL 206 L 4 Long ranger, specifications as follows.

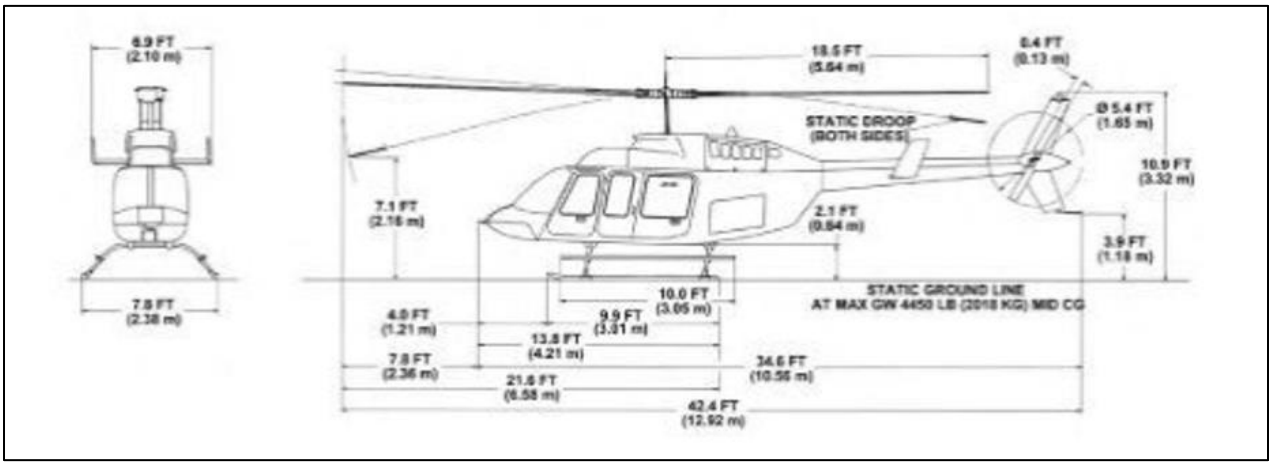


Figure 4 Bell 206 L4 specifications

The proposed helipad design and location is assessed to be suitable for use by the Bell 206 L 4.

Proposed helipad design:

Principles:

- *No person is within 30 m of the closest point of a hovering or taxiing helicopter, other than persons who are essential to the safe conduct of the operation or the specific nature of the task and who are trained and competent in helicopter operational safety procedures.*
- *Defined areas belong to one of four main categories:*
  • FATO – the area over which the final approach is completed, and the take-off conducted
  • TLOF – the surface over which the touchdown and lift-off is
  • Stand(s) – the area for parking and within which positioning takes place
  • Taxiways and associated taxi routes – the surfaces and areas for ground or air taxiing.
- *An additional safety/protection area: - for a FATO – a safety area surrounds the FATO and compensates for errors in manoeuvring, hovering and touchdown.*
- *have sufficient obstacle free approach and departure gradients to provide for safe helicopter operations into and out of the site under all expected operational conditions.*
- *have approach and departure paths that minimise the exposure of the helicopter to meteorological phenomena which may endanger the aircraft and provide escape flight paths, if a non-normal situation arises, which maximise the potential for using suitable forced landing areas.*

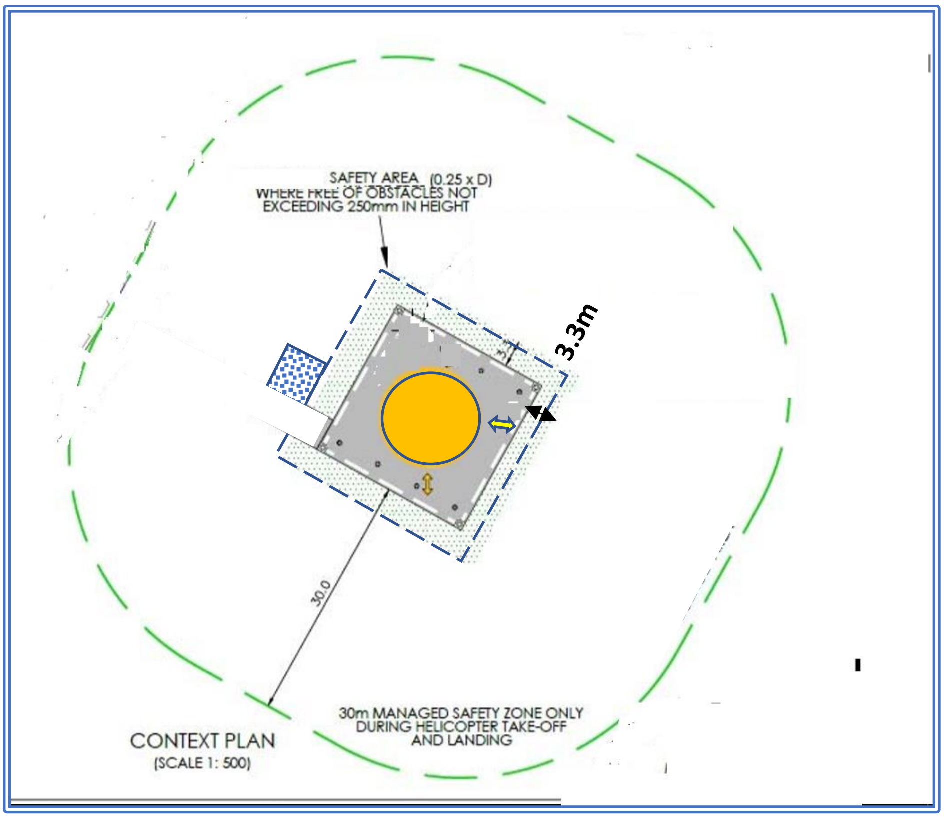
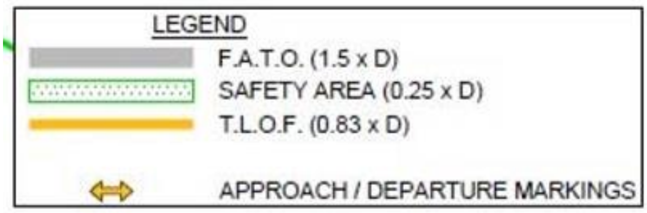


Figure 5 Helicopter landing and departure pad[1]



[1] CASA currently has a Regulatory Reform Program in place to establish new regulations/rules for helicopter operations including HLS.

Guidelines for the dimensions, marking and lighting for the LLA, TLOF, FATO area and safety area for the Design Helicopter, plus the visual flight rules (VFR) approach/ departure transitional surfaces, are specified and based upon the FAA document AC 150/5390-2C Heliport Design. Guidelines pertaining to structural requirements for static and dynamic loads to meet the design helicopter limitations are specified and based upon the ICAO Heliport Manual Document 9261-AN/903 recommendations.

Normally an HLS will have a simple layout which combines those individual areas with common characteristics. Such an arrangement will require the smallest area overall where the helicopter will be operating close to the ground and from which it is essential to remove all permanent obstacles and to exclude transient and mobile obstacles when helicopters are operating.

For an on-grade HLS, the advisory information recommends that the dynamic loads will be met with a sealed FATO area constructed of 150mm thick reinforced concrete slab base.

(FATO), being 19.38m x 19.38m (1.5 x length of the design helicopter, being 12.92 m), providing ground effect and with future design for sufficient structural integrity to accept the static load of the design helicopter, being 1.05t and a dynamic load bearing capacity of approximately 2.33t.

Touchdown and Lift Off Area (TLOF), being 10.98m (0.83 x length of design helicopter) – generally shown as yellow circle.

As required by the CASA Guidelines, this 'safety area' does not need to be a marked area or solid surface but is to be free of objects that exceed a height of 25cm. 30m clearance from pubic.

2.2 Hazards and Risks of Interest - Overview

2.2.1 Construction

The construction of the helicopter arrival and departure site will be constructed at the same time as the rest of the proposed development and as such will be subjected to controls nominated in the Construction Environment Plan and in particular the sedimentation and erosion control plan. As explained in the next Chapter, within Australia, there are no laws or regulations applicable to the design, construction, or placement of HLS.

2.2.2 Operation

Pilot light distraction from existing streetlights and nearby by traffic lights

No night flying of the helicopter is envisaged, therefore street lighting and nearby traffic lights are not considered to be an issue requiring further assessment.

2.2.2.1 Flight path to and from the site

Primary considerations in selection HLS approach and departure paths include:

- Direction of prevailing winds,
- Availability of emergency landing areas,
- Location of vertical structures and obstacles/hazards,
- Airspace restrictions and limitations,
- Avoidance of areas sensitive to noise and vibration, and
- Avoidance of ecologically and environmentally sensitive areas

These considerations are addressed in section 5.2.3

2.2.2.2 Windshear

The wind plays a huge role in the flight of any aircraft especially a helicopter. The unique design of a helicopter allows it to accomplish incredible things, but the pilot needs to be aware of just how crucial the wind is to the safe operation of the flight.

Windshear is when the wind suddenly changes direction without warning. The worst type of wind shear is when the wind blows as a headwind and you are coming into land, but then the wind suddenly changes into a tailwind.

If the pilot has limited power due to being heavy, high in elevation, and/or humid conditions and is using the headwind for the increased performance, that sudden loss of help from the wind can cause the helicopter to enter a high rate of descent. If not corrected early enough by the pilot, they may run out of available engine power to reduce the descent rate of the helicopter and have a hard landing.

This aspect is considered further in section 5.0

2.2.2.3 Turbulence

Air flowing around and over buildings, stands of trees, terrain irregularities, etc. can create turbulence that may affect helicopter operations. Rotor downwash coming up against a close wall can also produce considerable turbulence and recirculation.

The presence of large structures close to the proposed site may be the cause, in certain wind conditions, of considerable eddies and turbulence that might adversely affect the control or performance of the helicopters.

This aspect is considered further in section 5.0

2.2.2.4 Rotor wash

The helicopter downwash assessment during flight is based on the International Civil Aviation Organisation (ICAO) Annex 14 Volume II Heliports which includes parameters on heliport design to permit intended helicopter operations to be conducted safely. This ensures that the downwash assessment is conservative based on adopting international standards for heliport operations. JJ Ryan was commissioned to undertake a downwash assessment of the proposed activity. A quantitative analysis of the project site wind conditions was determined to be required to accurately define the impact of helicopter downwash considering prevailing wind conditions and assess the usability of the HLS.

This aspect is considered further in section 5.0 and the reader is referred to JJ Ryan's Downwash assessment report prepared for the EIS.

2.2.2.5 Wildlife and bird strike

While the proposed development/ associated helicopter site is not classified as an airport/heliport, this issue is important because wildlife strikes can cause potential for aircraft damage fatalities, injuries, and operational delays. It is recognised that these potential impacts can be reduced by managing land …. to minimise the potential for wildlife to conflict with aircraft operations. The risk of a strike relates to wildlife activity within the boundary …. and in surrounding areas and wildlife attracted to land uses increasing the risk of strikes.

This aspect is considered further in section 5.0

2.2.2.6 Flight path survey and flight path approach and take off splay

The proposed visual flight rules approach and departure paths run North to North–East. These paths have been assessed to achieve an obstacle free gradient of 2.5º (4.5% or 1:22 vertical to horizontal), measured from a point 1.5 m. above the forward edge of a 25 m diameter final approach and take-off area (FATO), to a height of 500 feet above the FATO at ~3,500 m. Refer to section 5.2.2.

This aspect is considered further in section 5.0

2.2.2.7 Refuelling of fuel storage facilities on the site, providing details around capacities and safety management procedures

Permanent fuel storage is not proposed at the site. Refuelling of the helicopter may take place from a mobile tanker in a designated hard stand area and it is this operation that posed a threat of fire from the ignition of flammable jet fuel. However, this is not the preferred location/normal as it is planned to refuel the helicopter at Canberra Airport.

This aspect is considered further in section 5.0

3.0 Regulatory / Guidelines Context for Helicopter Operations

This section overviews the regulatory and guideline context for the proposed helicopter operation and the setting of criteria for assessing requirements.

Within Australia, there are no laws or regulations applicable to the design, construction, or placement of HLS. The relevant current legislation for the use of HLS is Civil Aviation Regulation (CAR) 92 which places the onus on the helicopter pilot to determine the suitability of a landing site. CASA, as the regulator of aviation in Australia, divested itself of direct responsibility in the early 1990s and currently provides only basic operating guidelines via Civil Aviation Advisory Publication (CAAP) 92-2 (2) Guidelines for the Establishment and Operation of Onshore Helicopter Landing Sites. CASA does not provide design, structural information, or advice beyond that in the CAAP.

ICAO sets out international Standards and Recommended Practices (SARPS) for the safe conduct of civil aviation activities in the Annexes to the Convention on International Civil Aviation (Chicago, 1944), with the following Annexes applicable to helicopter operations: • Annex 6: Operation of Aircraft - Part III: International Operations - Helicopters 6th Edition July 2004, and • Annex 14: Aerodromes - Volume II: Heliport's 4th Edition 2013. ICAO Annex 14 Volume II provides SARPS for the planning, design, operation, and maintenance of HLS facilities for use by the providers of these facilities. CAAP 92-2(2) provides only limited guidance material on the minimum physical parameters required to assist helicopter pilots and operators in meeting their obligations under CAR 92.

The project site is in proximity of air traffic CTR of Canberra Aerodrome. Although not within currently "prescribed airspace", the site is within specified airspace around Canberra Airport to be prescribed to safeguard future Airport operations. Airspace protection advice has been sought from Air services Australia (AsA), the Civil Aviation Safety Authority (CASA) and Canberra Airport as part of the project consultation process. In relation to Canberra Airport and following consultation to explain the proposed development, Canberra Airport decided to withdraw all matters raised in initial representation to EPSDD (refer o EIS attachment detailing correspondence). This withdrawal acknowledges that the project will have no material impact on aviation activities at Canberra aerodrome. The helicopter landing/departure sight is sufficiently distant from Canberra aerodrome such that arriving and departing aircraft will not realise any traffic confliction with helicopters operating to and from it.

Notwithstanding, that CASA have advised in scoping document 201900007, having reviewed project information, *CASA has no comment on the proposal,* the project design elements demonstrate that: sensible cladding and roofing materials are used to minimise the possibility of glare effects; glass for buildings is used in a manner to minimise reflection and glare; and all external lighting will be lit downward from a horizontal level to minimise impact on aircraft operations at night.

4.0 Existing Environment

4.1 Receptors of Interest

Figure 6 shows adjacent businesses which comprise storage buildings and light industry and construction retail outlet.

Figure 6 Development site and surrounding businesses.

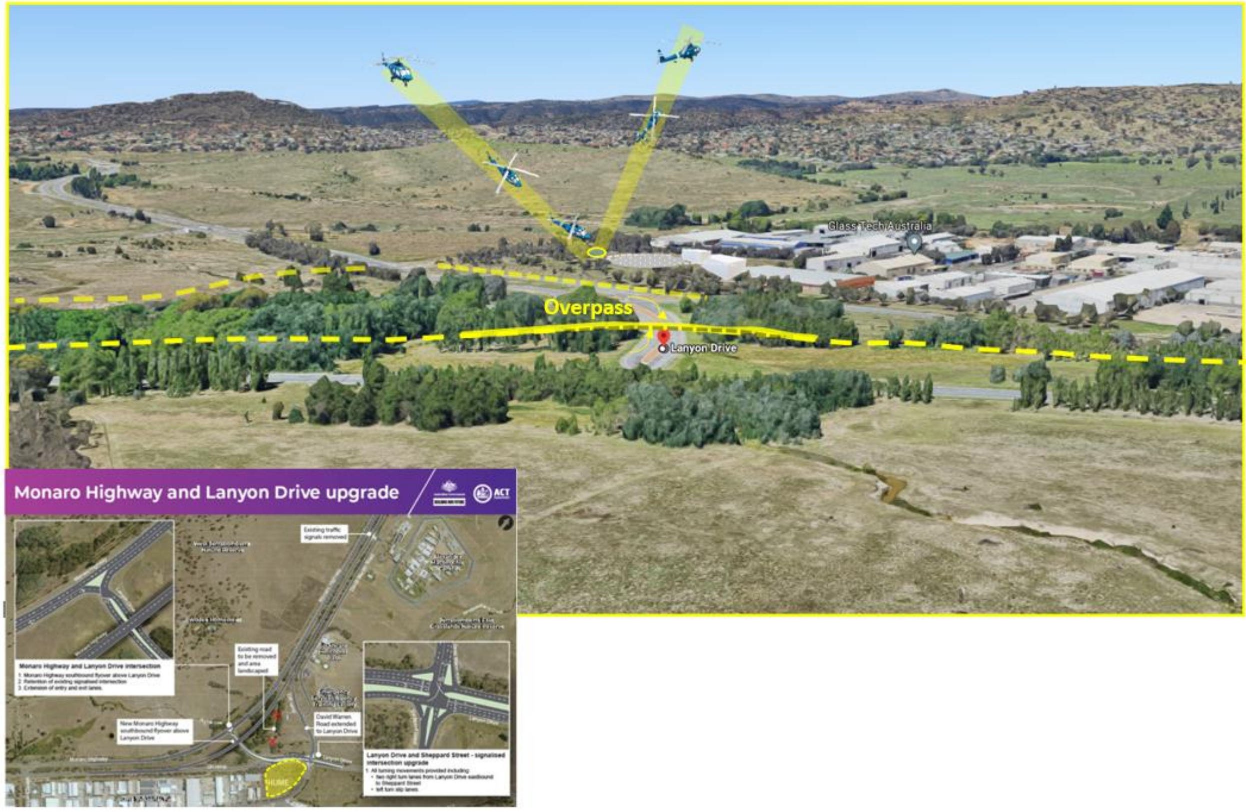


Figure 7 illustrates the project site and helicopter movement (preferred flight paths) in relation to proposed Lanyon Drive Upgrade.

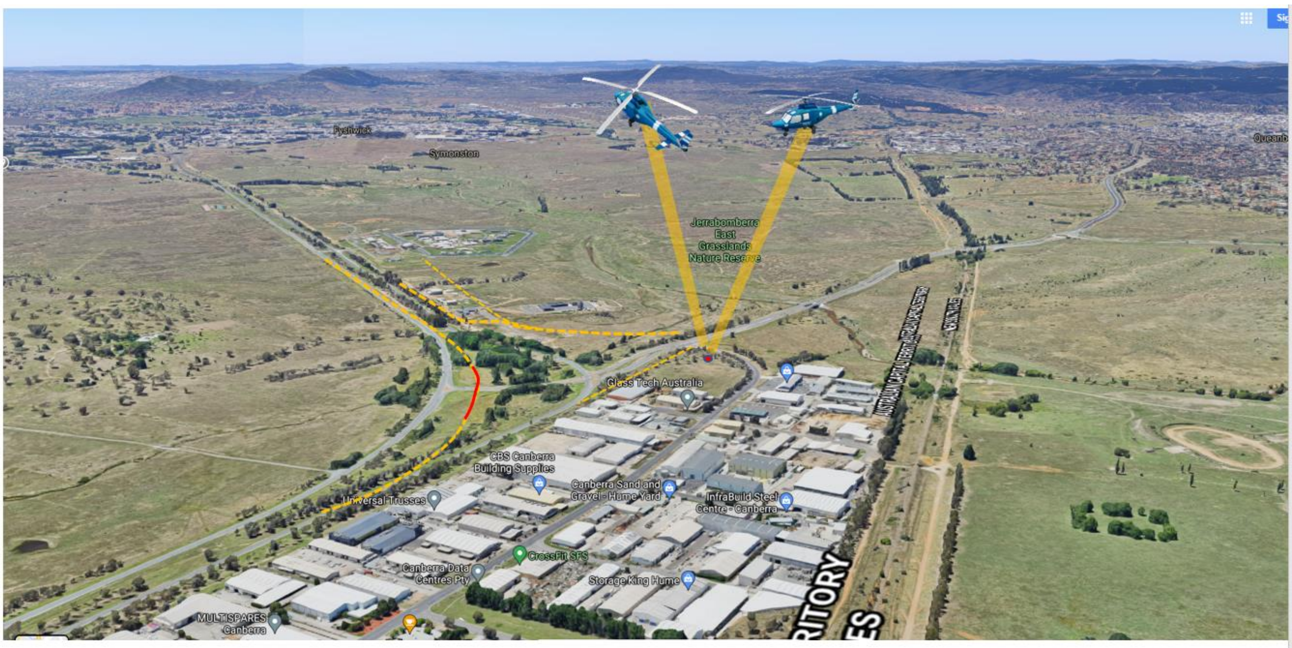


Figure 7a

Figure 7a Project site in relation to Monaro Highway Upgrade

Figure 8 Shows nearest residence in relation to the project site.

Figures 9 -11 illustrates receptors of interest and distance from the project site (Helicopter landing area).

Figure 9 Project site and sensitive receptors

RECEPTOR Id	RECEPTOR	DISTANCE FROM SITE m Approx
1	Alexander Maconochie Centre	1400
2	Jerrabomberra	1900
3	Jerrabomberra Sports Centre	400
4	South Jerrabomberra Development	2400
5	Residence	855

Figure 10 Looking north from South Jerrabomberra. Source – Village Building Company

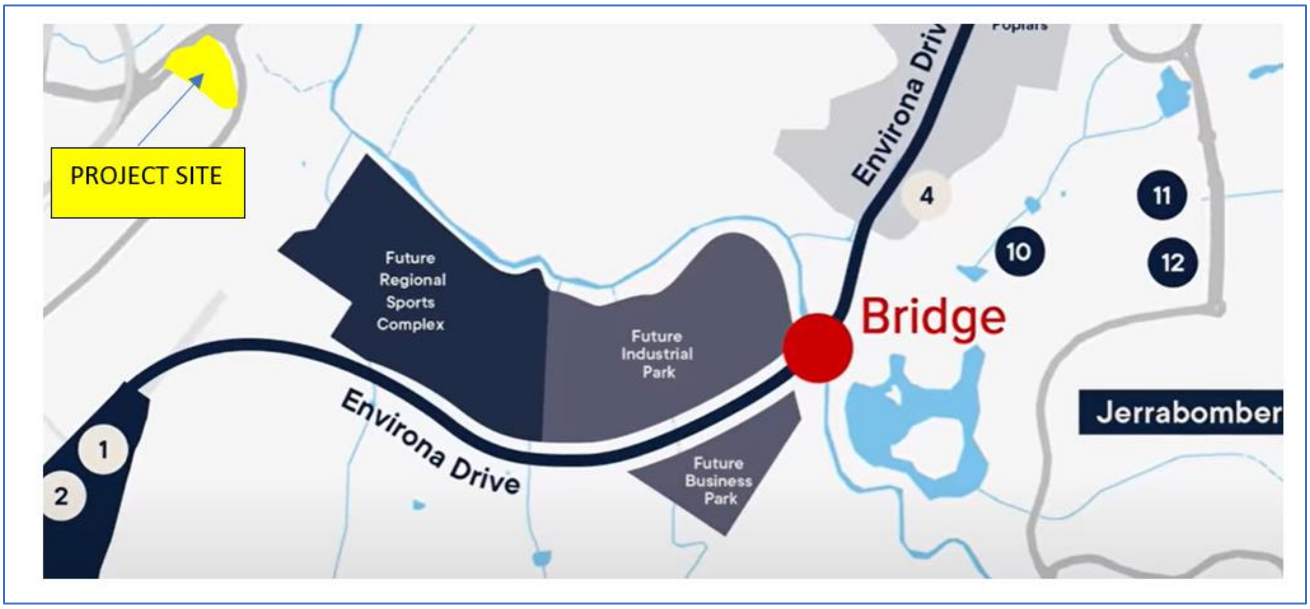


Figure 11 Location map showing the project site in relation to South Jerrabomberra Development. Source Village Building Company

Figure 4b/1 Project Location map showing the project site in relation to Jerrabomberra Growth Corridor

Project site

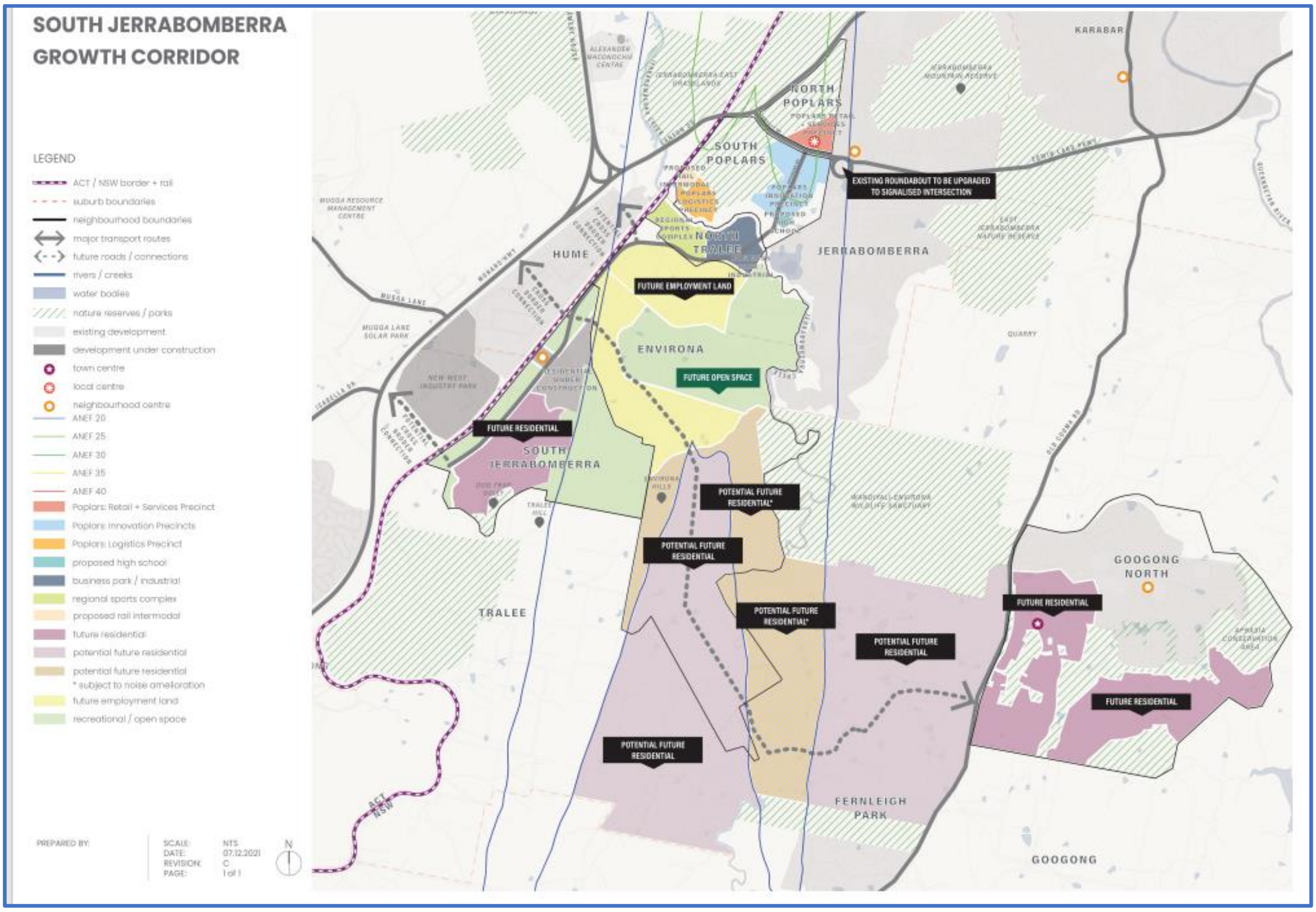


Figure 11/1

Village Building Co is currently developing a parcel of residential land (The dark grey and paler grey areas noted as North and South Tralee) situated on the NSW/ACT boarder, east of Hume, which, when complete, will host approximately 1500 dwellings. Known as South Jerrabomberra.

The red/blue/orange area at the top righthand side of the page is the Riverview Group's Poplars project which is currently under development.

The yellow area noted as future employment land/green area noted as future open space/caramel and purple as future residential areas are also controlled by the Riverview Group.

The Riverview Group indicated that they did not have any overarching concerns or immediate questions about the TRG proposal. It was noted that their current residential development plans have been revised and will now be located further away from the proposed TRG development

Shown in the indicative design plan below QPRC is currently planning for a new sport and recreational hub which will be located approximately 1.5kms away from the proposed TRG site

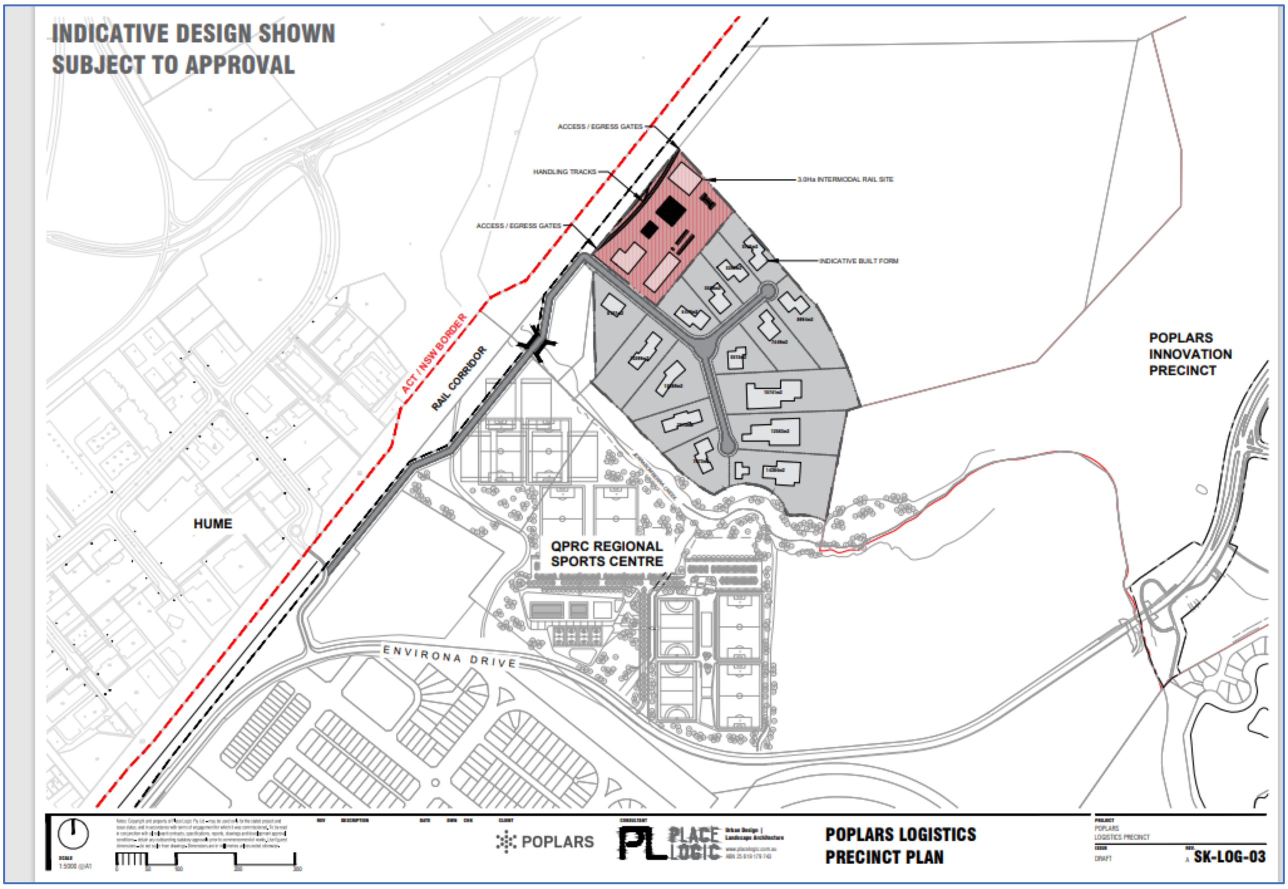


Figure 11/2 Project Location map showing indicative design plan for the QPRC sports complex.

4.2 Topography

Figure 12 presents a pseudo three-dimensional visualisation of the topography in the general vicinity of the Project area. The Project area is relatively flat with elevated terrain to the northwest and southeast.

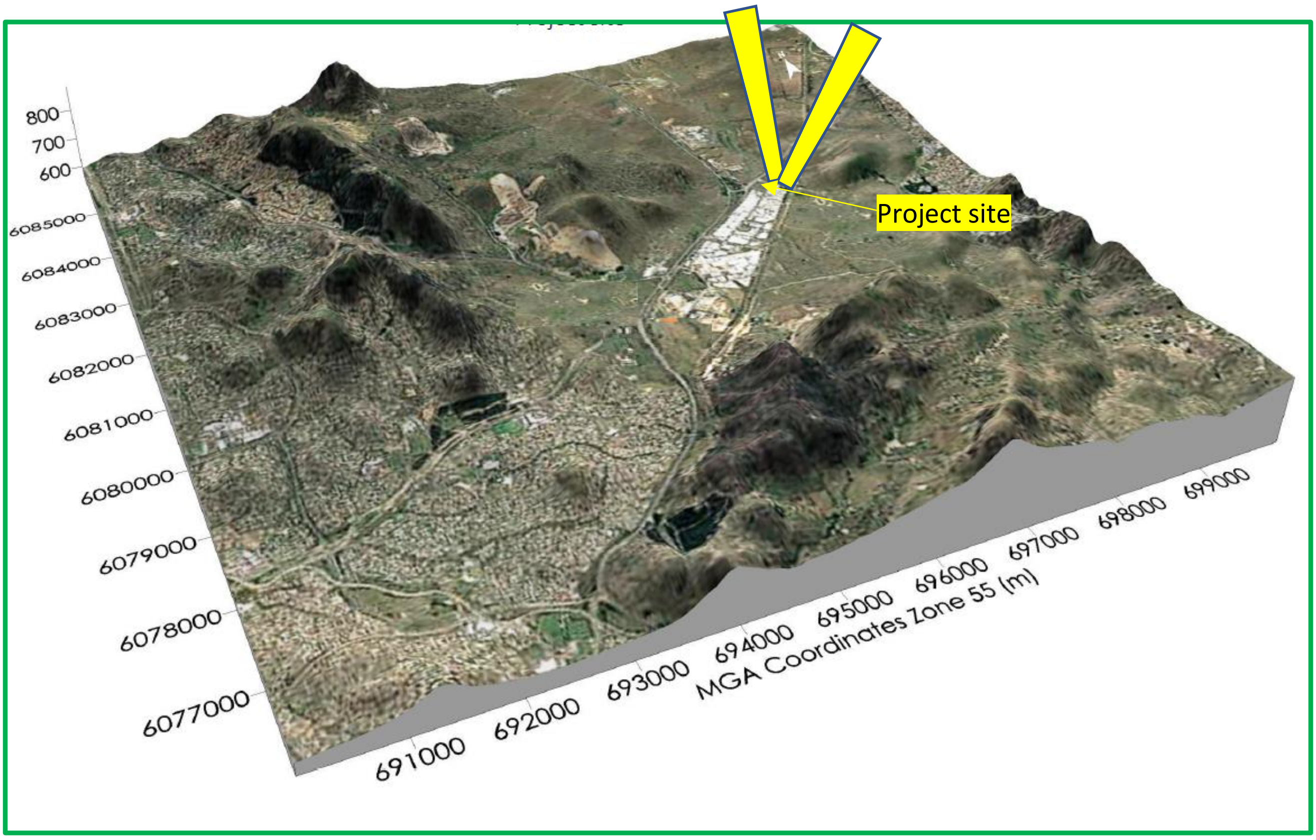


Figure 12 Pseudo three-dimensional visualisation of the topography illustrating preferred helicopter flight paths.

4.3 Local Climate

Meteorological conditions are important for determining the direction and rate at which emissions from a source would disperse. The key meteorological requirements for air assessments are typically hourly records of wind speed, wind direction, temperature, rainfall, and relative humidity. This section discusses meteorological conditions in the vicinity the Project study area.

The nearest AWS to the Project study area that characterises the climate of the local area is Tuggeranong AWS (Site Number: 070339). The station is located at an elevation of 587 m, approximately 8 km west southwest of the Facility study area.

The data indicates that January is the hottest month with a mean maximum temperature of 29.3 degrees Celsius (ºC) and July as the coldest month with a mean minimum temperature of 0.1ºC. Rainfall exhibits variability across the year. The data indicates that February is the wettest month with an average rainfall of 74.5 millimetres (mm) over 6.0 days and May is the driest month with an average rainfall of 22.3mm over 3.5 days.

Humidity levels peak during winter and decline thereafter. Mean 9am humidity levels range from 59 per cent (%) in December to 83% in June. Mean 3pm humidity levels range from 34% in January and December to 57% in June. Mean 9am wind speeds range from 6.5 kilometres per hour (km/h) in May to 11.3km/h in October. Mean 3pm wind speeds range from 13.2km/h in May to 18.7km/h in October.

Annual and seasonal wind roses prepared from data collected from 1996 - 2020 are presented in Figure 13-14.

Analysis of the wind roses show that on an annual basis, winds are typically from the northwest quadrant and winds from the north and east dominate the distribution. Seasonal distributions are similar to the annual distribution at varying degrees. During summer, winds are typically from the east with few winds from all other directions. In autumn, winds from the north and north-northwest dominate the distribution followed by winds from the northwest, south, and lighter winds from the east. In winter, winds from the north, northwest dominate followed by winds from the northwest quadrant and from the south. In spring winds are typically from the northwest quadrant.

The wind roses show a wind distribution pattern that is typical of the expected patterns for this area considering the location of the station in relation to local terrain features.

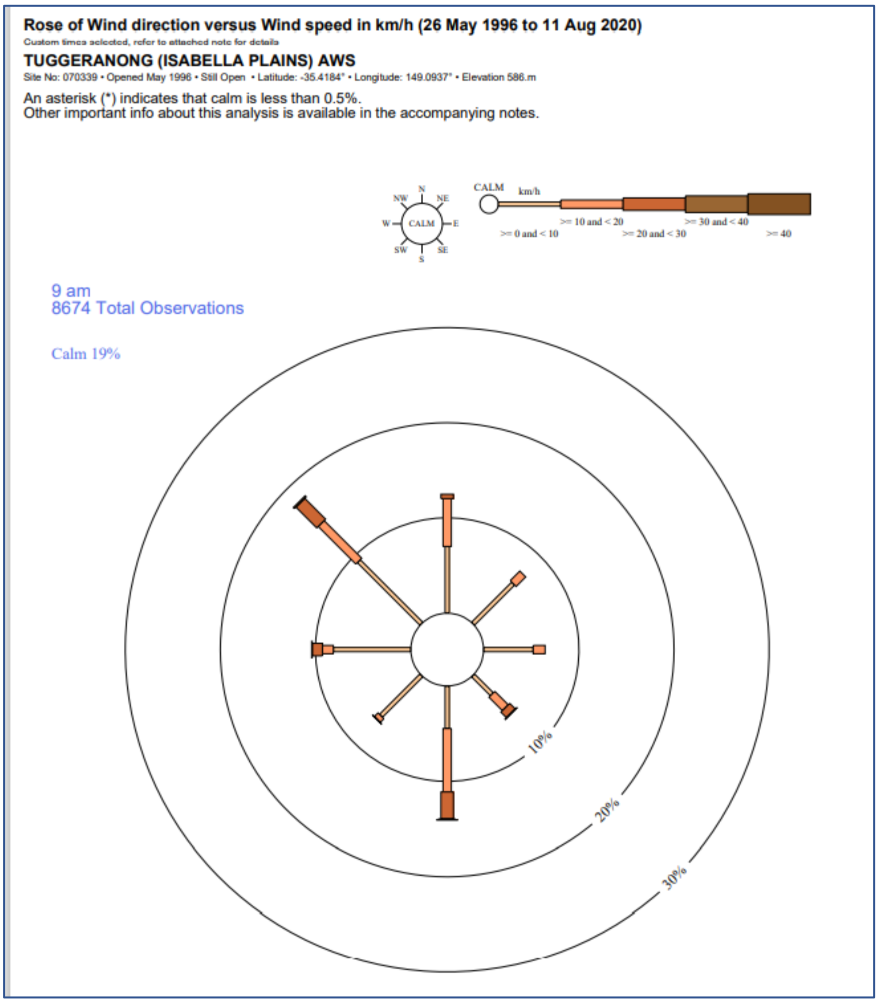


Figure 13 Rose of wind direction AWS 9am

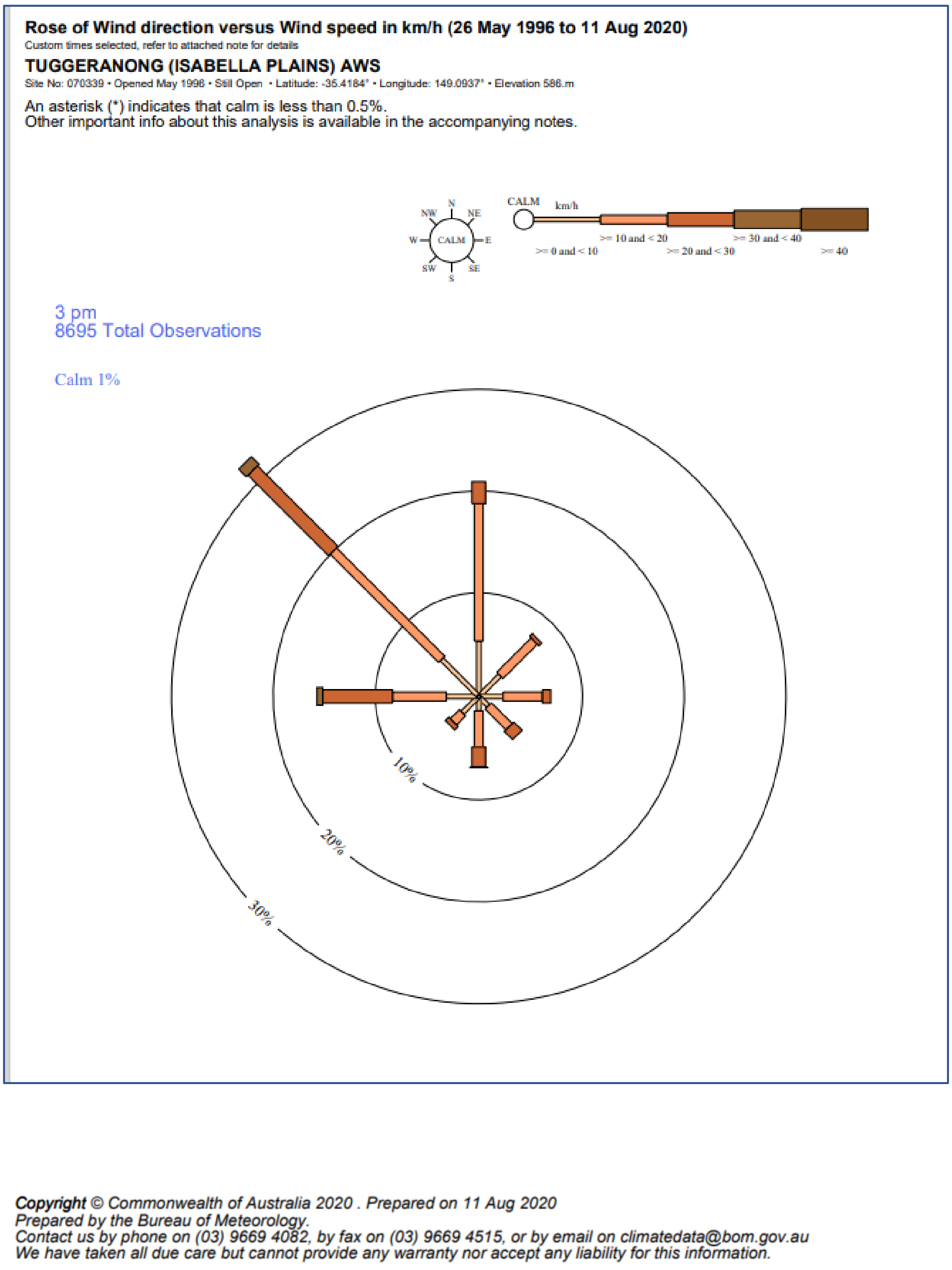


Figure 14 Rose of wind direction AWS 3pm**.**

5.0 Potential Impact Assessments

5.1 Construction Impacts

Construction activities associated with helicopter infrastructure is part of the proposed development Construction management Plan and associated plans. Potential impacts associated with helicopter infrastructure include.

5.1.1 Emission Sources

Air emissions from particulate matter of varying size fractions (TSP, PM_{10} and $PM_{2.5}$) are likely to be generated during the following construction activities:

- site establishment and mobilisation.
- earthworks and civil construction work including excavation and benching/retaining walls.
- -disposal of surplus material.

5.1.2 Impacts during Construction.

Direct potential impacts to the local air quality would typically be limited to particulate matter and emissions from vehicles, plant and equipment generated during site establishment works and bulk earthworks.

Exhaust emissions from the use of vehicles, and other machinery on site are likely to include nitrogen oxides, carbon monoxide, sulphur oxides, hydrocarbons, and particulate matter of varying size fractions in small quantities which would be typical for construction sites.

Activities that may generate particulate matter (i.e., dust) include wind erosion of exposed surfaces, movement of topsoil during excavations, disturbance of stockpiles, movement of vehicles and general site preparation works. Dust generation would primarily result from site clearing and benching activities/bulk earthworks. Impacts from these construction activities can be readily managed with a high level of control via water spray and dust suppression.

The dispersion of particulate matter would also depend on the meteorological conditions experienced during the works, but it is expected that these particulate levels would drop significantly with distance. During dry and windy meteorological conditions particulate emissions may be higher requiring additional specific corrective measures. The CEMP would identify triggers and procedures for dealing with these conditions.

5.2 Operational Impacts

The flying of helicopters in an out of the base will primarily be to fly machines in and out for Airborne surveillance and airborne operations management support and maintenance and refurbishment. This is expected to be at a maximum of 30-35 flights per month or an average 2 in-and-out flights per day on average.

5.2.1 Pilot light distraction from existing streetlights and nearby by traffic lights

As discussed previously, night-time helicopter flying is not envisaged and therefore the distraction from existing streetlights and traffic lights is not an issue requiring further consideration. Moreover, the location of the helicopter departure and landing area is located away from fixtures / luminaries and at an elevation which would not impact on helicopter operations.

5.2.2 Flight path to and from the site / helicopter landing site.

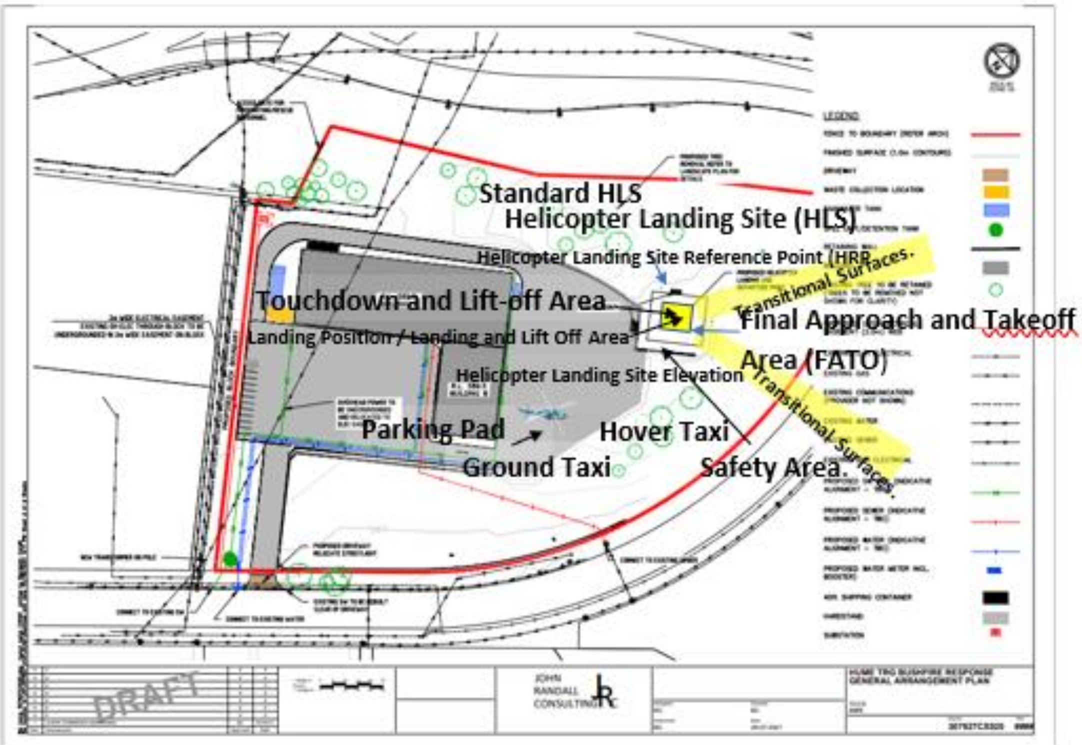
The PREFERRED FLIGHT PATH DIRECTIONS shown in Figure 16 below which illustrates the planned flight paths for the proposed development which have been designed in accordance with the design principle described in an earlier section which requires that the … *approach and departure paths that minimise the exposure of the helicopter to meteorological phenomena which may endanger the aircraft and provide escape flight paths, if a non-normal situation arises, which maximise the potential for using suitable forced landing areas.*

This image attempts to portray that it is the low-speed early part of the departure and the low-speed final approach that require stability in direction (see yellow arrows shown in section 2). While, or once, an aircraft has safe single-engine flying speed the pilot is at liberty to manoeuvre and turn to suit the prevailing wind conditions and comply with any relevant "fly neighbourly" procedures or to avoid known areas sensitive to aircraft noise and vibration. Increasing rates of climb and descent (increasing flight path steepness) can be utilised to attempt to insulate sensitive areas from noise and vibration. In reality, no two approaches or departures will ever be alike. The inherent flexibility of a helicopter allows it to accommodate various flight profile changes in response to changing circumstances and requirements.

Primary considerations in selection HLS approach and departure paths include:

- Direction of prevailing winds,
- Availability of emergency landing areas,
- Location of vertical structures and obstacles/hazards,
- Airspace restrictions and limitations,
- Avoidance of areas sensitive to noise and vibration, and
- Avoidance of ecologically and environmentally sensitive areas.

Figure 15 HELICPTER TERMS



Bell 206 L4 **Design Helicopter**

The Bell 206L4 is identified to be a Performance Class 1 (PC1) rotorcraft.

For a rotorcraft means the class of operations where, in the event of failure of an engine, 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.

- Position 1:
  - Begin take-off by getting the helicopter light on the skids.
  - Pause and neutralise all aircraft movement.
  - Slowly increase the collective and position the cyclic to lift off in a 40kt altitude.
  - Continue to increase the collective slowly until the maximum power available is reached (take-off power is normally 10% above power required for hover).
- Position 2:
  - The large collective movement in Position 1 requires a substantial increase in pedal pressure to maintain heading.
  - Use the cyclic as necessary to control movement toward the desired flightpath.
- Position 3:
  - Continue using cyclic to maintain desired climb angle.
  - Maintain rotor rpm at its maximum and do not allow it to decrease.
- Position 4:
  - Maintain these inputs until the helicopter clears the obstacle or until reaching 50ft.
- Position 5:
  - Establish a normal climb altitude and power setting.

Flight path in relation to Receptors

A. Monaro Highway Upgrade

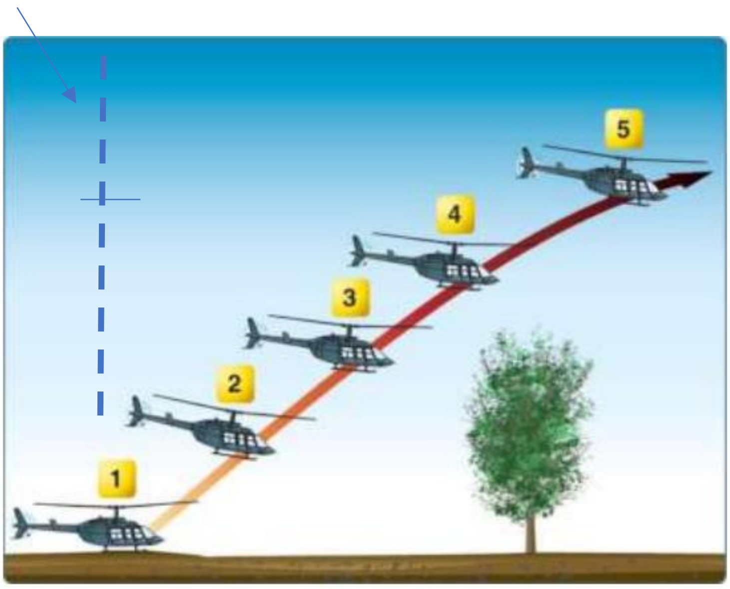
Figure 16 below shows the proposed upgrade which comprises intersection upgrades at key locations along the Monaro Highway from Johnson Drive through to the access road to the Alexander Maconochie Centre. This includes the intersections with Lanyon Drive and Isabella Drive and intersections with Mugga Lane, Tralee Street and Sheppard Street into Hume.

An overpass is proposed for the Southbound carriageway over Lanyon Drive as shown in figure 16. Helicopter flight path considerations described in 5.2.5 indicate that the overpass is approx. 320m from the proposed helicopter arrival and departure site and not located in the preferred helicopter flight paths. Moreover, these paths have been assessed to achieve an obstacle free gradient of 2.5º (4.5% or 1:22 vertical to horizontal), including the proposed overpass located at approx. RL 595.21 @ch14200 in relation to the proposed helicopter departure / landing site at RL 590.35.

This assessment is based on a max performance take off as shown below.

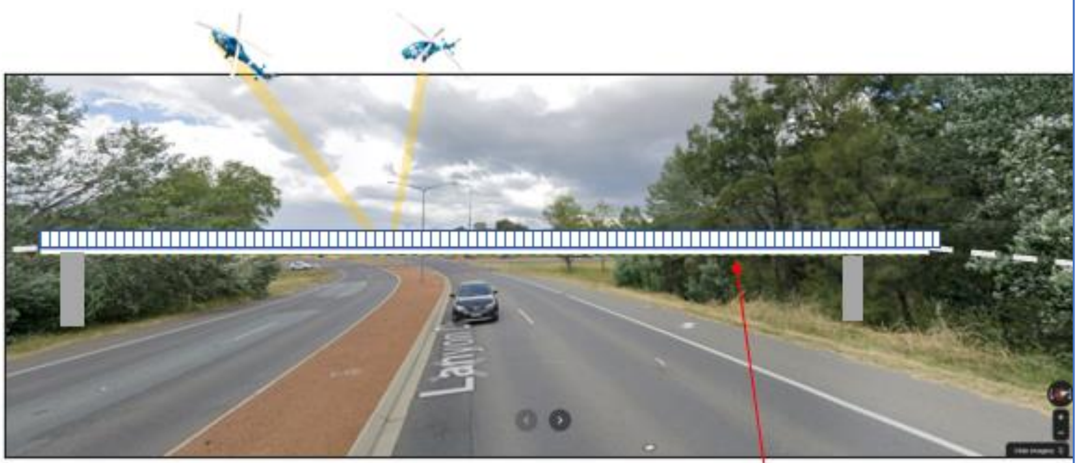
Figure 17 Illustrates helicopter take off mode according to maximum performance take off and fuel consumption.

Vertical take off



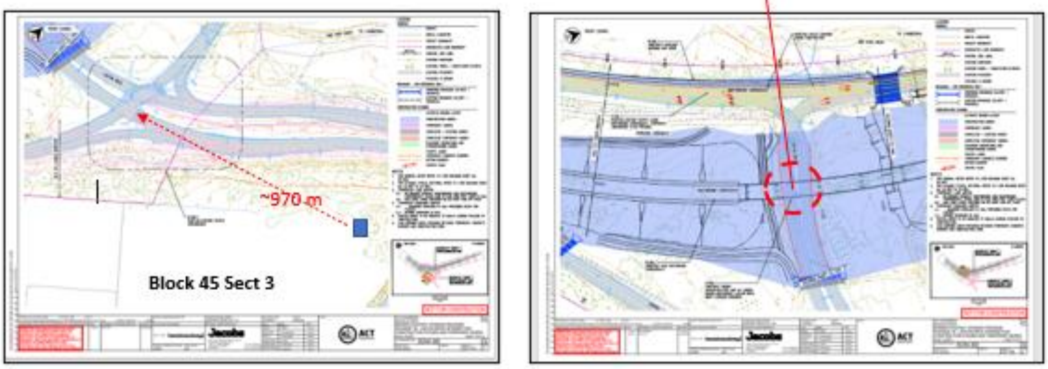
The purpose of a maximum performance take-offs is to transition from the helipad surface to a maximum performance climb to clear barriers in the flightpath.

There is a variation to the maximum performance take-off manoeuvre is to complete a vertical take-off. This technique allows the pilot to descend vertically back into the confined area if the helicopter does not have the performance to clear the surrounding obstacles. During this manoeuvre, the helicopter must climb vertically and not be allowed to accelerate forward until the surrounding obstacles have been cleared.



Photomontage illustrating helicopter flight paths and new Southbound Carriage way bridge over Lanyon Drive

Source: Goggle maps



Proposed Helicopter Site and Southbound Carriageway Bridge over Lanyon Drive

Source: Monaro Highway Program Tender August 2021.

Figure 16

B. Alexander Maconochie Centre

The Alexander Maconochie Centre is approx. 1400 mitres from the site and as such is assessed as an obstacle free receptor.

C. Jerrabomberra

As shown in figure 10 and the proposed flight paths - approach and departure paths run North to North–East, well away from Jerrabomberra located at approx 1900 mitres from the proposed site. Furthermore "fly neighbourly" procedures will be implemented to avoid known areas sensitive to aircraft noise and vibration. Increasing rates of climb and descent (increasing flight path steepness) can be utilised to attempt to insulate sensitive areas from noise and vibration.

D. Jerrabomberra Sports Centre

As shown in figure 10 and the proposed flight paths - approach and departure paths run North to North–East, well away from Jerrabomberra Sports centre located approx 400 mitres from the proposed site. Furthermore "fly neighbourly" procedures will be implemented to avoid known areas sensitive to aircraft noise and vibration. Increasing rates of climb and descent (increasing flight path steepness) can be utilised to attempt to insulate sensitive areas from noise and vibration.

E. South Jerrabomberra Development

As shown in figure 10 and the proposed flight paths - approach and departure paths run North to North–East, well away from South Jerrabomberra Development which is located approx 400 mitres from the proposed site. Furthermore "fly neighbourly" procedures will be implemented to avoid known areas sensitive to aircraft noise and vibration. Increasing rates of climb and descent (increasing flight path steepness) can be utilised to attempt to insulate sensitive areas from noise and vibration.

F. Residence

As shown in figure 10 and the proposed flight paths - approach and departure paths run North to North–East, well away from the nearest residence which is located approx 855 mitres from the proposed site. Furthermore "fly neighbourly" procedures will be implemented to avoid known areas sensitive to aircraft noise and vibration. Increasing rates of climb and descent (increasing flight path steepness) can be utilised to attempt to insulate sensitive areas from noise and vibration.

5.2.3 Windshear

As explained previously the worst type of wind shear is when the wind blows as a headwind and you are coming into land, but then the wind suddenly changes into a tailwind. Given the favourable meteorology of the area and the topography this scenario is unlikely to occur. Moreover, as explained by JJ Ryan *The helicopter downwash assessment demonstrates that the proposed HLS located to the northeast of the proposed operations base area are within CASA's recommended maximum wind velocity and will not have an impact on the proposed buildings and helistands.*

5.2.3 Turbulence

It is considered that adverse wind conditions do not exist at the proposed helicopter take-off and landing location, as it is in a convenient location and allows for a 30m buffer zone well away from buildings/structures which can create turbulence that may affect helicopter operations.

5.2.3 Rotor wash/Downwash

Rotor downwash is a commonly overlooked phenomenon that occurs during helicopter hover near a ground surface (including water etc.). It has the potential to cause significant damage to nearby vehicles and objects, as well as people.

Downwash is produced due to the production of thrust by the rotor blades. Most helicopter will contain two sets of rotors which are the main rotor and tail rotor. The main rotor generates the thrust required to generate lift. Thrust is produced under two controls, firstly is the collective control which increases the pitch angle of the rotor blades that will subsequently increase drag but also produce more lift because of a higher angle of attack. To sustain all these forces under a stable RPM the throttle controls are opened to produce a corresponding power output. The tail rotor counteracts the reaction forces experienced by the helicopter due to the generated thrust by the main rotor this is controlled by the anti-torque pedals. The cyclic controls are implemented to manoeuvre the roll and pitch angles of the helicopter which will allow it to move forwards, backwards and side to side. These components work hand in hand to stabiles and manoeuvre the helicopter towards a desired path.

There are a variety of risks associated with helicopter rotor downwash that are summarised in the following table.

Table 1 Summary of potential downwash risks to people, buildings, aircraft, and helicopters

Risk Element	Risk Description	Risk Mitigation
People	Secondary effects of Foreign Object Debris (FOD) such as dust and sand or other objects becoming airborne causing injury	Ensuring that the helicopter movement areas have an appropriate surface and have sufficient clearance to areas where people may be located (i.e. paths, congregation areas etc.)
Buildings	Operational effects on hangars and other building structures resulting in damage to cladding or other structure elements exceeding wind design loads	Designing the helicopter movement areas away from buildings or ensuring buildings are designed to withstand additional load
Light Aircraft	Impact on light (recreational or general aviation) aircraft while taxiing or in aircraft parking zones	Ensuring sufficient separation between helicopters taxiing or in aircraft parking zones
Helicopters	Brownouts or water spray during landing procedures causing loss of spatial awareness and resulting in a hard landing or helicopter crash	Ensuring effects of the zone of influence related to downwash is understood to allow an appropriate landing surface to be constructed

The Civil Aviation Safety Authority (CASA) Manual of Standards (MOS) Part 139 – Aerodromes Section 6.6 outlines the jet blast and propeller wash protection area requirements. The recommended maximum wind velocities which people, objects, and buildings in the vicinity of an aircraft may be subjected to should not be more than those provided in Table2.

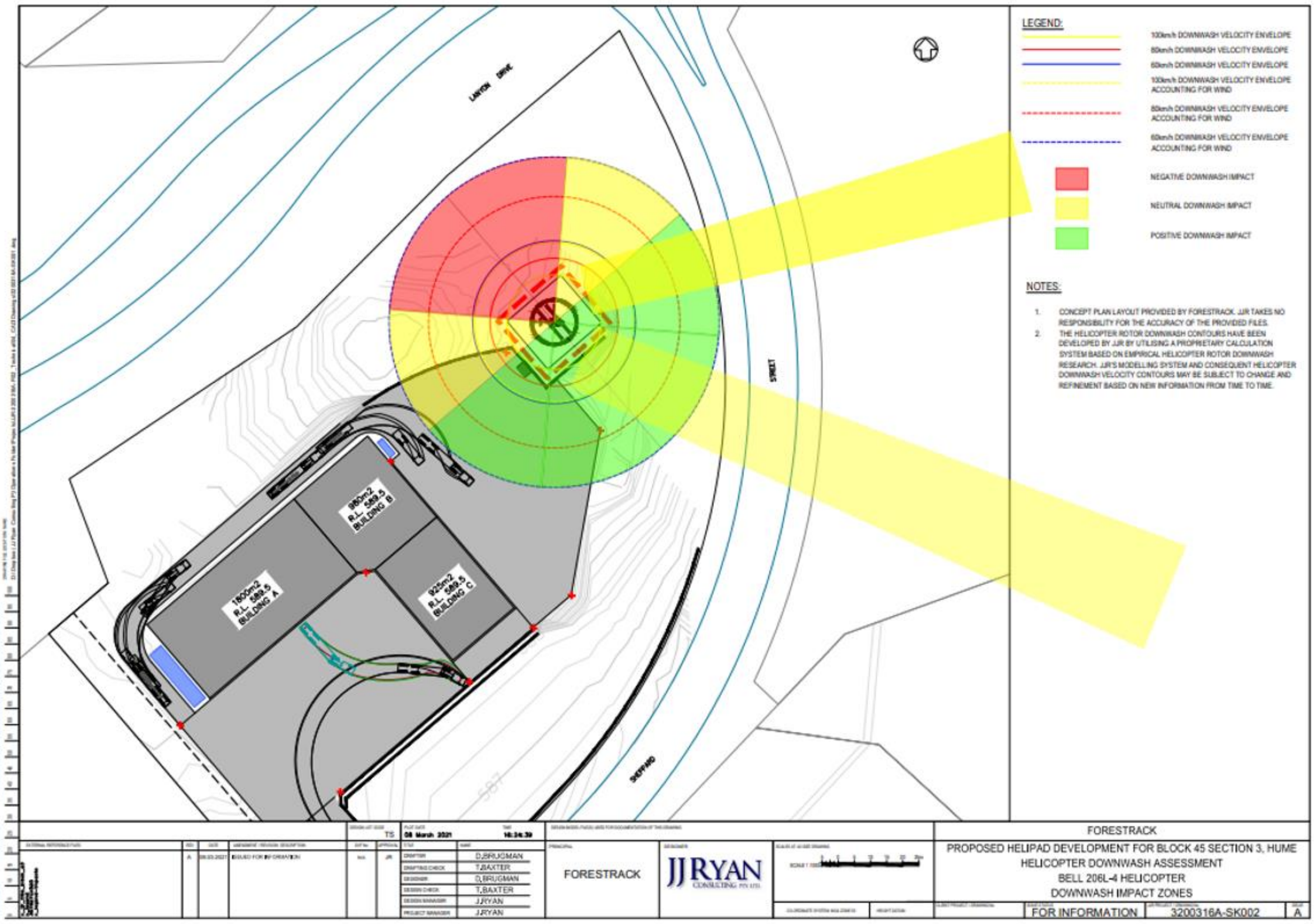
Table 2 Recommended maximum wind velocities

Wind Velocity Exposure Type	Recommended Maximum Wind Velocity (km/h)
Passengers and main public areas, where passengers have to walk and are expected to congregate	60km/h
Minor public areas, where people are not expected to congregate	80km/h
Public roads where the vehicular speed may be 80km/h or more	50km/h
Public roads where the vehicular speed is expected to be below 80km/h	60km/h
Personnel working near an aeroplane	80km/h
Apron equipment	Generally not in excess of 80km/h
Light aeroplane parking areas	Desirably 60km/h and not greater than 80km/h
Buildings and other structures	Not exceeding 100km/h
*** All values are from MOS Part 139 recommendations*	

JJ Ryan Consulting Pty Ltd were commissioned to o assess the helicopter downwash associated with the proposed HLS and take-off and landing area to determine if these significantly impact on adjacent buildings and helistands to the HLS at the proposed operations base.

The assessment attached to the EIS found that the proposed buildings for the operation's base lies outside of the 60km/h downwash velocity envelope accounting for wind. The proposed helistand lies within approximately the 80km/h downwash velocity envelope accounting for wind. It should be noted that the proposed helistand are located southwest of the HLS, where wind would have a positive impact on the downwash, which would generally reduce the downwash velocity of a helicopter. Sheppard St which is located east of the proposed HLS at the closest point is located outside of the 60km/h downwash velocity envelope accounting for wind.

Figure 18 shows the modelled downwash extents for Bell 206L4



Source: Forestrack Helicopter Downwash, JJ Ryan Consulting Pty Ltd, March 2021

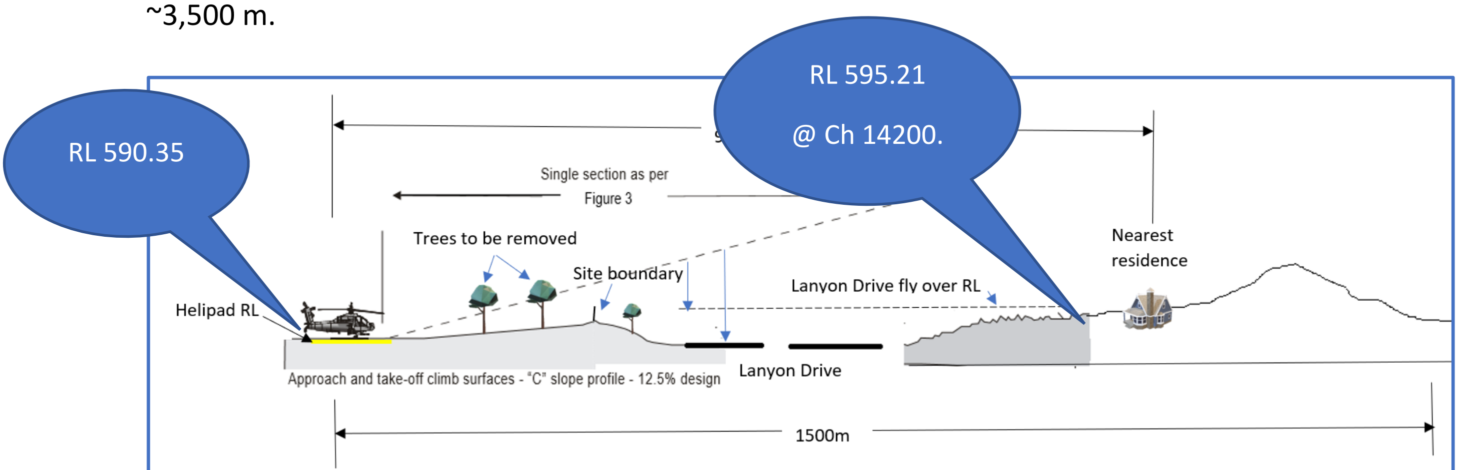
5.2.4 Wildlife and bird strike

The potential for bird/wildlife strike from the proposed development and in particular the impact on aircraft operations has been subject to an assessment for the EIS (Lanterra Consulting). This assessment - Defined the area to be assessed - Ranked the Probability of a Strike – rated the probability that species will be involved in a strike and proposed mitigation measures. The assessment report states that *the total number of aircraft movements can influence the probability of strikes, with the number of strikes directly correlated with the number of aircraft movements assuming all other variables remain constant (type of aircraft, weather, and mitigation measures). Strike probability is also influenced by the location of the landing site and subsequent arrival and departure flight paths. Overall, the proposed helicopter landing site itself does not provide a significant attractive habitat if managed (landscape management plan implementation) to achieve an acceptable risk level.*

The assessment found that the proposed development site is surrounded by several bird attractant features, and therefore the assessment has made several recommendations. These recommendations are based a risk assessment of the proposed land use and areas near the development site. A suite of mitigation measures is proposed covering design elements and ongoing operations of the proposed facility to manage the potential bird/wildlife attack on helicopter operations.

5.2.5 Flight path survey and flight path approach and take off splay

The proposed visual flight rules approach and departure paths run North to North–East. These paths have been assessed to achieve an obstacle free gradient of 2.5º (4.5% or 1:22 vertical to horizontal), measured from a point 1.5 m. above the forward edge of a 25 m diameter final approach and take-off area (FATO), to a height of 500 feet above the FATO at ~3,500 m.



Concept flight path model / departure

5.2.6 Refuelling of fuel storage facilities on the site, providing details around capacities and safety management procedures

Permanent fuel storage is not proposed at the site. Refuelling of the helicopter may take place from a mobile tanker in a designated hard stand area and it is this operation that posed a threat of fire from the ignition of flammable jet fuel. However, this is not the preferred location, as it is planned to refuel the helicopter at Canberra Airport. Should refuelling take place on site it will be carried out from a mobile tanker in a designated hard stand area. This area known as the helicopter parking pad shown in figure 15 is graded towards a floor sump which flows into the SPEL stormwater system.

In the event of spillage an emergency spill kit to be kept on site and staff trained in its use.

There are currently no regulatory standards in NSW/ACT for firefighting appliances. The most appropriate fire protection involves foam making equipment such as a Fixed Monitor System (FMS)/oscillating monitor nozzle/s for a concrete HLS.

The minimum standards currently are as follows:

- a fire water point with fire hose located adjacent to the primary HLS deck access point.
- firefighting appliances suitable for liquid and electrical fires located in the vicinity of the primary access point, including:
- 1 x CO2 3.5 kg.
- 1 x Dry Powder 9.0 kg.
- 1 x Foam 90 litres
- 1 x Fire Blanket.

Forestrack will provide initial and recurrent training aimed at providing the safety personnel with the knowledge and skills necessary to deal effectively with an emergency at the site. This safety training will be included in the helicopter Operation Plan as part of the companies Integrated Management System.

Helicopter Operation Plan / Safety training will address

- Operation of the helicopter site and facilities
- Safety procedures around helicopter(s) during ground operations
- Communication systems at the site
- Site emergency plan
- Operation of the fire protection system

6. Management Measures Recommendations

Construction

Construction activities associated with helicopter infrastructure is an integrated part of the proposed development and as such is subject to the Project Construction Management Plan and associated plans. The erosion and sedimentation plan addresses mitigation measures associated with the helicopter landing site which involves civil work to construct the helicopter landing site.

Operation

Apart from ongoing base operational management, several design elements have been included in the proposed development to address issues discussed in this assessment. Of particular concern is the location of overhead power wires which pending approval are to be relocated underground. Should this not be the case, the positioning of Power Line Hazard Markers (balls) may be necessary. Usually 12” marker balls are sufficient in size.

Key operational management issues associated with helicopter operations are:

- Establishment of an Emergency Planning and Training Plan[2] for safety personnel - this plan to address, aircraft emergencies, medical emergencies, dangerous goods, fires, natural disasters.
- Incident management plan spill procedures
- Fuel Management Plan – helicopter refuelling operation

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[2] *Helicopter Operation Emergency Plan – table of Contents*

- Administration
- Record of Amendments
- Distribution List
- Contact Telephone Numbers
- Helicopter Emergency Map Reference
- Aim
- Scope
- Legislation
- Response Area Covered
- Committee
- Roles and Responsibilities
- Forward Command Post (FCP
- Emergency Operations Centre (EOC)
- Casualty Processing Area (CPA)
- Relative Reception Centre (RRC)
- Reuniting Facility
- Facility to Advise Families of Deceased Relatives
- Crew Reception Facility
- Media Centre
- Operational response to and emergency
- Site Access
- Activation and Call Out
- Assembly Area
- Communication with Community
- Full emergency and crash
- Crash on site
- Crash off site
- Bomb Threat (including buildings)
- Disabled Aircraft
- Hazardous Material Incident
- Natural Disaster
- Medical Emergency
- Recovery of Wreckage/Clean Up
- Security Control
- Return to Operational Status
- Critical Incident Stress (CIS) and Post Trauma Management
- Emergency plan training / record

- Wildlife / bird Management Plan – refer to bird strike assessment report

The emergency plan will set out the procedures for coordinating the response of agencies.

Safe helicopter operations training consists of: • Orientation to the site; • Communication and HLS facility equipment; • How to manage emergencies; • How to work safely around aircraft; and • How to manage passenger transfers to/from helicopters with rotors running and rotors stopped. Upkeep and use of the fire extinguishers will also be included in the training.

7. Conclusion

Proposed helicopter operations itself will be managed during landing and take-off to ensure adequate safety is maintained for all persons. A procedures manual will be prepared covering the relevant matters. The relatively small area allocated for the landing and departure of the chosen helicopter is excluded to the public and will be actively managed. The proposed development does not include any permanent fuel storage for the fuelling of helicopter(s). Accidental spills will be managed by site controls and procedures outlined in the helicopter operations manual will also include robust emergency safety and routine procedures.

The purpose of approach/departure airspace is to provide sufficient airspace clear of hazards to allow safe approaches to and departures from landing sites. The proposed Approach/departure paths are such that downwind operations are avoided and crosswind operations are kept to a minimum. Moreover, the preferred flight approach/departure path is aligned with the predominate wind when taking account of potential obstacles. The proposed helicopter operation will have no material impact on aviation activities at Canberra aerodrome. The helicopter landing/departure sight is sufficiently distant from Canberra aerodrome such that arriving and departing aircraft will not realise any traffic confliction with helicopters operating to and from it.

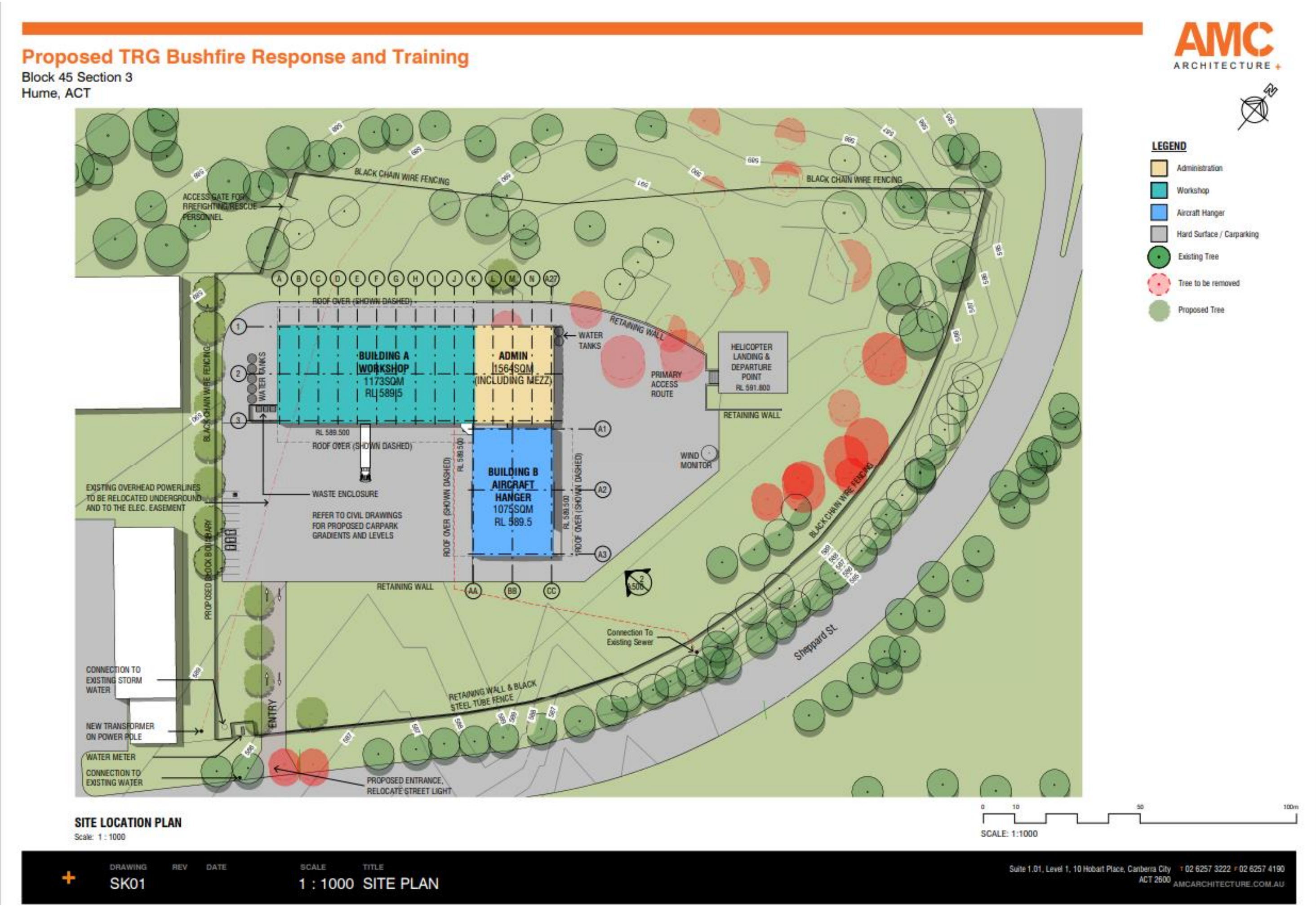
Pilots are always responsible for the safe conduct of the flight. This includes any effects rotor downwash may have on persons and objects near a landing location. Pilots will need to ensure their flight path is clear of potential objects, and pedestrians.

Helicopter noise levels have been predicted for all sensitive receptors in the assessment area for the project (refer to SLR Noise assessment). The predicted noise levels at residential and light industrial receptors show compliance with the applicable AS 2021 criterion, in addition to the criteria from the (superseded) AS 2363:1990, for residential and commercial receivers. Predicted noise levels would be comfortably below 50 dBA (15 ANEF + 35 dB) at surrounding residential areas. SLR noise assessment found that the “worst-case” noise level during warming up would be below 75 dBA LAmax at the nearest light industrial receptor.

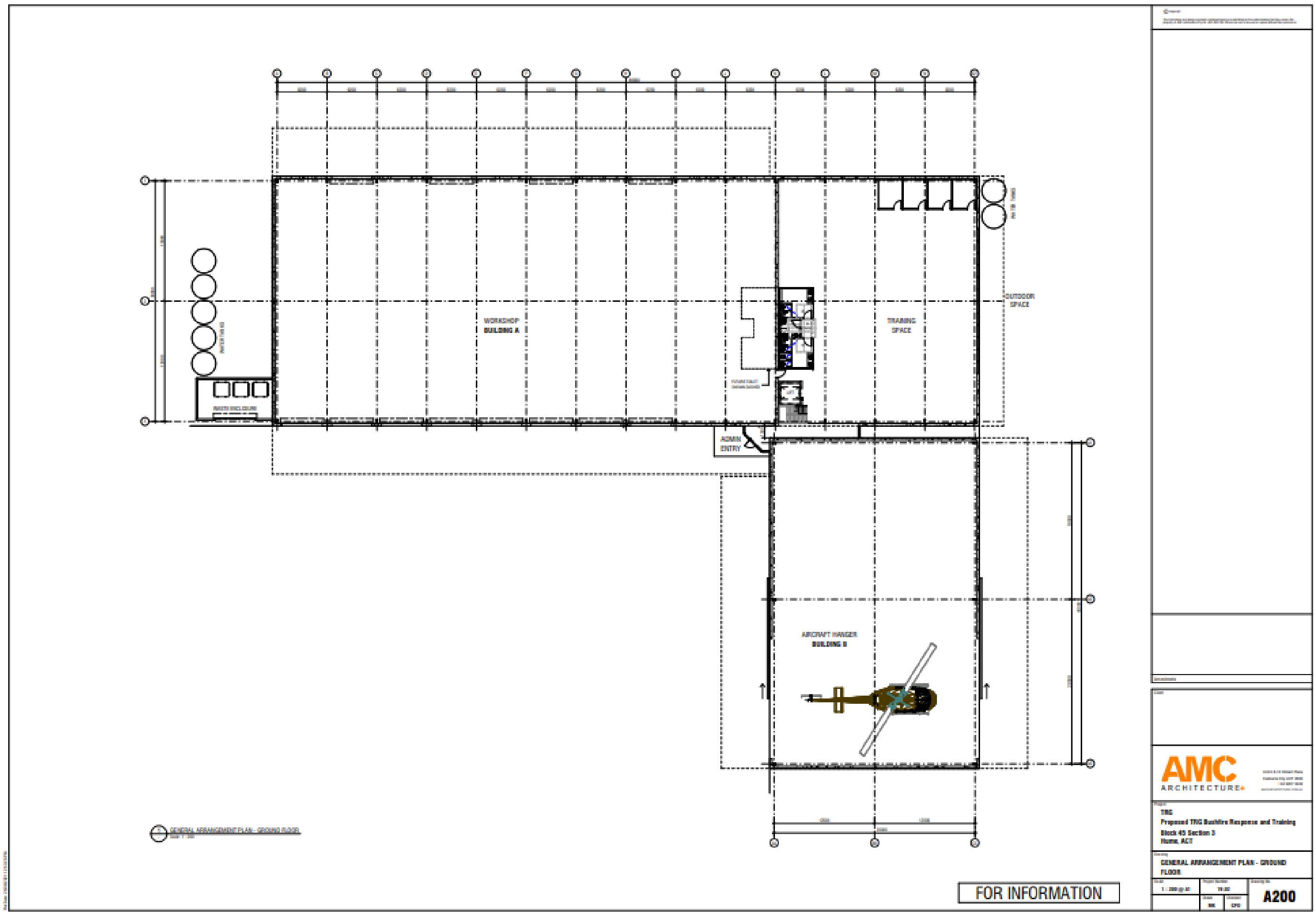
Helicopter operations into and from the base are expected to be infrequent at best. Forestrack are committed to a Fly Neighbourly[3] procedure and the provision of Fly Neighbourly accordance with acoustic testing to minimise any inconvenience to surrounding communities. By designing these paths predominately over undeveloped land, the helicopter should operate without travelling over or near populated areas.

Appendix A

Proposed development plans.



[3] A Fly Neighbourly Advice (FNA) is a voluntary code of practice established between aircraft operators and communities or authorities to negotiate a reduction of disturbance or adverse amenity impact in an area. It may be instigated by the local government, business operator or community group that is affected by the operation of the aircraft.


WORKSHOP
BUILDING A
TRAINING
SPACE
OUTDOOR
SPACE
ADMIN
ENTRY
AIRCRAFT HANGER
BUILDING B
GENERAL ARRANGEMENT PLAN - GROUND FLOOR
FOR INFORMATION
AMC
ARCHITECTURE
TRG
Proposed TRG Bushfire Response and Training
Block 45 Section 3
Hume, ACT
GENERAL ARRANGEMENT PLAN - GROUND FLOOR
A200