# 5 Stage 1 Western Sydney Airport

## 5.1 Introduction

## 5.1.1 Overview

The proposed Western Sydney Airport would be developed in stages in response to demand. Stage 1 would comprise a single runway, a terminal and other relevant facilities to accommodate approximately 10 million annual passengers as well as freight traffic.

As demand grows over time, the proposed airport is expected to include an expanded terminal, further support and commercial facilities and ultimately a second runway (to be developed around 2050). The expansion of the proposed airport similarly would occur in a number of stages in response to demand for aviation services. The long term development would be capable of handling approximately 82 million annual passengers.

The revised draft Airport Plan sets out a concept design including an indicative layout and land use plan for the proposed airport. The location and orientation of main elements such as runways and the area reserved for terminal development (for both Stage 1 and the long term) optimise the use of the site in light of the size, shape and orientation of the available land. In general, the preferred runway orientation and the amount of separation required between two runways defines the parameters for other aspects of the concept design. Consideration has also been given to previous airport design concepts, in particular with regard to runway orientation, to minimise the changes in potential impacts identified by previous environmental impact statements which were subject to public consultation.

This chapter provides an overview of the major functional elements of Stage 1 as described in the revised draft Airport Plan.

## 5.1.2 Stage 1 development

Site preparation activities would be undertaken for construction, including bulk earthworks to create a level surface for the Stage 1 development which covers approximately 1,150 hectares. Airport operations are proposed to begin around the mid-2020s and provide capacity to service approximately 10 million annual passengers, equating to approximately 63,000 annual air traffic movements. This level of demand is anticipated to occur around five years after operations commence.

Stage 1 would include the construction of a 3,700 metre runway positioned in the northern portion of the airport site on an approximate north-east/south-west or 50/230 degree orientation (referred to as runway 05L/23R). Stage 1 includes a single full length parallel taxiway and a range of aviation support facilities such as passenger terminals, cargo and maintenance areas, car parks and navigational instrumentation.

These facilities would be developed before operations begin in the mid-2020s and would be capable of handling both domestic and international regular public transport services in addition to freight. An indicative layout for Stage 1 is provided in Figure 5–1.



Figure 5–1 Indicative airport site layout – Stage 1 development

The scale of the Stage 1 development has been designed to match demand. However, the precise layout of Stage 1 would be the responsibility of the ALC and may differ from the indicative layout shown in Figure 5–1. Some other examples of terminal layouts that could meet the Stage 1 capacity requirements as set out in the revised draft Airport Plan are presented in Figure 5–2.



Figure 5–2 Alternative Stage 1 terminal layouts

## 5.1.3 Long term development

Incremental development of the proposed airport would be required at various stages as passenger demand increases and would include:

- expansion of the terminal precinct;
- continued growth of the airport support facilities and business development activities;
- · improvements in transportation infrastructure on and into the site; and
- development of a second runway.

The functional elements of Stage 1 would be designed so as not to preclude future expansion and to provide the required capacity for aircraft, passengers, cargo, and vehicle movements expected for the future. Flexibility and expandability have been considered in the geometry of the proposed airport and indicative facility layout to allow for its proposed staged development over the long term in line with increasing demand.

The Stage 1 runway is expected to reach capacity when passenger demand approaches 37 million annual passengers, around 2050, at which time a second parallel runway would be required. This is equivalent to approximately 185,000 annual air traffic movements. By around 2063, the total annual air traffic movements for the proposed airport is expected to be 370,000, serving approximately 82 million annual passengers.

The Land Use Plan, as outlined in the revised draft Airport Plan, has identified an area as aviation reservation to provide for future development of a second runway positioned in the southern portion of the airport site. The second runway would be on a parallel 05/23 orientation approximately 1,900 metres apart from the first runway, permitting independent operations and maximising the size of the midfield available on the airport site, to be used for the terminal and other support facilities.

Development beyond Stage 1 would be subject to further regulatory approval in accordance with the Airports Act, including any required environmental assessment, and are not assessed as part of this EIS. However, as Stage 1 clearly facilitates the development of these future stages, it is appropriate for this EIS to refer to the potential impacts associated with the long term development. In this context, a strategic environmental assessment is provided in Volume 3.

An indicative layout of the long term development is provided in Figure 5–3. This represents only one indicative layout for the long term development.

Alternative long term terminal layouts may be developed by the ALC. Some other examples of long term terminal layouts are presented in Figure 5–4.



Figure 5-3 Indicative airport site layout - Long term development







Figure 5–4 Alternative long term indicative terminal layouts

## 5.2 Airport precincts

Airports are generally divided into two main areas, or 'precincts', that reflect the level of public access to the main functional elements within each area. These are known as the airside and landside precincts.

The airside precinct includes all areas that are accessible to aircraft, as well as the restricted access areas within the airport site that support passenger and freight aircraft operations, including runways, taxiways, aprons, baggage handling, air traffic control, fuel facilities, and firefighting and rescue services. Parts of the terminal buildings and cargo handling facilities also form part of the airside precinct. These include boarding gates, lounges and other areas that are only accessible following security screening.

The landside precinct includes areas that are open to general public access such as parking lots, access roads and kerbside drop-off areas, bus stations and train stations. Those parts of the terminal buildings and cargo handling facilities not subject to security and screening, such as check-in and baggage drop-off and freight delivery docks, also form part of the landside precinct.

## 5.3 Summary of key features

The key features of the Stage 1 development approximately first five years after operations commence are provided in Table 5–1.

Feature	Details
General	
Airport site	Total area approximately 1,780 hectares
Ownership	Commonwealth
Land use	Commercial aviation
Estimated demand – Stage 1 Operations	
Annual aircraft movements – passenger	Approximately 56,000 international and domestic
Annual Aircraft movements – dedicated freight	Approximately 7,000 international and domestic
Passenger movements	Approximately 10 million per year international and domestic
Runway and lighting	
Length	3,700 metres
Width	60 metres
Aerodrome reference aircraft	Code F
Orientation	05/23 – Approximately north-east/south-west (50º/230º plus or minus up to five degrees)
On-site/ off-site lighting	900 metre high intensity approach lighting (HIAL) off end of runway threshold may require offsite interests.

Table 5–1 Summary of key Stage 1 features

Feature	Details	
Aviation fuel supply		
Fuel delivery method	Road tanker	
Storage	Onsite fuel farm providing at least 3 days storage of 8.1 mega litres	
Terminal		
Configuration/ type	Integrated domestic and international	
Size/ floor space	65,000 to 90,000 square metres of floor space	
Ground transport links and access		
Access	Road access only	
Public entrance	M12 link (100 metre wide corridor comprising up to six traffic lanes, two bus lanes and a rail corridor of sufficient width to provide for two independent rail services with two tracks for each service and provision for appropriately sized passenger railway station/s)	
Freight and maintenance	The Northern Road (50 metre wide corridor comprising a minimum of four traffic lanes)	
Car parking and drop-off		
Car parking spaces	Up to 12,500 (maximum authorised)	
Kerbside drop-off – Arrivals	180 to 250 metres	
Kerbside drop-off – Departures	180 to 250 metres	
Major utility requirements		
Water	1.6 mega litres of potable water per day and 1.8 mega litres of non-potable water per day	
Sewage and wastewater	2.7 mega litres of wastewater treated onsite and 0.11 mega litres of surplus sludge	
Electricity	16.7 megavolt amperes at peak demand	
Gas	57,000 gigajoules per year	

A holistic approach to the planning of the proposed airport has been applied to provide the initial required capacity for aircraft, passengers, cargo, and vehicle movements. Flexibility and expandability have been considered in the airport geometry and facility layout to allow for the proposed staged development in line with increasing demand. The capacity of each facility has been planned with regard to the overall airport operating efficiency and ability to accommodate future growth.

The development of the revised draft Airport Plan has taken into account various forecasts and assumptions around expected air traffic movements and required capacity for the proposed airport to operate during Stage 1 and in the long term.

In addition to the Airports Act and Regulations, in order to provide the most efficient and safe operation of the proposed airport, the following codes and regulations were taken into account in developing the revised draft Airport Plan:

• International Civil Aviation Organization (ICAO) standards and manuals;

- *Civil Aviation Act 1988*, the Civil Aviation Safety Regulations and the Civil Aviation Safety Authority's (CASA) Manual of Standards;
- Aviation Transport Security Act 2004 and Regulations;
- Air Navigation Act 1920 and Regulations;
- Customs Act 1901 and Regulations;
- Crimes (Aviation) Act 1991 and Regulations;
- Biosecurity Act 2015 and Regulations;
- Airspace Act 2007; and
- Air Services Act 1995.

## 5.3.1 Aircraft fleet mix and aerodrome reference codes

The revised draft Airport Plan has been developed to provide flexibility to accommodate any aircraft fleet mix anticipated to use the proposed airport. ICAO aerodrome reference codes (A, B, C, D, E, and F) were used in the planning of the functional elements of the airport site. Using the ICAO system provides flexibility to accommodate a variety of aircraft fleet types at the proposed airport during Stage 1 and long term development. Table 5–2 outlines the fleet mix categories and provides examples of applicable aircraft.

 Table 5–2
 Aerodrome and aircraft reference codes and examples

Aerodrome and aircraft reference code	Most common routes	Aircraft examples
Code A	General aviation	General aviation aircraft
Code B	Regional	SAAB 340
		Dash 8
Code C	Domestic	Airbus A320
		Boeing 737
Code D	Domestic	Boeing 767
Code E	International	Airbus A330/ A350
		Boeing 747-400
		Boeing 777
		Boeing 787
Code F	International	Airbus A380
		Boeing 747-8

During Stage 1 operations, Code C aircraft are expected to account for the majority of domestic operations at the proposed airport, representing approximately 90 per cent of the domestic fleet mix at the time. The international fleet mix during Stage 1 is expected to comprise about 59 per cent Code E aircraft and about 40 per cent Code C aircraft.

The fleet mix of freight aircraft assumes the majority of domestic dedicated freight activity is served by Code C aircraft and international freight activity served by larger Code E aircraft.

The remaining fleet mix would consist of Code A, B and F aircraft. No Code D aircraft are expected to operate at the proposed airport, since most Code D aircraft (e.g. B767, A310, B757) are being phased out of operations.

## 5.3.2 Critical design aircraft

The largest aircraft expected to use an airport determines the airfield planning dimensions and is considered the 'critical design aircraft'. The critical design aircraft also determines the critical separation and design geometry dimensions for safe operations on runways, taxiways and aprons.

Code F is the largest type of aircraft expected to use the proposed airport, and has therefore been adopted as the critical design aircraft, therefore maximising the aeronautical capacity of the Airport in the long term. This means that from the start of operations, the airport would be able to service the largest aircraft in operation today (e.g. the Airbus A380). Designing to meet Code F standards means that the functional elements would be able to meet Code F activity as operations develop without disrupting existing airport operations. This would be particularly important in advance of the potential second runway and terminal expansion.

Although Code F has been adopted as the critical design aircraft, it is expected that only a small number of Code F aircraft are likely to use the proposed airport, equating to about 0.5 per cent of movements for Stage 1 operations and up to one per cent of the expected fleet mix in the long term.

## 5.3.3 Airfield capacity and activity forecasts

## Airfield capacity

Airservices Australia assessed airspace implications and air traffic management approaches for the Sydney region airspace associated with the development of the proposed airport, to reaffirm that the airport site could be used as a high capacity airport to accommodate any aircraft fleet mix. It is important for long-term planning that the configuration of the airport site in Stage 1 does not preclude future development and therefore airfield capacity analysis is based on the long term, parallel runway scenario.

This analysis indicates that an airport at Badgerys Creek could potentially achieve 103 total aircraft movements per hour with parallel runway operations in the long term (anticipated to be around the 2060s). This would consist of:

- 45 landing operations; and
- 58 departure operations.

## Activity forecasts

Indicative activity forecasts based on the expected fleet mix have been developed for the purpose of planning the capacity, layout and functionality of the proposed airport. The key indicative forecast parameters considered during the design and planning of the airport site include:

- the annual passenger demand in terms of million annual passengers;
- forecast air traffic movements, either landing or departing; and
- peak hour passenger and air traffic movements demand at the airport.

The major functional areas of the airport, such as terminal facilities, runways, taxiways and roadways, would be designed to accommodate the peak hour passenger or peak hour aircraft demand. The busy hour activity represents a part of a regular day during which overall aviation activity at the airport is at its highest. Consideration of the peak hour activities during planning allows facilities to be sized appropriately so that they are neither underutilised nor overcrowded too often, and ensures that users consistently receive a satisfactory level of service and are not subject to significant congestion.

Within the first five years of operation, the proposed airport is expected to accommodate approximately 63,000 passenger and freight air traffic movements per year, including approximately 21 air traffic movements per hour during peak times. This could increase to 370,000 air traffic movements per in approximately 2063, including 85 air traffic movements per hour during peak times.

The Stage 1 and long term development capacity requirements for the proposed airport based on the indicative activity forecasts and the expected busy hour activity are summarised in Table 5–3. The Stage 1 airport layout would be designed so as not to preclude future development to accommodate expected long term capacity requirements.

	Stage 1 operations	First runway at capacity (c. 2050)	Long term (c 2063)
Annual passengers (arrivals and departures)	10 MAP	37 MAP	82 MAP
Peak hour passengers (international and domestic)	3,300	9,500	18,700
Total annual air traffic movements (passenger and freight)	63,000	185,000	370,000
Total busy hour annual air traffic movements	21	49	85

 Table 5–3 Summary of activity forecasts

The volume and profile of passengers using the proposed airport is expected to evolve over time in response to growing demand and relative market position. It is expected that in the early years around 80 per cent of passenger demand at the proposed airport would involve regional and domestic travel. Domestic demand is likely to be focussed on travel between capital cities, including Melbourne, Brisbane and Perth, as well as Gold Coast Airport.

Over time, it is expected that demand could grow, particularly in international regular public transport, as residual capacity at Sydney Airport is used. It is expected that after five years of operations the proposed airport could serve approximately 2 million international passengers annually, growing to approximately 19.5 million international passengers annually around 2050. By this time, the domestic-international split could be approximately 47 per cent domestic and 53 per cent international. In the long term, the proposed airport is expected to serve all types of aviation traffic including low cost carriers, full service carriers, international, domestic, connecting and regional traffic.

Freight aircraft are also expected to operate at the proposed airport, with the site able to accommodate approximately 7,000 dedicated freight air traffic movements per year in Stage 1 development, increasing to 30,000 air traffic movements per year in the long term.

## 5.4 Airside precinct

The airside precinct includes all areas that are accessible to aircraft, as well as the restricted access areas within the airport site that support passenger and freight aircraft operations, including runways, taxiways, aprons, baggage handling, air traffic control, fuel facilities, and firefighting and rescue services. Parts of the terminal buildings and cargo handling facilities also form part of the airside precinct. These include boarding gates, lounges and other areas that are only accessible following security screening.

## 5.4.1 Runways

## Orientation

### Design principles

Runway orientation is determined largely by the shape and size of the available land and the prevailing wind conditions at the site as preserved under the Strategic Direction put in place by the NSW Minister for Planning in 1985. Strategic Direction 5.8 – Second Sydney Airport: Badgerys Creek (Strategic Direction) was issued by the NSW Minister for Planning to local councils, under section 117(2) of the *Environmental Planning and Assessment Act 1979*, with the objective of avoiding incompatible development in the vicinity of any future airport at Badgerys Creek. The amount and shape of land available at the airport site is relatively constrained, and design development is limited in terms of options for runway orientation.

The site is oriented generally north-east/south-west. To provide for future development to two parallel runways, the design has been developed around an optimal orientation of 50/230 degree (magnetic) heading (referred to as 05/23). This is illustrated in Figure 5–5.



#### Figure 5–5 Runway orientation

ICAO aerodrome design standards dictate that the number and orientation of runways at an aerodrome should ensure that the aerodrome is useable for not less than 95 per cent of the time for the aircraft it is intended to serve (ICAO 2006).

In developing and assessing the usability factor for various runway orientation options the ICAO design standards assume that landing or take-off operations are precluded when the crosswind component exceeds the following:

- 20 knots (37 kilometres per hour) in the case of aircraft that require a minimum field length of 1,500 metres for take-off;
- 13 knots (24 kilometres per hour) in the case of aircraft that require a minimum field length of 1,200 metres for take-off; and
- 10 knots (19 kilometres per hour) in the case of aircraft that require a minimum field length less than 1,200 metres for take-off.

The Bureau of Meteorology assessed the usability of the airport site based on a 05/23 runway orientation by analysing, historical wind speed and direction data over the last 18 years. The *Western Sydney Airport Usability Report* is provided in Appendix D. This data was obtained from weather stations at and around Badgerys Creek. Analysis indicates that the proposed airport would be able to be used approximately 99.5 per cent of the time based solely on a prevailing crosswind of less than 20 knots.

The assessment undertaken by the Bureau of Meteorology found that a runway orientation of 05/23 would provide a high level of usability at the airport site and would likely exceed the 95 per cent usability target recommended by ICAO aerodrome design standards.

Given the size and shape of the airport site, this orientation is considered the optimal parameter for the development of the airport layout.

#### Number of runways

To meet the anticipated passenger and freight demand at the proposed airport, two parallel runways of equal length are proposed in the long term. This provision limits the options available for locating the first runway for Stage 1.

After around five years of operation, the Stage 1 runway is expected to accommodate approximately 63,000 passenger and freight annual air traffic movements, including approximately 21 air traffic movements per hour during peak times. This is equivalent to about 10 million annual air passengers. At full capacity (around 2050) the first runway could accommodate 185,000 annual air traffic movements per year, including 49 air traffic movements per hour during peak times – equivalent to about 37 million annual passengers. At this point a second runway would likely be required.

In the long term, two runways would be expected to service about 85 air traffic movements per hour during the busy hour, or up to 370,000 air traffic movements per year, equivalent to around 82 million annual passengers.

The Stage 1 layout consists of a single runway in the northern portion of the site, close to the boundary, referred to as the 'northern runway'. The northern runway was selected to be the first runway at the airport site for the following reasons:

- reduced earthworks requirements (cut and fill) associated with the northern runway;
- fewer constraints on how and when a future rail line may be accommodated on the airport site;
- there would be less impacts on airport site biodiversity values if the northern runway was constructed first; and
- shortest distance to connect utility trunk lines around the airport site.

Using standard naming conventions for runways to indicate their relationship to the left and right of each other in relation to the direction of travel, the northern runway would be 05L–23R and the future 'southern runway' would be 05R–23L. The layout of the Stage 1 05L–23R runway is provided in Figure 5–6.



Figure 5-6 Stage 1 'northern runway' (05L-23R) layout

#### Runway length requirements

Safe aircraft operating conditions require a runway length that is sufficient to ensure that, after beginning a take-off, an aircraft can either be brought safely to a stop or safely complete the take-off.

ICAO Annex 14 – Aerodromes Volume 1<sup>3</sup> identifies the minimum specification requirements for currently operating aircraft and for similar aircraft planned for introduction that are likely to have similar characteristics to those currently operating. Runway length analysis was conducted using the ICAO Aerodrome Design Manual<sup>4</sup> with consideration given to the following information:

- mean maximum temperature;
- aerodrome elevation;
- equivalent temperature in standard atmosphere;
- runway slope; and
- maximum take-off weight for the critical aircraft likely to use the proposed airport.

<sup>&</sup>lt;sup>3</sup> ICAO Annex 14 – Aerodromes Volume 1, Aerodrome Design and Operations, 6th Edition (ICAO2013)

<sup>&</sup>lt;sup>4</sup> Doc. 9157 Aerodrome Design Manual, Part 1, Runways, 3rd Edition (ICAO 2006)

The maximum take-off weights for a range of aircraft expected to use the proposed airport, including the design critical Code F aircraft are shown in Table 5–4. Analysis was undertaken of the runway length required to allow the aircraft to reach its furthest possible destination if operating at maximum take-off weight. Analysis included the domestic and international operations expected at the proposed airport.

Aircraft	Code	Maximum take-off weight (kg)	Runway length requirements (m) (based on typical take-off weights)
B737-800	С	79,016	2,930
A321-200	С	93,500	2,953
B777-200	E	286,900	3,426
A380-800	F	575,000	3,544
B777-300ER	E	351,535	3,632
B747-8	F	447,696	3,662
A330-300	E	233,000	3,697
B747-400	E	396,894	3,780
B767-300ER	D	186,880	3,780
A340-600	E	380,000	4,016

Table 5-4 Runway length requirements for critical aircraft expected to use the proposed airport

Source: Aircraft Manufacturers' Manuals

The analysis highlights that, under comparable conditions, newer aircraft tend to use less runway length for take-off than the earlier generation of aircraft. This has been possible because of improved aerodynamic efficiencies and efficient modern engines.

Based on the analysis undertaken, the maximum runway length requirement is 4,016 metres for the A340-600, followed by 3,790 metres for the B747-400 and B767-300ER aircraft. However, these three aircraft are currently being phased out of most airline fleets.

The heaviest Code F aircraft, the A380-800, requires a runway length of 3,544 metres based on maximum take-off weight operations and is therefore not a significant design constraint in considering the most appropriate runway length. A runway length of 3,700 metres will cater for the requirements of the A330-300, the B777-300ER (both Code E) and the B747-8 (Code F) aircraft and is considered the most appropriate length for the Stage 1 development and long-term planning of the airport.

A runway length of 3,700 metres would be constructed for Stage 1 development and would enable the airport to serve all domestic and international destinations within a radius of 8,000 nautical miles. Figure 5–7 shows that, for the B777-300ER aircraft at maximum take-off weight, the proposed airport could serve international destinations including Dubai and mid-west USA.



Figure 5–7 B777-300ER indicative range with Maximum Take-Off Weight

#### Runway separation

Airport developments with two or more parallel runways require adequate separation to accommodate independent (but parallel) approach and departure operations during peak hour operations. Runway separation requirements are based on ICAO Standards as prescribed in the *Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways*<sup>5</sup>. These standards require a minimum separation of 1,525 metres to enable runways to operate independently of each other in poor weather.

The separation criteria for the Stage 1 development and the long term runways have been developed in accordance with the requirements set out in the ICAO Standards and in such a way as to maximise the land between the two runways for terminal buildings, aprons and taxiways.

The Stage 1 development northern runway would be positioned in the north-west of the site, allowing for a separation of approximately 1,900 metres between the Stage 1 development runway and the second runway in the south-eastern portion of the airport site.

A separation of 1,900 metres would be required to allow the second runway to operate completely independent, parallel arrival and departure operations. This separation would also ensure adequate midfield separation to accommodate the airfield taxiway system, terminal buildings, aircraft stands and maintenance facilities, as well as ground transport access infrastructure required for operations to meet the anticipated long-term demand of approximately 82 million annual passengers, expected to be achieved around 2063.

<sup>&</sup>lt;sup>5</sup> ICAO Doc. 9643

## 5.4.2 Taxiway and apron system

#### Taxiways and taxi lanes

Taxiways and taxi lanes allow the safe and efficient movement of aircraft between runways and the terminal. Landing aircraft cannot touch down until any preceding aircraft has moved completely clear of the runway. Rapid exit taxiways (RETs) are required to facilitate this movement and need to be optimally positioned and configured to support the aircraft fleet mix expected to use an airport, so that the time an aircraft spends on a runway is minimised.

It is expected that the taxiway system for the proposed airport constructed as part of Stage 1 development would include a full length parallel field taxiway, with linking taxiways and taxi lanes providing safe and efficient access and circulation between the runway/parallel taxiway and the apron areas, including RETs. Stage 1 would be designed to preserve land to expand the proposed airport in the long term.







#### Lighting, marking and signage

The proposed airport would require a range of airfield ground lighting including low visibility lighting, as well as movement control and guidance system interface, pavement marking and signage for the taxiway and taxi lane systems. These would be developed in accordance with CASA Manual of Standards (MOS) – Part 139 Aerodromes and ICAO Standards.

## 5.4.3 Apron and aircraft stands

The main public transport apron and aircraft stands would be developed to operate as an integrated terminal. This is discussed in more detail in Section 5.4.9 and Section 5.5.1. An integrated terminal design would provide efficiencies in operation due to the ability to 'swing' certain airport facilities, allowing the airport operator to switch the use of airport facilities such as check-in, security and baggage claim between domestic and international passengers.

Swinging certain facilities would provide benefits including increased flexibility to accommodate the up-gauging of domestic aircraft, sharing of passenger processing facilities by international and domestic passengers and increased efficiency in transfers and the usage of stands and gates.

All aircraft stands on the regular public transport apron and the permanent freight apron area (if constructed in the Stage 1 development) would be provided with an aircraft (reticulated) hydrant refuelling system.

A freight apron may be located at the western end of the airport site or, as a temporary provision, near to the passenger terminal area. If the temporary location is utilised, fuelling of aircraft may be undertaken by fuel truck instead of hydrant fuelling.

It is likely that some Code F stands would be developed as Multiple Aircraft Ramp Systems (MARS). These provide maximum flexibility in stand capability and airline allocation within the terminal by allowing one stand to handle either two Code C aircraft or one Code F aircraft.

A mix of contact (aerobridge served) stands and non-contact (walk-on/walk-off) stands would be required according to the nature of traffic, (e.g. full service carriers versus low cost carriers).

The layout of the Stage 1 aprons and aircraft stands would be designed such that they are able accommodate the capacity requirements of both the Stage 1 and the long term developments and the requirements of the critical Code F aircraft.

An indicative example of an apron and stand layout sufficient to accommodate a Code F aircraft is provided in Figure 5–9.



Figure 5–9 Indicative apron and stand layout for a Code F aircraft

## 5.4.4 Air traffic control

Air traffic control capability will be provided at the proposed airport and may be provided by an air traffic control tower (ATCT). An ATCT needs to be located so that the time taken by the air traffic controller to detect the start of an aircraft's movement at take-off is minimised. This is referred to as the Response Time.

The location of an ATCT should result in the shortest possible response time. The proposed position of an ATCT should result in an approximate response time of up to four seconds, with an upper limit of five seconds in exceptional circumstances.

Based on the design grading of the airport site, estimated runway locations and elevation plans, the controller eye level elevation would need to be a minimum of 115 metres Australian Height Datum (AHD) to provide a four second response time. For the airport site, this means that the ATCT would need to be at least 35 metres high.

Planning for the long term, to provide air traffic control coverage of both runways within the desired response time, an ATCT would be located in the centre of the midfield area, at a suitable location within the area shown in Figure 5–10.

The facility would be a stand-alone installation and would be segregated in a secure ATCT precinct.



Figure 5–10 Indicative location of an air traffic control tower

## 5.4.5 Navigational aids

The Stage 1 runway is expected to be equipped to accommodate instrument approach procedures at both ends, which provide navigational guidance to approaching aircraft enabling them to land safely during periods of poor visibility.

Protection zones would need to be included to assure the continuous operation of the navigational aids. Easements or land acquisition may be required to facilitate these protection zones, within which restrictions would be placed on building types, building heights and certain activities in order to avoid interference with navigational aid equipment.

## Navigational equipment

Stage 1 would include a number of navigational aids, located in accordance with the relevant equipment siting guidelines. The following equipment would typically be required:

- Precision Approach Path Indicator (PAPI);
- Instrument Landing System (ILS) Category III B;
- Glide Path (GP);
- Localiser (LOC);
- Far Field Monitor (FFM);
- Distance Measuring Equipment (DME);

- Advanced-Surface Movement Guidance and Control System (A-SMGCS); and
- Ground Based Augmentation System (GBAS).

For safe airport operations, GBAS would improve the accuracy and reliability of an aircraft's navigational system by transmitting location data between one or more accurately surveyed ground stations and an approaching aircraft's navigation system.

The GBAS facility comprises two components including a VHF Data Broadcast antenna and four Remote Satellite Measurement Unit antennas. The GBAS is required to be located at least 200 metres from operating aircraft, 150 metres from major roads and railway lines and requires clear unobstructed coverage to the entire runway length. The location of the GBAS would be confirmed during detailed airport design.

## Runway lighting

Runway lighting would comprise the following typical elements:

- High Intensity Runway Lights (HIRL);
- Airfield Lighting Equipment Room (ALER) Facility, which will house all control systems and Constant Current Regulators (CCR) of the Airfield Ground Lighting (AGL) system;
- Runway Centreline Lights;
- High Intensity Approach Lighting (HIAL) where HIAL protrudes beyond the airport site boundary, interests on the adjacent land would be acquired for the purposes of the installation of the HIAL. Indicative locations for the required HIAL are shown in Figure 5–11;
- Touchdown Zone Lights (TDZ);
- Runway Threshold Lights;
- Runway Wing Bar Lights;
- Runway End Lights; and
- Runway Guard Lights.



Figure 5–11 Indicative location of the required high intensity approach lighting

### Taxiway lighting

Taxiway lighting would comprise the following typical elements:

- RET indicator lights;
- Stop bars;
- Taxiway edge lights;
- Taxiway centreline lights; and
- Movement area guidance signs.

#### Meteorological equipment

Meteorological equipment would comprise the following typical elements:

- Runway visual range touchdown at each runway end;
- Runway visual range roll-out at each runway end;
- Runway visual range mid-point; and
- Illuminated wind direction indicator.

## 5.4.6 Security and safety

The proposed airport is expected to be designated as a 'Category 1' airport for the purposes of the *Aviation Transport Security Act 2004* and related Regulations. This designation dictates minimum security requirements for the proposed airport.

A perimeter security fence and pass controlled secure airside access points would be required to restrict public access to all airport operations areas and supporting facilities.

Inside the security fencing, a perimeter road would provide access to all perimeter support infrastructure, including all navigational aids, as well as detention basins and water quality structures. This roadway may also be used to monitor airport perimeter security and provide access for maintenance of the security fencing, perimeter lighting, and closed circuit television (CCTV).

Safety measures at the airport site would be put in place in accordance with all relevant laws including requirements in relation to:

- emergency safety response facilities and reserves;
- fuel and other toxic spill containment infrastructure;
- fire training area;
- runway end safety areas; and
- airside emergency safety assembly areas.

## 5.4.7 Aviation Rescue and Firefighting Services (ARFFS)

An ARFFS station would be required to service the Stage 1 (northern) runway. In the long term, a second ARFFS station may be required to service the second (southern) runway.

During Stage 1 development, the ARFFS station is expected to be located on the outboard side (to the west) of the northern runway and as close to the centre of the runway alignment as possible in order to optimise response time to each end of the runway. An indicative location for the ARFFS is shown in Figure 5–12.

The ARFFS station would include staff accommodation, administration and vehicle garaging facilities, fuel storage and delivery systems, fire-fighting foam storage and run-off control facilities, and a vehicle maintenance facility.

An ARFFS training area may be provided adjacent to the ARFFS station and is likely to be positioned in the vicinity of the ARFFS station, adjacent to the airport site boundary.



Figure 5–12 Indicative location of the ARFFS station and training facility

## 5.4.8 Aviation support

The proposed airport would require the provision of a range of fully serviced facilities to provide support to aviation activities. The type and scale of the support services required would change and develop over time in line with increased demand.

The Stage 1 development may include maintenance facilities for aircraft and ground vehicles and equipment, fuel services for aircraft and ground vehicles, freight and cargo handling and processing facilities, general and corporate aviation facilities, flight catering facilities and other support facilities such as storage areas, policing operations and waste disposal.

The indicative locations of the main functional elements providing aviation support are shown in Figure 5–13.



Figure 5–13 Indicative locations of the main aviation support facilities

#### Aircraft maintenance facilities

The Stage 1 development would include an aircraft maintenance precinct and associated aprons, taxiways and landside access. Facilities may include:

- general maintenance facilities including an engine run up area;
- hangars;
- provision for support activities;
- aircraft engine maintenance testing;
- compass calibration
- aircraft wash;
- staff car park; and
- fuel requirements for ground vehicles.

A major element of the aircraft maintenance facility is the aircraft engine run up area, where aircraft engines are run at full throttle to check whether they capable of producing take-off thrust. A dedicated bunded location would be provided to ensure that air blast from the engines does not damage other aircraft or structures, and to assist in the reduction of ground-based noise associated with airport operations.

## Fuel

Appropriate facilities for the handling of aircraft fuel and lubricants would be provided. These facilities would include fuel storage for aircraft (such as Jet A 1) and ground based vehicles (such as unleaded petrol and diesel with provision for electric vehicles and/or gas driven vehicles), in addition to fuel transfer and aircraft re/defueling.

The requirements for the storage and transfer of fuel are discussed in more detail in Section 5.6.8 of this chapter.

### Freight and cargo

The Stage 1 development is expected to include a secure freight precinct, to which aprons, taxiways and landside access would be provided in order to meet the expected capacity requirements for freight. As for all functional elements in Stage 1, they would be developed so as not to preclude future growth in the long term.

The Stage 1 development may include a cargo terminal complex and provision for support activities such storage facilities including for multi-level stacking racks, GSE and unit load devices, freight handling facilities and warehouses, bonded stores, associated offices for freight and government agencies, customer reception, truck docking, cargo staging, associated parking and airside and landside access roads.

#### General and corporate aviation

Depending on demand, the proposed airport may include facilitates for general aviation, corporate aviation and helicopters. Should such facilities be required in the future, they may be subject to separate environment and planning processes under the Airports Act.

## Flight catering

The Stage 1 development may include a flight catering facility, depending on demand. This would include appropriate airside and landside access for flight catering providers. Provision would also be made for supporting activities, such as a flight kitchen, bonded stores, cool rooms and stores, a truck manoeuvring area for loading docks within the complex, truck parking and a fuel facility for ground vehicles.

#### Other support facilities

Other support facilities that may be developed as part of Stage 1 include:

- Government agencies facilities such as those required for policing, border force requirements and quarantine;
- vehicle maintenance for ground service equipment;
- long term storage areas for various airlines;
- an aircraft waste disposal facility;
- a wastewater treatment plant; and
- a building and ground maintenance facility.

## 5.4.9 Airside roads

Airside roads would be provided for efficient movement of vehicles around the airport site between the terminal area and support facilities, without disruption to aircraft operations. These roads would be internal access roads and subject to security clearance and restricted access. A Ground Transport Plan would be prepared as part of the detailed design of the proposed airport.

### Perimeter road

A perimeter road would provide access to perimeter support infrastructure and navigational aids. This road would also be used to monitor the perimeter security and perform any maintenance of the security fencing, perimeter lighting, and CCTV system.

The perimeter road pavement (surface) would be designed to accommodate all expected vehicles, including specialised and emergency response vehicles. Parts of the perimeter road that would be used for emergency response vehicles would be sealed with two-lanes. Parts that would be remote from airside activities, and used for maintenance and inspection of support facilities only may be an unsealed all-weather road.

### Internal road layout

Airside roadways would be provided to ensure efficient movement of required vehicles without disruption to aircraft operations between the terminal area and support facilities.

Where not part of the apron areas, the airside roadways would generally be sealed, have two trafficable lanes and have a design speed of 60 kilometres per hour.

## Airside access to airport support facilities

Airside secure access is likely to be provided via Anton Road, the connecting road to the realigned The Northern Road and possibly from internal public roads as required.

#### Emergency access points

An Emergency Access Plan addressing infrastructure required for all Emergency Services would be prepared in consultation with ARFFS.

## 5.5 Landside precinct

The landside precinct includes areas that are open to general public access such as parking lots, access roads and kerbside drop-off areas, bus stations and train stations. Those parts of the terminal buildings and cargo handling facilities not subject to security and screening, such as check-in and baggage drop-off and freight delivery docks, also form part of the landside precinct.

## 5.5.1 Terminal

An integrated terminal precinct, serving both international and domestic passengers and located in the midfield area between the Stage 1 development northern runway and the potential long-term southern runway, is considered the most effective design solution for the layout of the airport site. In the long term, a midfield terminal would most appropriately utilise the available space and facilitate the best integration of landside, terminal and airfield operational requirements.

An integrated terminal would provide the greatest flexibility and allow the terminal precinct to evolve to meet changing passenger demand over time. In an integrated terminal precinct, performance criteria for the common use elements such as check-in, security and baggage claim facilities would be developed to meet the overall busy hour demand, rather than individual domestic and international busy hour demands.

The Stage 1 development terminal would be designed for incremental expansion to meet the expected long-term demand and cost effectiveness, without significant disruption to operations and applying the same level of service and performance standards as Stage 1 development.

The terminal precinct would be the primary public focus of the proposed airport, serving arriving and departing international and domestic passengers. It would incorporate features to optimise the functional and aesthetic appeal of modern substantial airport operation, while being efficient and cost effective for passengers, airlines, government agencies and related aviation service providers.

All elements of the terminal design would be developed by the ALC in accordance with the requirements of relevant laws, including the Airports (Building Control) Regulations and the *Aviation Transport Security Act 2004* and Regulations; CASA MOS; ICAO Standards and IATA guidelines; instruments governing the provision of disabled access; provisions for heritage and other memorial areas; and industry benchmarks for support and retail areas.

## 5.5.2 Terminal building

## Service requirements

The Stage 1 development terminal would include:

- facilities for departing passengers (check-in and departure concourse) and for arriving passengers (baggage claim and arrivals concourse areas);
- outbound and inbound inspection services (passport control, security screening, and immigration/emigration, quarantine and custom checks);
- passenger facilitation areas such as departure and gate lounges/areas; and
- areas for the provision of food, beverage and retail for passengers, visitors and staff.

## General Design Considerations – Built Form

Western Sydney Airport would be a key gateway for people arriving from other national and international destinations and a gateway to Western Sydney and therefore must present a positive image for the city, state and nation.

The airport site would achieve a cohesive identity through built form integration, both within the site and also within the surrounding environment. The design would consider:

- specific factors relating to climate and geography;
- the urban or local planning context, in particular limitations and constraints;
- the size of individual developments so that structures do not dominate the landscape unless important to the overall design (e.g. airport terminals and control towers);
- morphology and elevation;
- design for cultural expression;
- access to natural light;
- transport corridors, including active transport considerations, supporting efficient movement within and between the airport site and its surrounding environment;
- universal access for the public including disability access standards;
- external spaces, circulation and services;
- any particular requirements to address evidence based design;
- specific design requirements for efficient movement of passengers and operations of the facility;
- human scale environments and inviting building frontages;
- clear wayfinding with recognisable entrances, directions of movement and definition between arrivals and departures;
- safety and security considerations;
- visual and acoustic separation of the public and operational zones of the facility;
- expansion and future proofing requirements;
- lifespan and life cycles of materials;
- operational, maintenance and environmental services efficiency;
- design for cultural expression;
- the incorporation of Aboriginal and European heritage features;
- integrated design approach through landscaping and public art;
- the anticipated growth and ongoing maintenance in a manner that minimises impacts on operational efficiency and passenger convenience; and
- applicable elements of environmentally sustainable design including consideration of climate and water sensitive principles in design and in selection of materials and colour.

#### Location

The Stage 1 terminal would be constructed in the northern portion of the airport site, within the Terminal and Support Services Zone in the Land Use Plan (see Chapter 4). The terminal would provide direct access to the Stage 1 northern runway and its associated taxiway system.

Ground transport access to the terminal may be provided from the north of the site with a high capacity connection to the future M12 Motorway, to be located north of Elizabeth Drive. An indicative location for the terminal precinct is shown in Figure 5–14.



Figure 5–14 Location of the terminal precinct

#### Size

The size of the Stage 1 terminal would be determined in the detailed design process based on capacity requirements, but is expected to be in the order of 74,000 to 90,000 square metres of floor area.

#### Terminal – public areas

The terminal will include a range of public areas that would be developed as demand dictates. The main passenger and baggage sub-components would include the following key elements:

### Check-in and bag drop off

Passengers and their checked luggage would be processed using a combination of self-service and staffed counters for check-in and baggage drop-off.

Check-in facilities may include common use and airline-specific branding. The specific layout would be developed as part of the design process informed by demand, technology advancements and general market trends.

A baggage system with screening and sorting capabilities would be provided to facilitate efficient and secure processing of all baggage in accordance with Commonwealth security requirements and taking into account IATA guidelines regarding functionality, throughput and hardware requirements.

#### Immigration and emigration, customs and quarantine

Inbound and outbound border control processing facilities would be provided to satisfy the relevant demand and level of service standard. Adequate flexibility would be provided in Stage 1 to accommodate changes in policy, threat levels and legislation, and to integrate current and future screening technologies.

Passengers would be processed using a combination of automated processes and staffed positions.

The terminal design would take into account IATA recommendations for queuing and circulation within these passenger processing facilities.

Office facilities and amenity areas for government and border agencies, including detention areas would be provided.

#### Security processing

Passengers and their carry-on baggage would be screened before entering the boarding gate area of the terminal. The facilities provided in the Stage 1 terminal would provide sufficient flexibility to accommodate changes in screening requirements and protocols, and would provide for future growth in line with increasing demand.

Additional screening points may be located in aircraft boarding lounges. Separate screening facilities may also be provided for processing of airport workers, goods and other items.

#### Baggage claim

Baggage claim facilities, presentation areas for inbound baggage reconciliation and delivery gates, and associated circulation belts would be provided. In addition, inbound baggage offload belts would be provided with convenient access for tugs and carts.

#### Departure gates and aircraft boarding areas

The layout of contact and remote aircraft parking positions would be provided to meet the forecast aircraft fleet mix, taking account of aircraft types, schedules, and gate occupancy and turn-around times.

Flexible aircraft parking positions would accommodate a variety of aircraft types and sizes, including domestic and international traffic, thus optimising the overall gate utilisation.

When gates are used for international arrivals, segregation would be provided to direct arriving passengers to immigration and customs facilities.

#### Retail and food and beverage offering

The retail and terminal operations would be integrated to provide a high quality airport customer experience, and would be designed into the overall operation of the passenger terminal.

A range of food and beverage outlets and retail shops and services would be provided to meet the needs of customers, which are expected to be similar to those available at other comparable

Australian airports. The necessary storage, back-up facilities, goods delivery access, logistics, and security screening for these activities would be built into the overall airport and terminal design.

#### Other terminal provisions

The proposed airport would be designed to meet the growing demand from passengers and other stakeholders for a high level of automation, more convenience, more self-service and the use of technology for a more efficient airport experience. Consistent with other comparable Australian airports, the terminal may include other operational and commercial facilities.

## 5.6 Utilities

The Stage 1 development would include the reticulation of utilities including power, water, gas and telecommunications from external suppliers consistent with 24 hour operations, which anticipates the longer term needs for the proposed airport. The connections would have sufficient capacity for Stage 1 operations and would be capable of expansion as demand grows, without significant disruption to operations.

Co-ordination with utilities providers would be required during detailed design to determine supply points. All agencies and stakeholders associated with the proposed airport would be consulted in relation to their service requirements.

## 5.6.1 Services supply

Services would be connected to the site boundary by the relevant utility provider. Offsite works associated with connecting the services to the boundary would be the subject of separate approval processes initiated by the relevant utility provider.

## 5.6.2 Corridor identification and preservation (onsite and offsite)

Services entering the site would, where possible, be appropriately integrated and co-located within the access transport reserves and using common trenching. Supply corridors would be located within the airport site, and could be accessed with minimal disruption to the airport operations.

The utilities would where practicable, be designed to allow for future expansion to provide adequate supply to meet the demands of the long term development.

## 5.6.3 Relocation and removal of existing utilities

The Stage 1 development will include the decommissioning and removal of a range of existing utilities. Where off-site services, such as those provided to surrounding residents and businesses, rely on existing onsite infrastructure that is inconsistent with the proposed airport's development, the affected infrastructure will be relocated by, or in consultation with, the relevant utility provider in accordance with that provider's established processes.

Specific requirements to ensure surrounding services to existing customers are maintained, including the need for any infrastructure relocation services, will determined as part of the detailed design process.

#### Water

There is existing Sydney Water infrastructure along The Northern Road, which connects to a private easement that runs through the site to properties on Mersey Road. Properties on Badgerys Creek Road are serviced by a water main from Elizabeth Drive. Existing customers on the southern side of the airport site are also serviced through connections that cross the airport site.

Water main extensions and augmentations would be required in order to maintain service delivery to these customers, and the process for removal and relocation of existing assets would be discussed with Sydney Water.

#### Electricity

Elizabeth Drive contains a 33 kV sub transmission feeder as well as an 11 kV feeder that forms part of the Endeavour Energy network in the area. These feeders are currently overhead and due to their proximity to the end of the northern runway would need to be relocated or moved underground.

Endeavour Energy has advised that some of 11 kV lines traversing the site provide important cross feeder/zone connections in the network and as such would need to be relocated.

The 11 kV feeder along the existing The Northern Road is expected to be relocated into a realigned The Northern Road.

The 11 kV feeder in Badgerys Creek Road would need to be re-routed to the east of Badgerys Creek. This may require an easement to be established through private property if suitable road routes cannot be found.

An existing TransGrid 330 kV above ground transmission line currently runs across the south-west area of the airport site. The Stage 1 development may include the construction works required to relocate all or part of the TransGrid 330 kV transmission line crossing the airport site so that the transmission line is underground within the construction impact zone (see Chapter 6, for further information). Consultation would also occur with Airservices Australia to ensure the relocation of the 330 kV line does not have impact on operations at the proposed airport.

#### **Telecommunications**

Telstra has an aerial cable along the existing alignment of The Northern Road, which would need to be relocated off the airport site. A replacement cable is expected to be installed as part of the installation of utilities associated with The Northern Road realignment.

Consultation would need to occur with Telstra regarding the possible removal of the optic fibre conduit and aerial cables along Badgerys Creek Road, which connects the Elizabeth Drive optic fibre conduit to the Bringelly Exchange.

Depending on road realignments and closures and the impacts these have on existing telecommunications infrastructure, works may need to be undertaken to move existing customers to the north of Elizabeth Drive and east of Badgerys Creek from the Bringelly Exchange to the Luddenham Exchange. This is dependent on the closure of Badgerys Creek Road, in part or in full, and whether an alternative connection route to the Bringelly Exchange is established. In the event that the Badgerys Creek Road optic fibre conduit is removed in full, a new conduit would need to be run from the Luddenham Exchange along Elizabeth Drive. If closure of Badgerys Creek Road is limited to the northern portion only a connection to the existing Elizabeth Drive to Badgerys Creek Road is

## 5.6.4 Water

#### Potable water requirements

Initial consultation with Sydney Water has indicated that the nearby water reticulation system has capacity to meet the Stage 1 potable water requirements of an estimated 1.6 mega litres per day. The primary connection point will be located at the boundary of the airport site at Elizabeth Drive. Other connection locations may be identified in consultation with utility providers.

### Non-potable and recycled water

The Stage 1 development may also include provision for the use of non-potable water for appropriate purposes.

The production of treated wastewater is expected to exceed demand for recycled water at the proposed airport. The Stage 1 development may be constructed to allow for surplus wastewater, once treated to acceptable standards, to be discharged through irrigation within the airport site, including through subsurface irrigation. The quantities of treated wastewater and, thereby, the volumes of recycled water available will be refined as part of the detailed design process.

A mechanism will be identified to allow for the recycled water to be re-used, disposed by irrigation or disposed by other means.

### Redundancy

It is expected that the detailed design would accommodate redundancy requirements, currently estimated at a minimum of two days of the maximum day demand for both potable and non-potable water. This would be stored on site.

## 5.6.5 Sewage and wastewater

#### System requirements

An estimated 2.7 mega litres of wastewater per day would be generated at peak operating capacity of Stage 1. This would be reticulated, treated and recycled (as grey water) or irrigated on site. An approximate surplus of 0.11 mega litres of generated sludge each day would be stored and removed by tanker.

The treatment process would be determined in detailed design but is expected to require an onsite wastewater treatment facility using a Membrane Biological Reactor. Effluent quality would be in accordance with ANZECC National Guidelines on Water Recycling. Redundancy requirements and reliability in the event of failure would also be addressed in the detailed design.

The processes, technologies, footprint and location of the sewage treatment plant, (if required), would be determined as part of the detailed design process. This would include odour management requirements, chemical handling processes and sludge disposal procedures.

It is expected that a trade waste contract may need to be established for offsite waste disposal including trade waste metering requirements.

### Aircraft waste disposal

Facilities for the management of aircraft waste will be provided, including any facilities required for quarantine waste collection and disposal for all international operations. A waste to energy facility for recovery of energy from quarantined waste may be constructed.

## 5.6.6 Electricity

#### System capacity requirements

The proposed airport would be a high voltage customer that would be responsible for electrical reticulation within the airport site from a boundary connection. The supply voltage would be 132kV.

Connection points to the local network and the location of high voltage substations will be consistent with the Land Use Plan and would be determined in consultation with electricity suppliers.

#### Redundancy and backup supply capacity requirements

N-1 reliability would be required for the power supply. 'N-1' means that the electricity system would continue to supply the loads connected to the system even if any one element were to fail. N-1 reliability would apply to the external connection, which would require the electricity network supply provider to use diverse routes and connect to zone substations that also have N-1 reliability to support the operations of the proposed airport.

#### Onsite delivery and distribution

The electrical connections would be at the boundary of the site, one at Elizabeth Drive and one from The Northern Road. Additional or alternative connection points may be established subject to the development of new local substations in the vicinity of the airport site

## 5.6.7 Gas

#### System requirements

The Stage 1 development is expected to require approximately 57,000 gigajoules of gas each year.

In consultation with gas supplier(s), gas supply based on anticipated demand will be determined. A distribution main reticulation with an expected pressure rating of 210 kilopascals will be designed to run through the airport site with connection points to meet the requirements of gas users.

#### Onsite delivery and distribution

The gas connection will be at the boundary of the airport site and is expected to occur via the 200 millimetre diameter steel secondary gas main located along Elizabeth Drive. At the connection point to the proposed airport, a pressure-reducing station is expected to be required to change the secondary mains pressure to 210 kilopascals for onsite reticulation.

All gas works would be designed and constructed in accordance with all relevant standards and codes and the gas supplier's network operation rules.

## 5.6.8 Aviation fuel

#### Fuel storage requirements and location

Stage 1 would include a fuel farm with fuel storage capacity equivalent to at least three days. It would be capable of incremental expansion to meet the anticipated long term development capacity of 82 million annual passengers.

The fuel farm for Stage 1 would be located near the northern boundary of the airport site. An underground fuel piping system would connect it to a network of hydrants to be located at aircraft stands and designated hydrants to refuel ground based trucks.

The fuel farm is expected to require four fuel tanks, each with a capacity of three mega litres, however this would be determined as part of detailed design. Each tank would be contained in a bunded area 65 square metres and 1.5 metres high. The location, configuration, design and construction of this area would be compliant with AS1940-2004 and other standards referenced therein and would include provisions for at least two and up to five B-Double tankers to be unloaded at any one time. An indicative location of the fuel farm is provided in Figure 5–15.

An access road approximately 20 metres wide would be required for maintenance and inspection (and any ongoing delivery of fuel by road tanker). This road would be located off Anton Road and a small office structure for security and administration would be located adjacent to the entry gate off Anton Road.



Figure 5–15 Indicative location of the fuel farm

## Fuel distribution (onsite)

Fuel would be distributed onsite via a purpose built underground pipeline grid which would distribute fuel to a network of airside hydrants to be located at aircraft stands. The pipeline grind within the fuel farm and servicing the proposed airport would provide for a bypass capability and ensure adequate redundancy is in place.

For aircraft unable to connect to a hydrant, there would be provision for ground-based refuelling trucks to be filled via a designated hydrant filling stand. The stand area, within the vicinity of the terminal, may include space for a tanker garaging and support activities.

## Fuel delivery (off-site)

Fuel delivery for Stage 1 would be initially supplied by road tanker and anticipated to be sourced from either the Clyde or Banksmeadow fuel terminals. Anton Road, via Adams Road, is anticipated to be the primary access point for deliveries of fuel by road tanker, and will be of a suitable standard to enable access by B-double vehicles. Any upgrade of these local roads would be subject to a separate planning and approval process. The specific route/s of travel will be determined in consultation with NSW Roads and Maritime Services and subject to relevant planning and approval processes.

As the proposed airport grows in response to demand beyond Stage 1, future delivery may be via a dedicated pipeline. A secure, landside delivery point immediately adjacent to the fuel tank farm would be provided. Any off-site pipeline would be subject to separate assessments, planning and approval processes. Transport for NSW is working on developing options for a fuel pipeline corridor.

## 5.6.9 Petrol and diesel

Small holdings of petrol and diesel would be maintained in the vicinity of the airport maintenance depot to service ground vehicles and aviation support activities.

## 5.6.10 Telecommunications

The Stage 1 development would include the provision of communications facilities within the airport site and necessary connections with off-site communications infrastructure. To ensure continuity of communications, two separate fibre optic cable connection points would be required to the airport site. These would be determined in consultation with the telecommunications providers but are expected to connect from Elizabeth Drive, with the second connection point likely to be in the realigned route of The Northern Road.

Within each major terminal building a communications room would be required. This would become the interface point for the airport's communication network.

## Airport operations

Communications requirements for airport operations would be determined during detailed design.

#### Passenger services

Communication services for passengers would be provided in consultation with telecommunications providers.

## Reliability

A high level of reliable telecommunications coverage would be required across the airport site.

## 5.6.11 Meteorology instrumentation

The proposed airport would require meteorological instrumentation which would be determined and designed in consultation with the Bureau of Meteorology and CASA to meet the requirements of the airport operator and other potential users, including airlines.

An automatic weather station and other meteorological equipment are expected to be required to provide relevant data to support aviation operations in accordance with international standards and recommended practices.

The automatic weather station would include a visibility sensor and ceilometer (for determining cloud base height) as well as sensors for rain, wind and temperature.

## 5.6.12 General waste disposal

Based on assumptions from other currently operating airports around the world, during Stage 1 operation the proposed airport is expected to generate up to about 11,210 tonnes of general waste per year.

There would be locations for onsite waste collection, with disposal to occur off-site. Landside waste collection would allow for sorting and separate disposal of recyclable, non-recyclable and hazardous materials.

Infrastructure required within the airport site to manage waste is expected to include:

- a location(s) for onsite waste collection that will allow for sorting and separate storage for offsite disposal of recyclable, non-recyclable and hazardous materials;
- distributed vacuum systems within the terminals and a process plant to separate the waste streams, capable of being scalable as the terminal grows;
- a waste management transfer depot for collection and dispatch off site to landfill or other disposal facilities;
- facilities for recycling; and
- facilities on or close to the airport site that could convert the waste stream to energy.

## 5.7 Stormwater

## 5.7.1 Stormwater management

The development of the proposed airport would create a large impervious area and appropriate management, treatment and storage of stormwater runoff would be required. In identifying the required infrastructure for managing stormwater runoff across the airport site, consideration has been given to the mitigation of ponding and standing water areas that could not only impact on the movement of aircraft and airport vehicles, but also attract birds to the area, increasing the risk of bird strikes.

The location and alignment of the stormwater infrastructure would be determined based on the requirements of the *Manual of Standards Part 139—Aerodromes*<sup>6</sup>.

## 5.7.2 Water quality

The design considerations for the management of surface water quality across the airport site need to mitigate any change to the quality of water being discharged from the site. In analysing the water quality treatment requirements, consideration was given to the required reduction of all pollutants specified in the Upper Parramatta River Catchment Trust (2004) *Water Sensitive Urban Design (WSUD) Technical Guidelines for Western Sydney* (total suspended solids of 80 per cent, total phosphorous of 45 per cent and total nitrogen of 45 per cent). Water quality is discussed further in Chapter 18 (Volume 2a).

## 5.7.3 Apron drainage

A pit and pipe stormwater system would provide drainage of the apron and aircraft parking areas and feed into a branch pipeline. The pit and pipe system would be sized to cater for the 10 year average recurrence interval (ARI) storm event. Overland flows in excess of the 10 year ARI storm event would be captured by the taxiway drainage.

The branch pipelines would discharge into trunk pipelines that run parallel to the taxiways and runways. These trunk lines would then convey flows beneath the runway and taxiway area and discharge at specific locations into a series of detention basins at the airport site boundary. The arrangement of the pipelines and discharge points would be developed to reflect the existing catchment areas and discharge locations where possible.

## 5.7.4 Runway and taxiway drainage

The predominant surface water management for the runway and taxiway areas would be provided through parallel grassed swales, which would also provide the initial treatment of runoff from the paved areas.

The swales would be sized according to the management of flows from the runway and taxiway areas under the 50 year ARI storm event and would discharge into pipelines then ultimately discharge into the detention basins.

<sup>&</sup>lt;sup>6</sup> Version 1.12: November 2014, Australian Government Civil Aviation Safety Authority

Overland flows from the apron area and taxiway closest to the terminal buildings would be designed to cater for the management of flows to prevent ponding on the taxiway or within 30 metres of the buildings, for up to the 50 year ARI storm event. The management of these flows would be achieved by providing slot drains at the low point between these features.

## 5.7.5 Detention basins

A series of nine bio-retention and flood detention basins would be provided around the periphery of the airport site. The detention ponds would provide treatment and detention of stormwater run-off prior to release into the receiving watercourses of Badgerys Creek, Cosgroves Creek, Oaky Creek and Duncans Creek. The basins have been sited to allow discharge points that are consistent with natural drainage lines and watercourses wherever possible to minimise potential impacts on existing hydrology and watercourse downstream of the airport site.

Grassed swales will be established to formalise the drainage network and convey stormwater runoff from the developed areas within the airport site to the detention basins. Low flows are diverted to a smaller forebay area within each basin to allow treatment of water within a bio-retention system. Higher flows will bypass the bio-retention system and be diverted into the larger flood detention basins. The basins are designed to provide sufficient storage to allow controlled release to the receiving waters in a way that mimics the natural flows as closely as possible over a range of storm magnitudes and durations. The detention basins would operate as dry basins in order to minimise bird attraction to the site and reduce the risk of bird strike.

The size of each detention basin and the minimum bio-retention area requirements are designed for each sub-catchment within the airport site and shown in Table 5–5. It is noted that the civil design for each of the bio-retention basins has additional buffer areas set aside, to enable a greater treatment area to be provided if required to increase the level of treatment. Basins 4 and 5 are proposed to be constructed as part of the long term development. The proposed locations of the detention basins are shown in Figure 5–16.

Detention pond	Basin use	<b>Bio-retention areas</b>	Flood detention volume
1	Bio-retention and flood detention	0.6 ha	125,000 ha
2	Bio-retention and flood detention	0.22 ha	39,000 ha
3	Bio-retention and flood detention	0.6 ha	100,000 ha
4	Not used in Stage 1 development	-	-
5	Not used in Stage 1 development	-	-
6	Bio-retention and flood detention	1.0 ha	101,000 ha
7	Bio-retention and flood detention	0.5 ha	117,000 ha
8	Bio-retention and flood detention	0.2 ha	59,000 ha
9	Bio-retention	0.15 ha	-

 Table 5–5
 Stage 1
 Detention basin volumes

Note: Basin 4 and Basin 5 would be integrated into the long term development.



Figure 5–16 Indicative location of the detention basins

## 5.7.6 Airside stormwater quality management

Stormwater quality of the airside surface water runoff would be managed through the following key elements:

- flame traps proposed on the aprons and aircraft parking areas to collect small and accidental spills;
- swales to manage and provide initial treatment and conveyance for stormwater runoff from the runway and taxiway areas. The bio-retention systems included in the downstream end of each of these swales and would provide secondary treatment prior to release to receiving waters;
- bio-retention basins to manage pollutants.

## 5.8 Ground transport

The proposed airport is located in the growing areas of Western Sydney. It is within the Western Sydney Priority Growth Area and close to the South West Priority Land Release Area to the southeast. This area is anticipated to grow significantly over the next 30 years and will place its own demands on the transport system.

The NSW Long Term Transport Masterplan, Western Sydney Infrastructure Plan and South West Rail Link Extension Corridor Preservation set the road and public transport network requirements for the region. In addition, the Australian and NSW governments are undertaking a Joint Scoping Study on the Rail Needs for Western Sydney, including the proposed airport. The Study will consider the best options for future rail links, including decisions about timing and rail service options, both directly to the airport site and within the Western Sydney region. The Scoping Study will also address the question of what would it take to have rail on the airport site by the time the airport is operational.

In the long term, the proposed airport is expected to generate approximately 82 million passenger movements per year, equivalent of 224,000 passengers per day entering and leaving the airport site.

## 5.8.1 Landside roads

Road access will provide for private cars, commercial traffic, buses, pedestrians and cyclist. The details of road access will be prepared during the detailed design process in consultation with NSW and local government authorities, and it is expected to address:

- road design speeds;
- security issues;
- traffic loads from the proposed airport and other developments on site;
- connections with off-site/external roads, including matching capacity, speeds and road geometry;
- modal share of traffic loads;
- forecast traffic flows, including public transport requirements;
- car parking;
- commercial and operational vehicles and storage;
- terminal interface;
- passenger pick-up and drop-off by private and commercial vehicles;
- pedestrian linkages between terminals and all transport drop-off and pick-up areas;
- pedestrian, cycle or road networks for workers moving around the airport site;
- use of dedicated busways;
- ability to continue to provide access to and from the airport site when key intersections are unavailable; and

 the ability to expand, with minimal disruption, to meet future airport and business development requirements.

## 5.8.2 External roads crossing the site

#### The Northern Road

The Northern Road is a state road under the care and control of NSW Roads and Maritime Services (Roads and Maritime). It currently transects the airport site. It would be realigned outside the airport site by Roads and Maritime before the start of the airport's construction. Concurrently, services in easements along The Northern Road alignment would also be relocated.

A connection to The Northern Road would be constructed at the south-western airport site boundary by Roads and Maritime as part of the construction of The Northern Road on its new alignment.

The offsite realignment is subject to a separate approval process conducted by Roads and Maritime.

#### Other existing internal roads

Existing internal roads on the airport site outside the Stage 1 construction impact zone, such as Badgerys Creek Road (the onsite portion), may remain in place for interim uses. This would be determined in consultation with the ALC and in accordance with the Land Use Plan.

Minor internal roads within the airport site are being closed when they are no longer required or may remain in place for interim uses permitted by the Land Use Plan.

#### Other external roads

Other roads that would be upgraded to meet the requirements of Stage 1 include:

- Adams Road, from Elizabeth Drive at least to Anton Road to meet the needs of support traffic for the proposed airport, including B-double tanker traffic; and
- Anton Road, from Adams Road to meet the need for secondary access to non-public airport facilities located along the northern site boundary, including B-double tanker traffic.

All road upgrades outside the airport site boundary would be subject to a separate approvals process.

#### 5.8.3 Landside roads

#### Public access

Road access would provide for private car, public transport, commercial traffic, pedestrians and cyclists. The primary public access road to the proposed airport would be from the future M12. Roads and Maritime would construct the M12 connection to the airport site boundary, subject to separate approval.

The design of the main public access road would take account of the M12 connecting road developed by Roads and Maritime. The current expectation is that this main public access road would include:

- a minimum design speed of 90 kilometres per hour and minimum posted speed of 80 kilometres per hour for the main carriageways, decreasing to safe speeds in the vicinity of the terminal forecourt and ground transportation centre (minimum design speed of 40 kilometres per hour);
- a minimum of two (and up to three) trafficable lanes plus bus lanes and shoulder in direction on the main carriageways;
- prioritisation of public transport; and
- provision for efficient and safe vehicle movement around the ground transport facilities within the terminal forecourt, including access to the commercial precinct, support areas and airport parking.

The main public access road would allow efficient and safe vehicle movement around the ground transport hub within the terminal forecourt, including access to the commercial precinct, support areas and airport parking.

Subject to revised traffic arrangements for the M12, secondary public access points from Elizabeth Drive may also be provided to improve traffic circulation to commercial areas on either side of the main entrance road.

Pedestrian and cycle access would be included in the terminal and ground transport precincts and parking areas, and pedestrian and cycle routes would likely be provided within the airport site including:

- pedestrian graded ramps between terminal levels for passengers arriving and departing with baggage; and
- safe undercover pedestrian access between parking, pick-up and drop-off areas and terminal facilities.

All ground transport connections would comply with the Disability Discrimination Act 1992.

#### Road layout

The road layout within the airport site would provide for the safe and efficient movement of traffic under all expected traffic conditions. The location of the road network would be generally as shown on the Land Use Plan and may include additional secondary roads. Existing local roads on the airport site that are outside the proposed Stage 1 construction impact zone are expected to remain open.

### Commercial access road (from The Northern Road realigned)

The design of the access road to and from the realigned The Northern Road to freight and maintenance precincts would take into account the connecting road to be constructed by Roads and Maritime. Current expectations are that this road would include a minimum of two trafficable lanes in each direction on the main carriageways, and have a minimum design speed of 80 kilometres per hour and minimum posted speed of 80 kilometres per hour for the main carriageways connected to The Northern Road, decreasing to safe speeds in the vicinity of these facilities.

#### Emergency access points

Emergency access would be available to both the airside and the landside precincts via the entry points which would include Badgerys Creek Road, Anton Road, The Northern Road connection, and any secondary access provided off Elizabeth Drive as well as via the primary M12 public entrance.

## 5.8.4 Rail access

For the proposed airport to reach its long term capacity, rail services would be required at the airport site at an appropriate point in its development. Stage 1 does not currently anticipate a rail service because the recently approved road network upgrades have been assessed as adequate to support anticipated airport demand for at least a decade after operations commence. The Australian Government recognises however that rail could provide a benefit not only to passengers and employees using the airport, but also to the broader Western Sydney Region. For this reason, the Australian and NSW governments are undertaking a Joint Scoping Study on the Rail Needs for Western Sydney, including the proposed airport. The Scoping Study will consider the best options for future rail links, including decisions about timing and rail service options, both directly to the airport site and within the Western Sydney region. The Scoping Study will also address the question of what would it take to have rail on the airport site by the time the airport is operational.

Planning for rail connections at the proposed airport is being undertaken in close consultation with Transport for NSW so that airport infrastructure considerations are aligned with Transport for NSW's planning for its rail network, including the proposed extension of the South West Rail Link. Access for rail across the proposed airport site and for one or more stations in the terminal precinct will be preserved. The rail line will be predominantly underground through the airport site to avoid critical infrastructure and will be consistent with the aviation layout and staging of the airport development while optimising ease of access for passengers. The rail alignment will preserve sufficient space for two independent rail services of two tracks each and with passenger access to the airport terminal and to a business park if required.

Subject to the findings of the Scoping Study, a final rail alignment will be determined in consultation with the NSW Government. Depending on the alignment and preferred timing to develop rail services, work may be required during the Stage 1 development to either commence construction or to future-proof the corridor. Any such work is expected to be subject to a separate approval process.

Figure 5–17 broadly indicates how rail could approach the airport site. A potential final rail alignment would be determined by governments following the Joint Scoping Study on Rail Needs for Western Sydney.



Figure 5–17 Indicative rail alignment options connecting to the airport site

## 5.8.5 Parking

Stage 1 would include dedicated car parking facilities for up to 12,500 vehicles to meet the expected demand and may include multi-storey or covered/uncovered surface-level facilities for:

- commercial parking for customer vehicles;
- employee and operational parking;
- commercial vehicle parking and storage;
- parking for rental cars; and
- emergency services vehicle parking.

The majority of passenger car parking for Stage 1 is expected to be surface level parking although some multi-level parking may be provided.

## 5.8.6 Terminal kerbside

The design for the terminal kerbside would be developed as part of detailed design. It is estimated that a kerbside of 180 to 250 metres would be likely for both departures and arrivals for Stage 1.

## 5.8.7 Ground transport facilities

Ground transport facilities would provide for connections to the terminal, including:

- set down and drop off zones;
- pick-up, including waiting zones;
- loading zones;
- commercial and operational vehicle parking and storage;
- buses;
- taxis;
- hire cars; and
- rental cars.

The road and pedestrian systems servicing the ground transport hub and terminal kerbside would also provide for safe and equitable vehicular and pedestrian access to and from these facilities.