BROKEN HILL AIRPORT

Airport Master Plan

Final Report: September 2023

Landrum and Brown

BROKEN HILL CITY COUNCIL

Adopted by Broken Hill City Council at its Ordinary Council Meeting held 29 November 2023
Minute Number 47381

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Version and Use Information:

Version Letter	Date	Author(s)	Approver	Comments
A	23/06/2023	JAL		Draft
B	24/08/2023	JAL	IG	Draft Final
C	18/09/2023	JAL	IG	Final Issue
D	9/11/2023	JAL	IG	Final Issue: Minor Revisions

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Glossary

List of Abbreviations and Acronyms

Term	Description
AC	Advisory Circular
ABF	Australian Border Force
ACN	Aircraft classification number
ADF	Australian Defence Force
AIP	Aeronautical Information Publication
AMS	Department of Home Affairs Aviation and Maritime Security Branch
ARP	Aerodrome reference point
ARR	Arrivals
ASDA	Accelerate Stop Distance Available
ATM	Air Traffic Movement
BHCC	Broken Hill City Council
BHQ	Broken Hill Airport IATA code
BN	Britten Norman
BOM	Bureau of Meteorology
CAAP	The Civil Aviation Advisory Publication
CAGR	Combined Annual Growth Rate
CAO	Civil Aviation Order
CAR	Civil Aviation Regulations 1988
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
CWY	Clearway
DEP	Departures
ERSA	En Route Supplement Australia
FAA	Federal Aviation Administration of the USA
FIFO	Fly In Fly Out
GA	General Aviation
GSE	Ground Support Equipment
ha	Hectares
BHQ	Broken Hill Airport
IATA	International Air Transportation Association
LDA	Landing Distance Available
m	Metres
MOS	Manual of Standards
MRO	Maintenance Repair and Overhaul
MTOW	Maximum Take Off Weight
NASF	National Airports Safeguarding Framework
NDB	Non-directional Radio Beacon
OLS	Obstacle Limitation Surface

Term	Description
OMGWS	Outer main gear wheel span
PANS-OPS	Procedures for Air Navigation Services - Aircraft Operations ICAO Doc 8168 Vol I and II
PAPI	Precision Approach Path Indicator
PAX	Passengers
PCN	Pavement Classification Number
QF	QANTAS (QantasLink)
RESA	Runway End Safety Area
RFDS	Royal Flying Doctor Service
RPA	Rules and Practices for Aerodromes
RTP	Regular Public Transport
Rwy	Runway
SWY	Stopway
TODA	Take-off Distance Available
TORA	Take-off Run Available
ZL	Regional Express (Rex)

1 Executive Summary

The Broken Hill Airport master plan review has been developed by Landrum and Brown in consultation with Broken Hill City Council and stakeholders.

The aim of the Airport Master Plan is to:

- Develop a long term strategic vision for the airport,
- Identify growth opportunities for both the aviation and non aviation sectors.
- Identify upgrades to infrastructure to facilitate growth and achieve regulatory compliance.

A major part of the airport master planning process has been to demonstrate how the airport can respond to a projected growth in the mining sector around Broken Hill. This has the potential to substantially change the operational dynamic at the airport. Increased mining activity in the region is likely to see an increase in charter and potentially Fly In Fly Out (FIFO) operations at the airport. Additional infrastructure would be required to serve this increased aviation activity.

A second aspect of the airport master plan has been to identify potential commercial land resources that exist on the airport site. Unlocking of these land resources could provide economic benefits to both the Council and the wider region.

1.1 Existing Infrastructure

The major existing infrastructure elements at Broken Hill Airport are:

- Two runways – one sealed and used for all types of current aircraft operations; one unsealed and only suitable for small aircraft and not available after heavy rain.
- Taxiways Alpha, Bravo and Charlie linking Runway 05/23 with the aircraft parking aprons.
- Aircraft parking aprons serving scheduled services (the RPT Apron), Royal Flying Doctor Service (RFDS) and general aviation (GA) operators.
- Passenger terminal. This has sufficient capacity for current passenger demand levels.
- Internal airport roads and car parking.
- RFDS facilities – hangar, medical centre, visitor centre. RFDS facilities are on freehold land and not controlled by Broken Hill City Council.
- GA sector facilities – hangars
- Aviation support facilities – fuel tanks, navigational aids, weather station.
- Council facilities – works depot, crematorium, animal shelter.

The major infrastructure issues that have been identified and need to be addressed are:

- Insufficient runway strength for larger jet aircraft. This limits potential aircraft types used by airlines and charter operators that may wish to use Broken Hill airport.
- Poor condition of Taxiways Bravo and Charlie as well as the RFDS and GA aprons.

- Insufficient aircraft parking capacity on the RPT Apron.
- Single taxiway – Taxiway Alpha – linking all aprons and Runway 05/23. This presents a risk to airport operations should there be an aircraft breakdown or pavement failure.
- Lack of terminal security screening – not currently required but continued growth may trigger a requirement for screening at short notice.
- Lack of public car parking capacity.

With the exception of the taxiways mentioned above, the overall condition of airport infrastructure is generally good and not a cause for concern provided good maintenance programs remain in place.

1.2 Forecasts and Future Requirements

Forecasts of aviation activity have been prepared as part of the master planning process. The forecasts have guided facilities requirements for future infrastructure and growth.

The mid range forecast is for Broken Hill Airport to grow from 65,000 annual passengers in 2019 to 110,500 annual passengers in 2042.

It is considered that aircraft size will increase from the current 38 – 51 seat range to approximately 74 seats during this time.

Forecasts have been developed for the charter and FIFO sector. These are being driven by the projected growth in the Broken Hill mining sector. These forecasts must be understood to be to some extent speculative as there is currently negligible traffic arising from this sector at the airport. Therefore, the forecasts have not had a base to build from.

When combined, the scheduled and charter sectors are forecast to require substantial additional facilities over the twenty year master plan period.

The forecasts and stakeholder consultation have been the major inputs to determining the future facilities requirements at the airport.

1.3 Airport Development Proposal

The aim of the airport development proposals is to provide additional infrastructure that responds to the growth demands on the airport as well as regulatory requirements.

Providing growth flexibility has been a key part of the airport planning process. Much of the airport growth is forecast to be generated by an expansion of the regional mining industry. Mining is a highly cyclical industry and it is possible that growth may not meet the forecasts but there is also the possibility that growth may exceed forecasts. The aim of the planning has been to facilitate growth on an incremental basis so additional capacity can be provided when required without overcapitalising should the growth not occur or be delayed.

The highlights of the airport development to 2042 are.

Runways

- Strengthening of Runway 05/23 to enable operations by larger Code C jets such as the B737 family, A319 to A321 family or A220 family and provision of larger aircraft turning pads at each runway end.

- Safeguarding for a 280 metre wide runway strip to Runway 05/23.
- Sealing of Runway 14/ 32 to allow for all weather operations.

Taxiways

- Provision of a full length parallel taxiway to Runway 05/23. It is envisaged that only part of this will be required during the 20 year master plan period.
- Additional taxiways to link the aircraft parking aprons with the runway system.
- Upgrades and refurbishment of existing taxiways. Major maintenance of Taxiway Bravo is likely to occur during the 2023 – 24 financial year.
- Additional taxiways will be provided to serve an enlarged aviation commercial zone.

Aircraft parking aprons

- NSW Government grants have been received by Council for the expansion of the RPT apron and refurbishment of the RFDS apron. These works are likely to occur during the 2023 – 24 financial year.
- Further expansion of the RPT Apron for up to a total of nine aircraft has been planned for. It is envisaged that growth will occur incrementally to meet demand.
- Major expansion of the GA apron is planned to serve an enlarged aviation commercial zone. This will include a dedicated helicopter parking facility. The additional GA aprons will be provided to the east of the terminal precinct.
- Proposed expansion of the RFDS apron to meet additional RFDS demand. The RFDS have indicate a desire for additional apron space in the future.

Passenger terminal

- Expansion and upgrade of the existing passenger terminal. Security screening passengers and baggage will be the major driver as well as additional mining traffic demand.

Internal airport roads and car parking.

- A new roundabout at the airport entrance to direct traffic in three directions – terminal, RFDS precinct and new commercial development zone.
- Additional roads to serve the commercial development zone to the east of the airport.
- A new road to link the RFDS area with the airport entry. Removing the need for RFDS visitors to pass the face of the terminal.
- Expansion of the existing terminal car park and rental car park.
- High level engineering plans have been developed outlining engineering requirements for road and car park development.

RFDS facilities

- Development of an RFDS precinct to the west of the passenger terminal. This will have separate road access.

- Scope for further development of RFDS facilities – hangar, medical centre and visitor centre. This will include additional car parking for RFDS visitors and staff.

Commercial Development Zone

- The master plan provides for the development of a commercial development zone in the north east sector of the airport.
- The commercial zone is envisaged to accommodate both aviation related business – with direct access to aircraft aprons – and non-aviation businesses.
- Approximately 10 hectares of commercial land has been identified for the non-aviation commercial zone.
- Depending on market demand there is flexibility on which land may be allocated to aviation or non aviation uses.
- High level engineering plans have been developed outlining engineering servicing requirements such as power, water and sewage for the commercial development areas.

Other Facilities

- Aviation support facilities – fuel tanks, navigational aids, weather station – are envisaged to remain largely unchanged.
- Council facilities – works depot, crematorium, animal shelter – will also be unchanged.

1.4 Implementation Plans

Staging plans have been developed for each five year period through to 2042. These show how the airport can be developed in an orderly manner. Enabling works and interrelationships between stages have also been identified.

The capital cost plans have been developed based on the requirements and the staging plans.

2 Introduction

2.1 Background

The Broken Hill Airport master plan review has been developed by Landrum and Brown in consultation with Broken Hill City Council and stakeholders.

The aim of the Airport Master Plan is to:

- Develop a long term strategic vision for the airport,
- Identify growth opportunities
- Identify upgrades to infrastructure to facilitate growth and achieve regulatory compliance.

The Broken Hill Airport is the gateway to Far Western New South Wales. The airport is located 503 nautical miles (932km) west of Sydney and 230 nautical miles (426km) north east of Adelaide.

Figure 1: Broken Hill RPT Services and Connections (2023)

The airport has several fixed-wing and rotary-wing operators as follows:

- Regular Public Transport (RPT) SAAB 340 services to and from Sydney, Adelaide, Dubbo and Mildura operated by Regional Express (Rex) and Bombardier Q300 services to Sydney operated by QantasLink. Rex services through Mildura provide connections to Melbourne.
- Royal Flying Doctor Services (RFDS) Emergency services and other transient emergency services when required.
- Charters mainly related to the mining industry.

The total airport area is approximately 344 hectares. The terrain around the airport provides few constraints for development of airport infrastructure, capacity and operations though development is limited by ease of access and ground conditions.

2.2 BHCC Objectives and Response

The Broken Hill Airport Master Plan that has been developed is a response to an expected increase in employment in the mining industry and a predicted population increase in the local area. The growth of the mining industry and its ongoing development will fuel increases in demand from industry and contribute to passenger growth.

The objectives of Broken Hill City Council in commissioning the preparation of a new Broken Hill Airport Master Plan are to: [1]

- Address the expected increase in passenger and freight transport required to support the expanding mining industry.
- Interrogate the airport upgrade costings adopted in the 2019 business case given the change in global affairs, supply chain and market prices.
- Identify potential industrial, business and commercial opportunities for the proposed subdivision/industrial precinct.
- Identify required upgrades to the airport terminal and security to meet regulatory requirements for increased passenger services.
- Support applications for State and Federal Government Funding to upgrade airport infrastructure to overcome current issues that include upgrades to aprons, taxiways and runways.
- Expand Broken Hill's industrial/commercial land footprint by sub-dividing the airport to meet the demands of the aero, space and freight industries.
- Ensure that the airport caters for growth and employment opportunities associated with a recent resurgence in mining activity and other large-scale investment projects.
- Cater for the use of larger jet aircraft typically used by major budget carriers to further develop regional tourism initiatives.

The Master Plan that has been developed is a response to those objectives. It is a document that provides a strategic plan:

- To provide airport facilities that will enhance economic growth and strengthen regional communities in the City of Broken Hill and the broader Far West region.
- To ensure that the airport achieves regulatory compliance.
- To unlock more potential for traffic growth at the airport – growth being key to development.
- That facilitates the continued presence of the Royal Flying Doctor Service base at Broken Hill Airport.
- That provides a framework for commercial development at the airport.
- Provides a framework for further detailed planning and engineering development at the airport.

The main areas of study have included:

- Development of a robust forecast that will provide a guide to future development.
- Facilities analysis and development to sustain future growth of the airport.
- Airport Development Options;
    - Balancing needs and growth demand for aviation facilities – both airside and landside.
    - Optimizing the use of existing airport land and infrastructure.
    - Identifying strategies for commercial land development.
    - Providing facilities for an enhanced RFDS operation.
    - Landside Access – providing for future access improvements to the airport.

[1] EOI22/4 – Expression of Interest to Develop a Master Plan for the Broken Hill Regional Airport, Broken Hill City Council, August 2022.

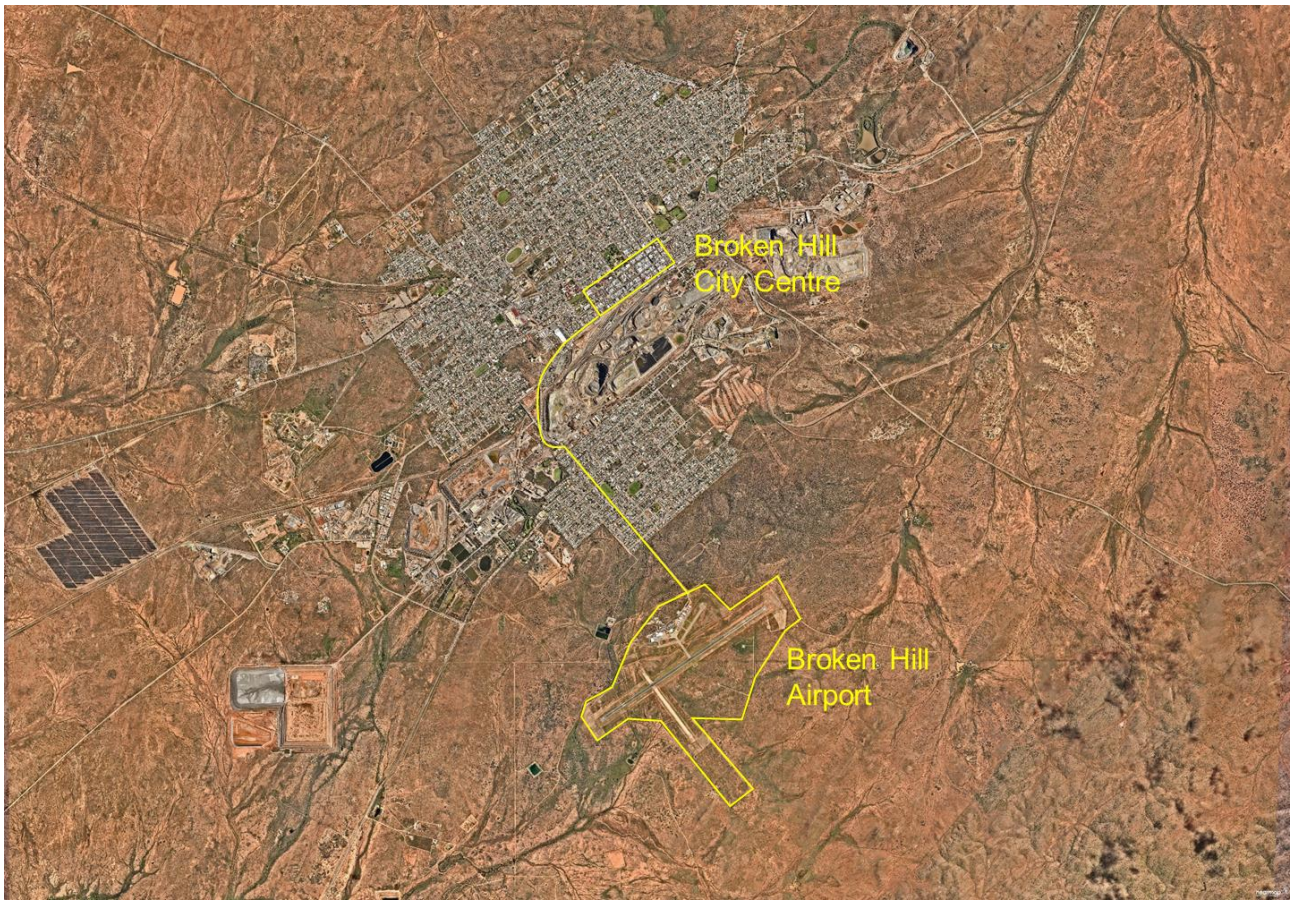
3 Existing Airport Infrastructure

3.1 Site Overview

Broken Hill Airport (BHQ) is located 6km south of the Broken Hill city centre and is accessed from the city by the Silver City Highway, Bonanza Street and Pro Hart Way.

The relative location of the airport is shown in Figure 2 below.

Figure 2: Broken Hill Airport Location Map[2]

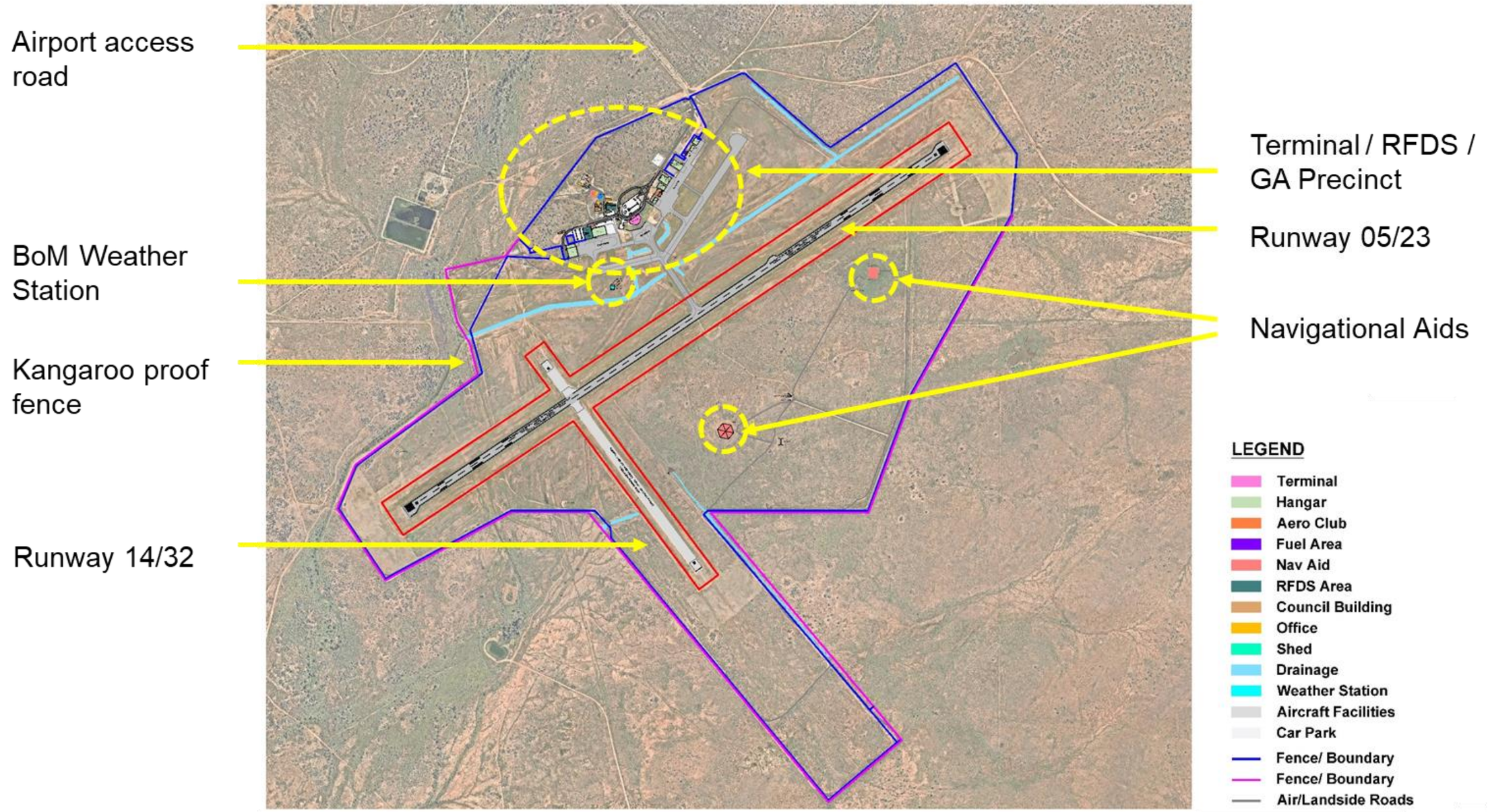


The terminal, aircraft parking aprons and hangars are located to the north of the airport and accessed from Airport Road. The airport has a total land area of 344 hectares. Areas of freehold land owned by the RFDS are included in this figure.

The overall existing site plan and terminal area plans are shown in Figure 3 and Figure 4 below. The site plans show the airport site boundary, major airfield infrastructure and runway strips, navigational aids, terminal and hangar buildings, and major stormwater drains.

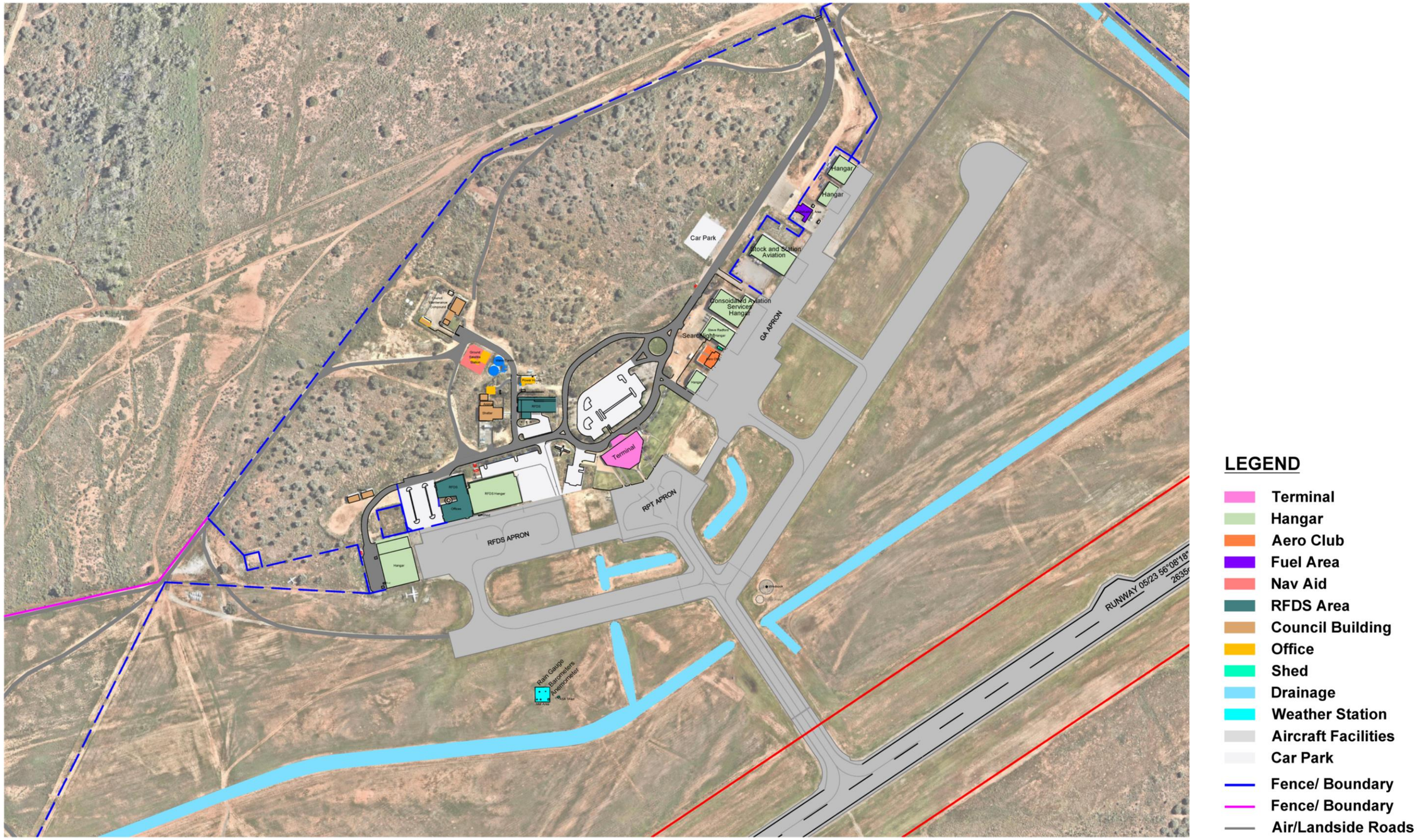
[2] Aerial Photo Base: Nearmap

Figure 3: Overall Broken Hill Airport Site Plan[3]



[3] Aerial Photo Base: Nearmap

Figure 4: Existing Terminal Area Plan[4]



[4] Aerial Photo Base: Nearmap

3.2 Site Analysis: Review of Existing Airfield Infrastructure

3.2.1 Runways

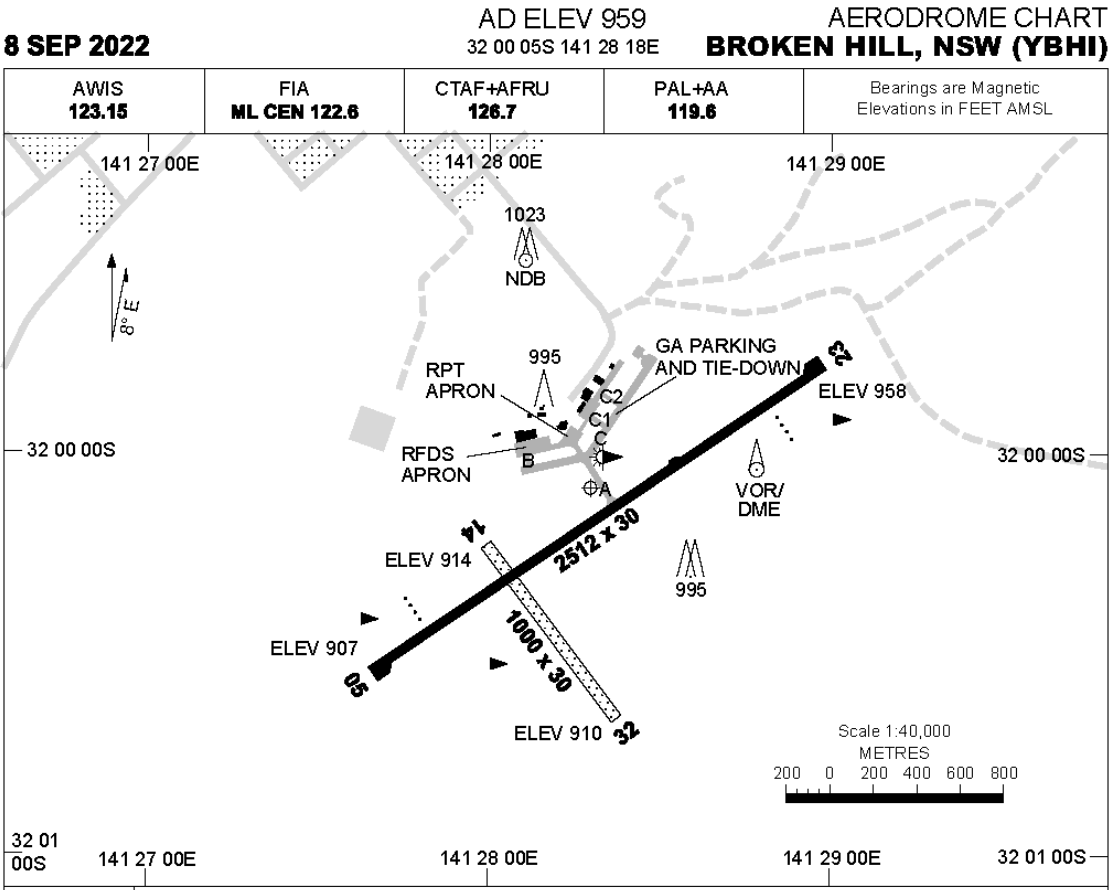
The key features of the airport runway infrastructure are:

- Runway 05/23 is the main runway for the airport. This is 2512m long, 30m wide, and has a 150 metre wide runway strip which is grandfathered to the previous regulations as it does not conform to the requirements of the 2020 Manual of Standards (MOS).[5] . Though Runway 05/23 has the length to be classified as a Code 4 runway (over 1,800 metres), it is classified as 3C as runway strength constrains aircraft types to runways usually classified as Code 3.
- Runway 05/23 has a designated PCN of 15[6]. The largest aircraft that uses the runway regularly (Bombardier Q300) has a PCN requirement of 8.
- Runway 05/23 is a non-precision approach runway.
- Scheduled operations can only use Runway 05/23.
- Runway 14/32 is the secondary runway for the airport. It is 1000m long, 30m wide and has a 90m runway strip. The runway is classified 2B on this basis. Runway 14/32 is unsealed on a limestone base and does not have a designated PCN.[7]. This limits take offs and landings to small aircraft of under 5,700kg MTOW (Maximum Take off Weight). As the runway is unsealed, it is unusable after heavy rain.
- Runway 14/ 32 is non instrument rated.
- There is no runway lighting on 14/32.
- There are no terrain issues affecting airport operations.
- There are no parallel taxiways on the airport. That, combined with a single taxiway access (Taxiway Alpha) to aircraft parking aprons means that all aircraft must occupy some or all of Runway 05/23 when taxiing prior to take off or after landing.

Major airfield features are shown in the Broken Hill Aerodrome Chart in Figure 5 below.

[5] Part 139 (Aerodromes) Manual of Standards 2019 (as amended), 13 August 2020.
[6] https://www.airservicesaustralia.com/aip/current/ersa/FAC_YBHI_23MAR2023.pdf
[7] https://www.airservicesaustralia.com/aip/current/ersa/FAC_YBHI_23MAR2023.pdf

Figure 5: BHQ Aerodrome Chart[8]



RWY	AERODROME LIGHTING
	TAXIWAY : BLUE EDGE ON TWY A, B, C AND C1 RL : PAL+AA 119.6 , SDBY , PTBL (EMERG ONLY, 90 MIN PN)
05 047 227 23	PAPI 3.0° 47FT LIRL PTBL PAPI 3.0° 47FT LIRL PTBL
14 134 314 32	PTBL PTBL

[8] https://www.airservicesaustralia.com/aip/current/dap/BHIAD01-172_15JUN2023.pdf

The major runway features – runway length and runway strips - are shown in Figure 6 below.

Figure 6: Major Existing Runway Features[9]

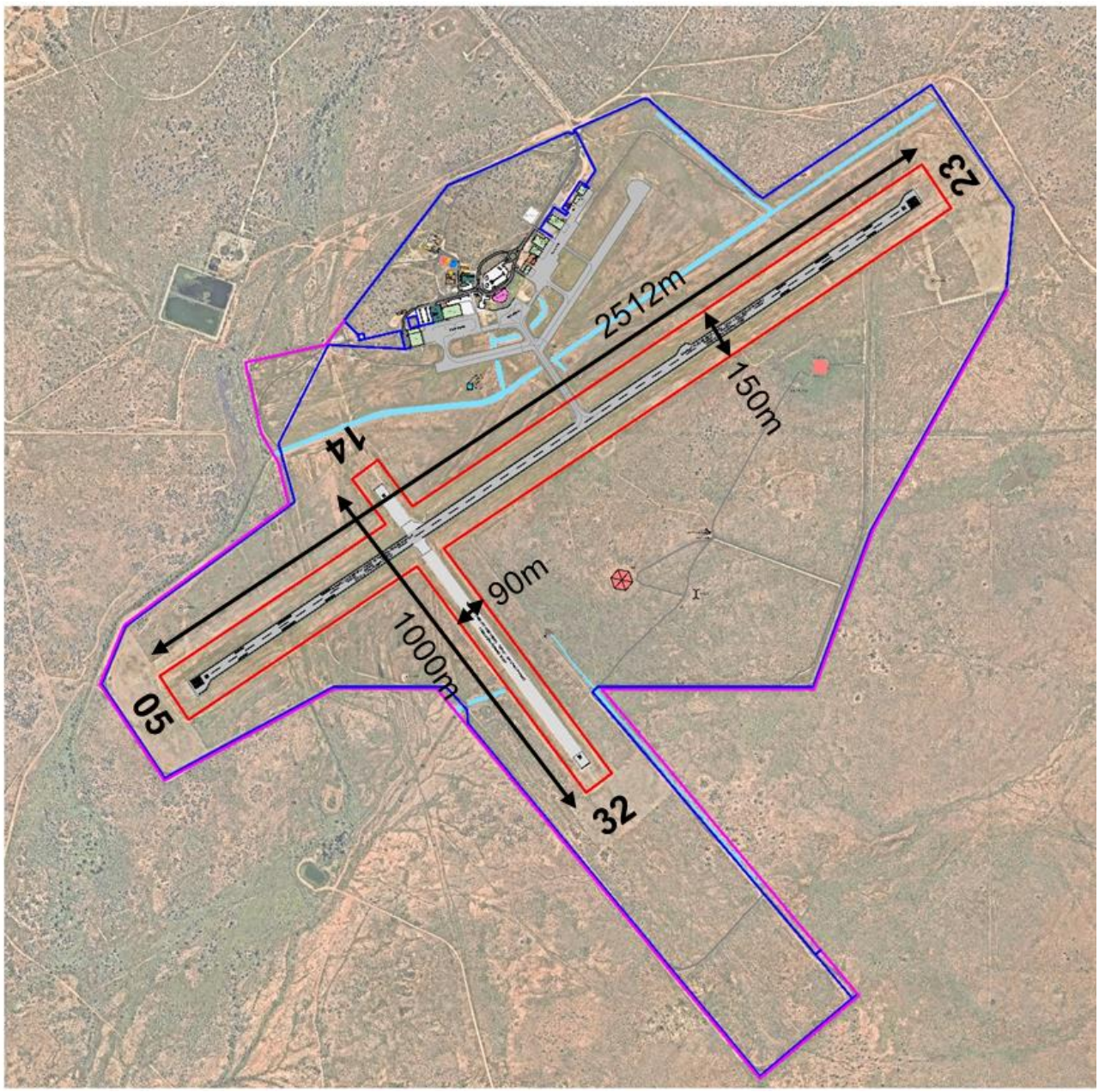


Table 1 below outlines the characteristics for aircraft currently serving Broken Hill Airport or may be used in future subject to an airport upgrade.

Table 1: Current or Potential BHQ Aircraft Characteristics

[9] Aerial Photo Base: Nearmap

Aircraft Type	AC Code	Seats	MTOW (tonnes)[A]	Runway Code	Runway PCN @ MTOW[B]	OMGWS (m)	Taxiway Width Requirement[C]
SAAB A340	B	30 – 36 (ZL)	13.15	3B	6	7.26	15
Bombardier Q300	C	50 (QF)	19.5	2C	8	8.56	15
Bombardier Q400	C	74 (QF)	30.5	3C	14	9.54	23[D]
ATR 42	C	42	18.6	2C	9	4.68	10.5
ATR 72	C	68	23.0	3C	11	4.66	10.5
Fokker F70	C	80 (QQ)	39.9	3C	14	5.04	10.5
Fokker F100	C	100 (QQ)	45.8	4C[E]	25	5.04	10.5
Embraer E190	C	94 – 112 (QQ)	51.8	3C	28	5.94	10.5
Boeing B717	C	110-125 (QF)	50.0	4C	31	4.9	10.5
Boeing B737-800	C	168 - 180	79.0	4C	44	5.7	10.5
Airbus A220-300	C	137	67.5	4C	36	6.7	15
Airbus A320-200	C	176	78.0	4C	41	7.6	15

Notes related to Table 1.

A. Existing RWY 05/23 is rated to 40 tonnes MTOW.
B. Existing RWY 05/23 PCN is 15
C. CASA MoS 139 (2020) – Table 6.37[10]
D. QANTAS have advised that they have a nationwide dispensation to use 15 metre wide taxiways subject to a risk analysis.
E. The airport and aircraft operator have some discretion on operation taking into account take off weight limitations, risk analysis and safety cases.

The table shows in red that larger Code C jets cannot be currently be accommodated at Broken Hill due to insufficient runway strength. There is sufficient runway length for these aircraft.

Strengthening of Runway 05/23 for these larger jets would see the runway reclassified to 4C due to the runway length. CASA MoS139[11] indicates that Runway 05/23 should have a runway width of 45 metres (rather than 30 metres as existing) if it was to be reclassified to 4C. However, the same section indicates that there is discretion on the part of airport and aircraft operator regarding runway width. The operation of Code 4C jets on 30 metre wide runways usually requires a safety case to be developed by airlines. Ballina, Kununurra and Ayers Rock are Australian airports where Code C jets such as B737 and A320 are operated from 30 metre wide runways. It is considered that on the basis of need and the precedents set out above that there is no need at this stage for Runway 05/23 to be widened from the current 30 metres. This would have to be confirmed by a safety case and agreement with CASA. Prior discussions with CASA are recommended.

A non precision approach Code 4 runway should have a 280 metre wide runway strip[12] . Currently, there is a 'grandfathered'[13] 150 metre runway strip in place. A change to the operational characteristics of the runway

[10] Part 139 (Aerodromes) Manual of Standards 2019 (as amended), 13 August 2020.
[11] Civil Aviation Safety Authority Part 139 (Aerodromes) Manual of Standards 2019 Table 6.02 (1)
[12] Civil Aviation Safety Authority Part 139 (Aerodromes) Manual of Standards 2019 Table 6.17 (4)
[13] Refer Appendix A for CASA 'Grandfathering' definition

would see a requirement for full current conformance.[14]. Runway End Safety Areas (RESA) would be required should there be a runway upgrade and the need for full conformance to current standards.

A future 280m runway strip should be considered and safeguarded for in any future planning and airport development.

The runway length of 2512m is considered to be longer than required for current and foreseeable future traffic. The added length does add to operational and maintenance costs but there is not benefit seen in shortening the runway especially in as there have been recent upgrades to the airport lighting system. There is no requirement for runway shoulders[15] due to runway width.

Runway 05/23 is considered to be in generally good condition though some crack sealing is required for maintenance reasons. The runway will need a structural re-sheeting to accommodate heavier aircraft up to B737 or A320.

Runway 14/32 is a gravel runway and in generally good condition. A sealed resurface has been considered so that it can be used in all weather conditions.

All airport ground lighting was replaced in 2021.[16]

Figure 7: Runway 05/23 Looking East

Figure 8: Runway 14/ 32 Looking South

[14] https://consultation.casa.gov.au/regulatory-program/part-139-acs-con-1/supporting_documents/Draft%20AC%20139.A03%20v1.0.PDF
[15] Civil Aviation Safety Authority Part 139 (Aerodromes) Manual of Standards 2019 Section 6.11
[16] Annual Technical Inspection Broken Hill Airport: Aerodrome Design Services, February 2022.

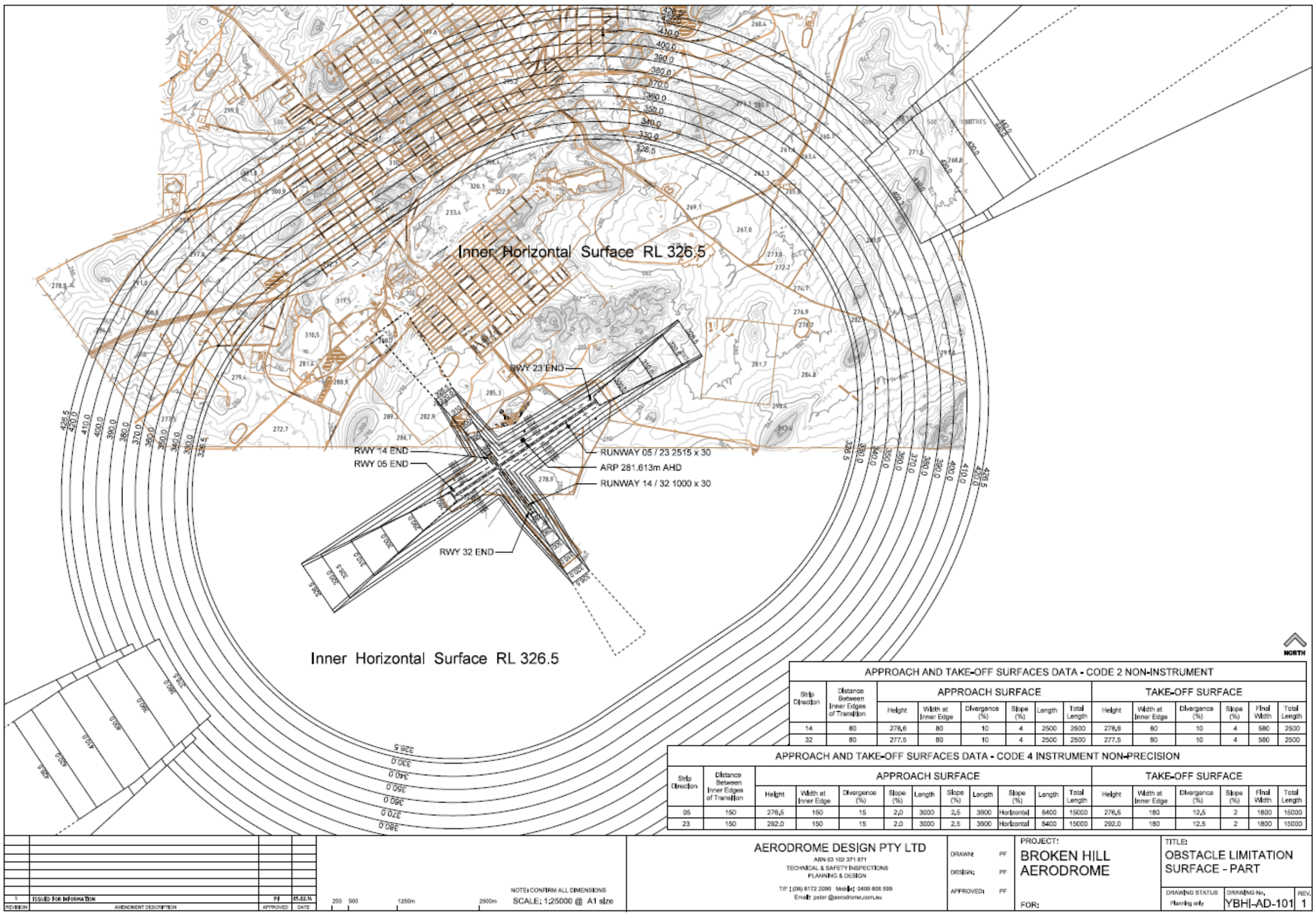
The current Obstacle Limitation Surface (OLS) diagram is shown in Figure 9[17].

Currently there appear to be no significant OLS issues.

Technical inspections reviewed have noted that regular tree maintenance at runway ends is required to prevent obstructions.

[17] Supplied by BHCC. Prepared by Aerodrome Design Pty Ltd.

Figure 9: Obstacle Limitation Surface – 150 metre Runway Strip



APPROACH AND TAKE-OFF SURFACES DATA - CODE 2 NON-INSTRUMENT

Strip Direction	Distance Between Inner Edges of Transition	APPROACH SURFACE						TAKE-OFF SURFACE					
		Height	Width at Inner Edge	Divergance (%)	Slope (%)	Length	Total Length	Height	Width at Inner Edge	Divergance (%)	Slope (%)	Final Width	Total Length
14	80	278.6	80	10	4	2500	2500	278.6	80	10	4	580	2500
32	80	277.5	80	10	4	2500	2500	277.5	80	10	4	580	2500

APPROACH AND TAKE-OFF SURFACES DATA - CODE 4 INSTRUMENT NON-PRECISION

Strip Direction	Distance Between Inner Edges of Transition	APPROACH SURFACE										TAKE-OFF SURFACE					
		Height	Width at Inner Edge	Divergance (%)	Slope (%)	Length	Slope (%)	Length	Slope (%)	Length	Total Length	Height	Width at Inner Edge	Divergance (%)	Slope (%)	Final Width	Total Length
05	150	276.5	150	15	2.0	3000	2.5	3900	Horizontal	8400	15000	276.5	180	12.5	2	1800	15000
23	150	282.0	150	15	2.0	3000	2.5	3900	Horizontal	8400	15000	282.0	180	12.5	2	1800	15000

REVISION	AMENDMENT DESCRIPTION	APPROVED	DATE
1	ISSUED FOR INFORMATION	PF	05.02.16

NOTE: CONFIRM ALL DIMENSIONS
250 500 1250m 2500m
SCALE: 1:25000 @ A1 size

AERODROME DESIGN PTY LTD
ABN 63 102 371 871
TECHNICAL & SAFETY INSPECTIONS
PLANNING & DESIGN
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Email: peter@aerodrome.com.au

DRAWN: PF
DESIGN: PF
APPROVED: PF

PROJECT: BROKEN HILL AERODROME
FOR:

TITLE: OBSTACLE LIMITATION SURFACE - PART
DRAWING STATUS: Planning only
DRAWING No.: YBHI-AD-101
REV.: 1

3.2.3 Taxiways

There are no parallel taxiways on the airport. The taxiways serve the terminal, RFDS and GA aprons. The taxiway locations and names are shown in Figure 10 below. All access from the runway is via Taxiway Alpha with Taxiway Bravo serving the RFDS apron and Taxiway Charlie serving the GA apron. Taxiways Bravo and Charlie are wider than required as they were the original airport runways. The taxiways are marked as 15 metres which is suitable for an aircraft with an OMGWS of up to 9 metres. Currently, the taxiways are only required to be 10.5 metres in width.

Figure 10: Taxiway Locations[18]

The single access from runway to aprons is a major area of operational concern raised by both Broken Hill Airport and airport user stakeholders. Taxiway Alpha is a major operational risk as it is a potential single point of failure should there be an aircraft breakdown or major maintenance is required.

The condition of the taxiway surfaces has been identified as a major issue going forward. Taxiways Bravo and Charlie are in poor condition and require replacement. This has been highlighted by the 2022 Annual Technical Inspection [19] and earlier. Up to 20,000 metres of crack sealing has been applied. A continual taxiway sealing and patching program has been required to prevent taxiway failure and damage to aircraft.

[18] Aerial Photo Base: Nearmap
[19] Annual Technical Inspection Broken Hill Airport: Aerodrome Design Services, February 2022.

Figure 11 and Figure 12 show the extent of patching that has been carried out to date. Larger potholes need to be filled with fast setting concrete as shown below.

It is apparent from the condition of Taxiway Bravo that replacement of the surface is needed as soon as possible. Funding has been received for these works and they are expected to take place in 2023.

Figure 11: Taxiway Bravo Aerial View[20]

Figure 12: Taxiway Charlie Aerial View[21]

Figure 13: Taxiway Bravo Potholes

[20] Aerial Photo Base: Nearmap
[21] Aerial Photo Base: Nearmap

3.2.5 Aircraft Parking Aprons

There are three distinct aircraft parking aprons on the airport:

- RPT Apron – two stands adjacent to the terminal where scheduled aircraft services are parked.
- RFDS Apron – three stands which serve RFDS operations.
- GA Apron – serving GA hangars north east of the terminal

These are shown in Figure 14 below.

Figure 14: Aircraft Parking Apron Locations[22]

The RPT Apron is accessed from the runway by Taxiway Alpha and has two stands power in power out stands. Bay 1A is allocated for aircraft up to Q300 size, Bay 2 for SAAB 340.

Advice received is that a Q400 aircraft can only be accommodated if there are no other aircraft on the apron. There are currently no markings for a Q400.

[22] Aerial Photo Base: Nearmap

Feedback received from airport stakeholders is that additional RPT apron space is required to provide additional capacity for itinerant charters, provide capacity expansion and for redundancy (aircraft breakdowns, etc.). A minimum of one additional stand is seen to be required.

BHCC has received NSW grant funding for an apron upgrade and expansion. This is expected to commence construction in 2023. This additional apron will provide two additional stands and allow aircraft up to B737 or A320 to be parked on the apron. The latter aircraft will not be able to be accommodated until runway and taxiway strengthening has also taken place.

The RPT apron is assessed as being in generally good condition.

Figure 15: RPT Apron October 2022

Figure 16: SAAB 340 parked on RPT Apron

The RFDS apron is located to the west of the RPT apron and accessed from Runway 05/23 by Taxiways Alpha and Bravo. The apron provides aircraft parking for RFDS operations and access to the RFDS maintenance hangar.

Three RFDS aircraft can be accommodated on the apron. The RFDS have indicated a preference for at least a fourth bay and additional apron space for aircraft storage.

Pavement inspections have noted that the apron is in poor condition with areas of apron failure. The general consensus is that the pavement requires complete replacement. Funding has been received for refurbishment works. This is proposed to be undertaken in conjunction with the RPT apron upgrade works described above.

Possible pavement expansion is constrained by proximity to the BoM weather station. The southern edge of the apron is at the edge of the 150m radius from the weather station anemometer.

Figure 17: RFDS Apron showing Weather Station offset[23]

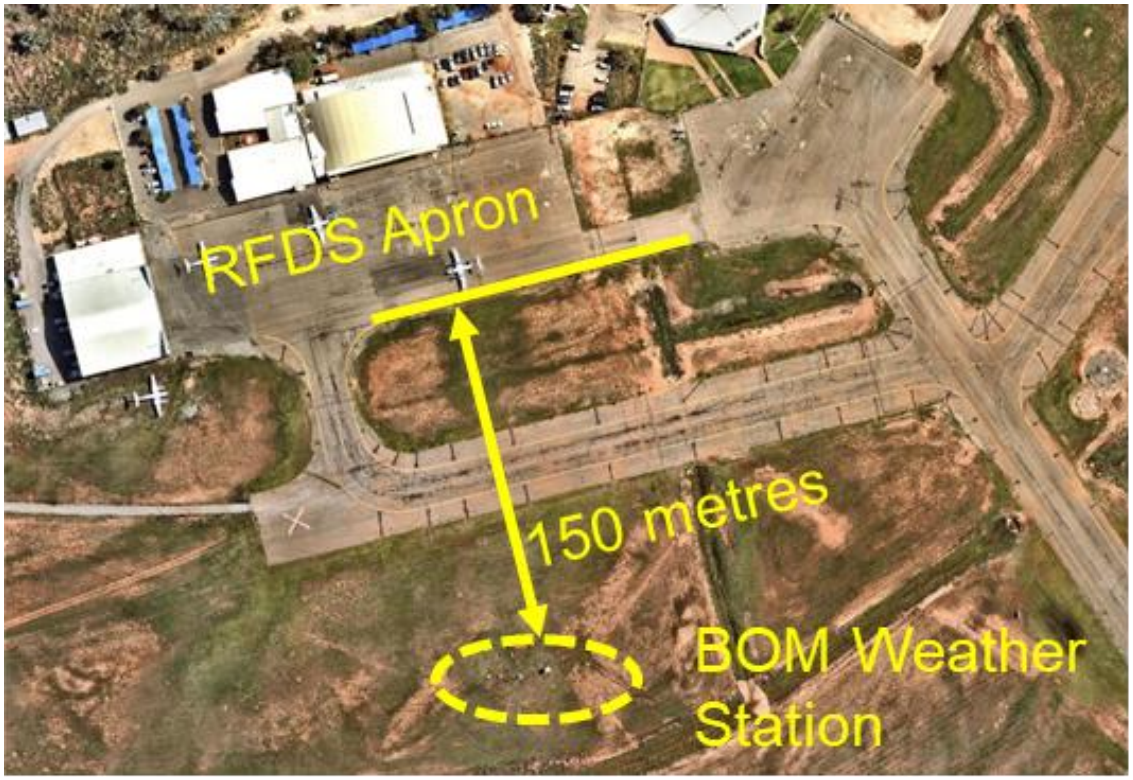


Figure 18: RFDS Apron showing patched pavement

[23] Aerial Photo Base: Nearmap

Figure 19: RFDS Apron

The General Aviation (GA) Apron is located to the north of the RPT Apron and is accessed from Runway 05/23 by Taxiways Alpha and Charlie.

The GA Apron provides access and aircraft parking to GA facilities at north end of airport including the Aero Club, privately leased hangars and the Uniting Church chaplain hangar.

The apron varies in width along its length. It is generally used for smaller aircraft (under 5700kg) only.

Airport Technical inspections have noted since at least 2018 that heavy maintenance is required especially near the Aero Club. There is a risk is that if maintenance is not undertaken in the near future then the pavement may fail.[24]

[24] Annual Technical Inspection Broken Hill Airport: Aerodrome Design Services, February 2022.

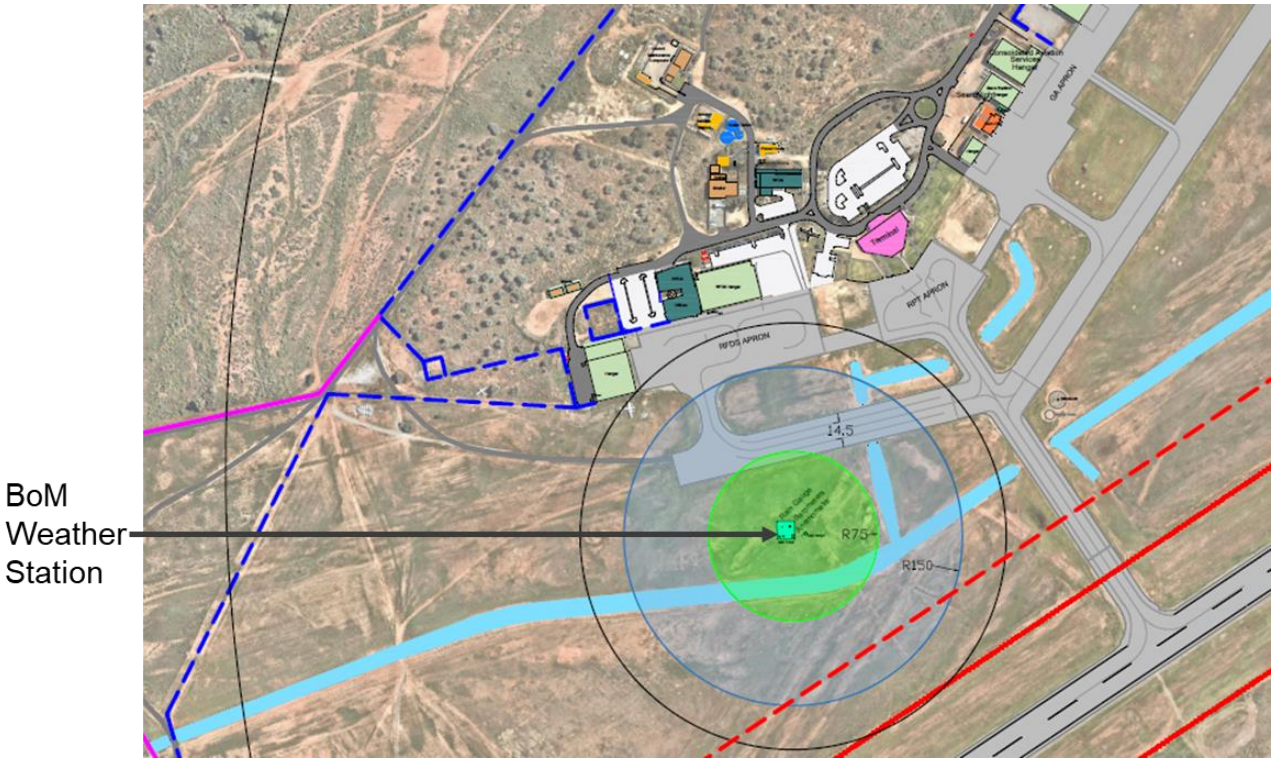
Figure 20: GA Apron showing area of failure risk

Figure 21: View of GA Apron looking north

3.2.6 Airport Weather Station

The Bureau of Meteorology (BoM) maintain a weather station on the airport. This consists of an Anemometer, Rain Gauge and Barometers. This is an essential safety and information gathering function. The location of the weather station is shown in Figure 22.

Figure 22: Location of BoM Weather Station[25]



The siting of the weather station siting is dictated by the requirements of BoM – MA8a Instrument Siting Requirements.[26]

Key siting issues is that the weather station is located clear of obstacles and is not affected by structures or aircraft operations.

The major siting issues are driven by the Anemometer location. The requirements of this are shown in Figure 22:

- Clearance to taxiways – 75 metre radius – currently this is 73m to the edge of the 15m wider taxiway but would comply if Taxiway Bravo was 10.5 metres wide rather than 15 metres wide as at present. A 10.5 metre wide taxiway is all that is required for the aircraft size used by the RFDS.
- Clearance to aprons – 150m radius. The RFDS apron is 150m from the Anemometer. As a result, it is not possible to extend this apron to the south.
- Clearance to runway – 120m radius. Both runways are well outside this radius.

It is considered that the location of the weather station does not impact ongoing airport development and should remain in its current location.

[25] Aerial Photo Base: Nearmap
[26] http://www.bom.gov.au/met-authority/docs/MA8a_Instrument_Siting_Requirements_v5.pdf

Figure 23: Airport Weather Station

3.2.7 Navigation Aids

Current Navigation Aids at the airport are:

- Non-Directional Beacon (NDB);
- VHF Omni - Directional Radio Range (VOR);
- Distance Measuring Equipment (DME);
- Remote Receiver.

The navigational aids are located in the South –East quadrant of the airport.

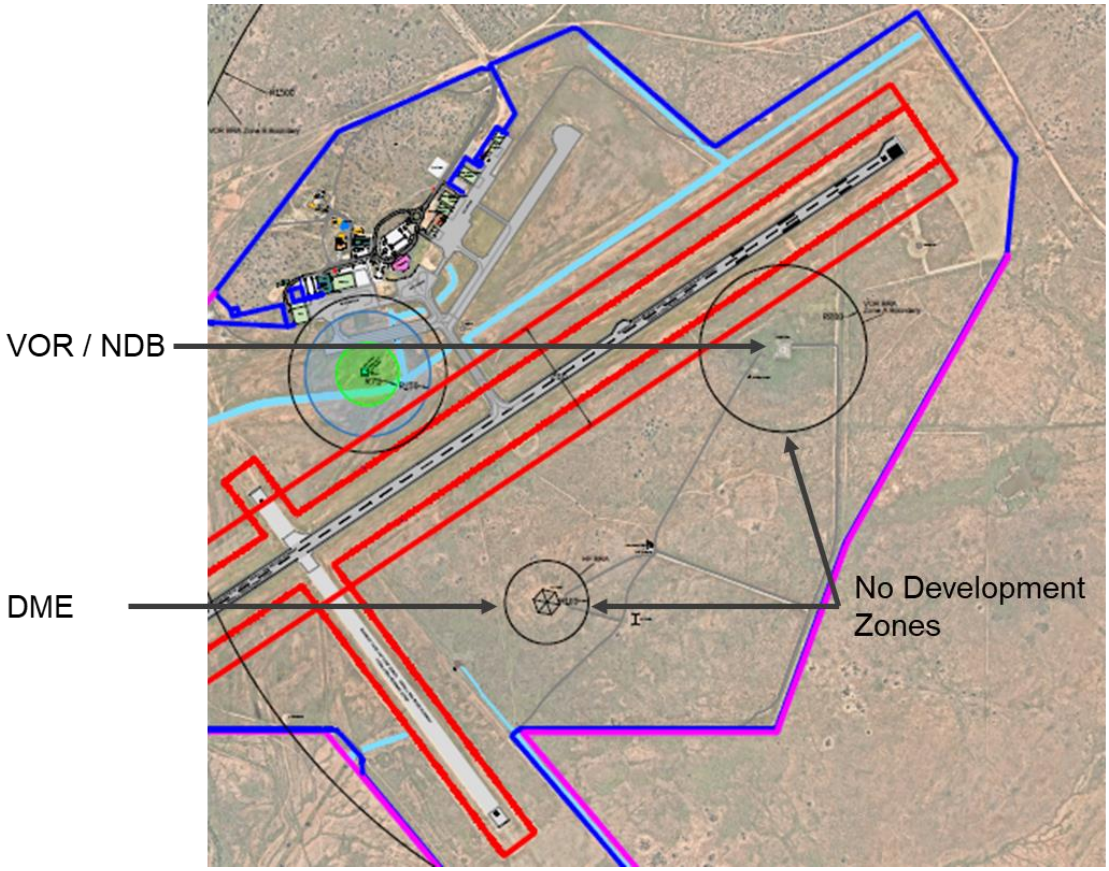
Potential airport developments such as a future requirement for a 280 metre runway strip to RWY 05/23 would not affect their current location.

Development of building and structures can be affected by the navigational aids locations. “No development” zones where no additional structures can be placed are shown in Figure 24 below. There are secondary zones beyond these radii that may affect building or structure heights (these have a sloped surface similar to an OLS). Potential building development in the Navaids zones would need to follow NASF Guideline G - Protecting Aviation Facilities - Communication, Navigation and Surveillance (CNS)[27] .

The DME can be seen beyond the weather station in Figure 23.

[27]https://www.infrastructure.gov.au/sites/default/files/migrated/aviation/environmental/airport_safeguarding/nasf/files/1.0_Guideline_G_CNS.pdf

Figure 24: Navigation Aids Location



3.2.8 Stormwater Drainage

There is an extensive system of open stormwater channels that largely drain to the west of the airport . These are located particularly to the north of Runway 05/23. Broken Hill generally has a dry climate but it is susceptible to intense rain periods. These stormwater channels perform an essential function but they do act as a planning constraint as any taxiway or apron development would require them to be piped and concrete culverts constructed.

Figure 25: Indicative stormwater channel location

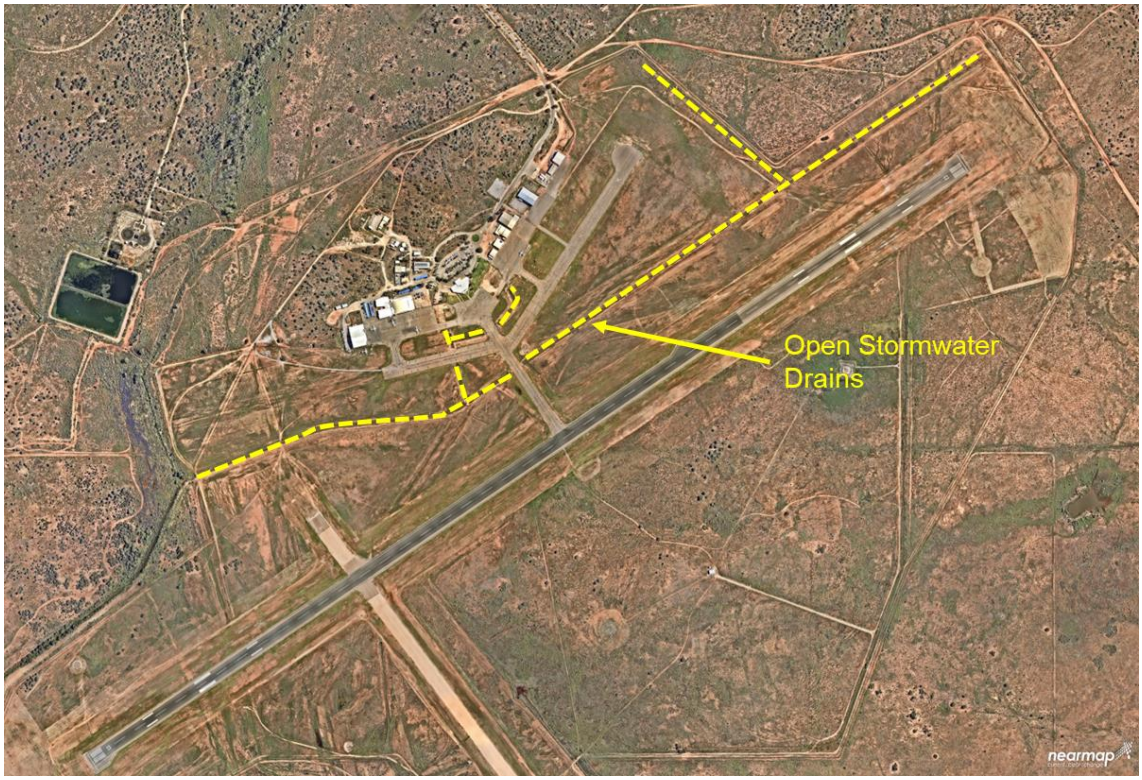


Figure 26: View of typical stormwater drain

3.3 Site Analysis: Review of Terminal and Support Facilities Infrastructure

The terminal, aprons and support facilities are located in the northern area of the airport site. These facilities are shown in Figure 27. The terminal precinct includes:

- Passenger terminal used for scheduled and some charter flights. This includes offices and facilities associated with terminal operations.
- Terminal car park also used by rental car operators.
- Aircraft parking apron used for scheduled and chartered fixed wing operations.
- RFDS medical centre, ground operations base (hangars), offices and Visitors centre. This includes associated car parking. With the exception of the aircraft parking apron and office building leased from Council, RFDS facilities are on freehold land purchased from Council.
- Hangars and facilities associated with ground based airport operators and the Aero Club.
- Support facilities such as fuel storage facilities.
- In the North East of the precinct are a range of Council owned facilities including airport operations base, animal shelter and crematorium. A Council owned office building is leased to the RFDS.

3.3.1 Terminal

The passenger terminal was opened in 1993. It is a masonry clad structure with a flat “colorbond” roof. The terminal is used for check in and baggage make up, passenger waiting , and holding area for flights. There are also toilets, a cafe selling food and beverage items, and a small back office for airline staff. The terminal area is approximately 1000m^2 The terminal is shown in Figure 28 below.

It is largely unchanged from construction and has been well maintained. It was observed to be in good condition.

The terminal has the following components:

- Check In: 3 counters (two for Rex, one for QANTAS)
- Office: Ground handler office, meeting room
- Baggage Makeup: 3 positions for tugs and carts
- Common seating: 51 seats – departures, 27 seats - arrivals
- Cafe: 34 seats
- Boarding gates: 2
- Baggage Claim: Cart drop off – space for two carts
- Car rentals: 4 counters – one not in use
- Toilets: Male / female

There is no security of either passengers or baggage – not required under current Aviation and Maritime Security (AMS) standards driven by aircraft size and traffic. Increases in traffic and introduction of larger aircraft such as the Q400 would require security screening for passengers and bags. There is an ongoing risk that AMS may require security screening at short notice. This would affect QF operations in particular.

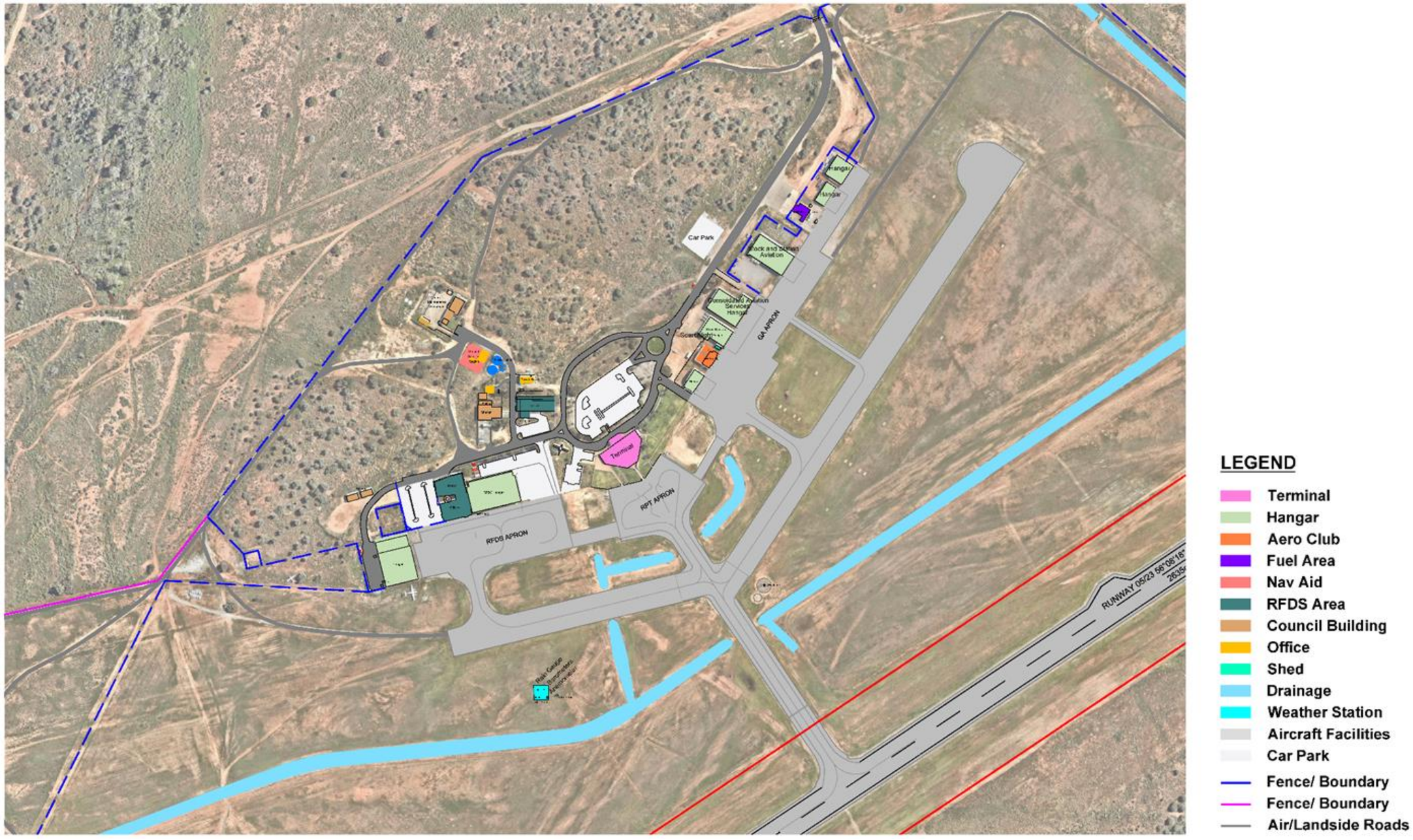
Current capacity is that two departures can be handled per hour – maximum 85 seats – 1 x SAAB 340 plus 1 x Q300.

Based on departures seating (including food and beverage seating) – terminal capacity is 92 passengers at IATA Level of Service (LoS) Optimum – use of arrivals seats in close proximity increases capacity. Level of

Service is the mid range which allows for some delays and crowding of the terminal at peak times. Farewellers and meeters/ greeters are additional to this figure. This level of service is considered to be acceptable and it was observed during the February 2023 site visit that there was no overcrowding even when there were significant departure delays.

Baggage collection is through baggage carts delivering bags to a portico at the side of the terminal. Passengers collect their own bags from the carts. The interaction of passengers and baggage carts is considered to be a low safety risk as passengers are kept separate from moving baggage carts.

Figure 27: Terminal, RFDS and GA Precincts – Existing Condition[28]



[28] Aerial Photo Base: Nearmap

Figure 28: Terminal Landside (North) Elevation

Figure 29: Terminal Airside (South) Elevation

Figure 30: Terminal Check In Area and Car Rental Counters

Figure 31: Terminal Seating and Café Area

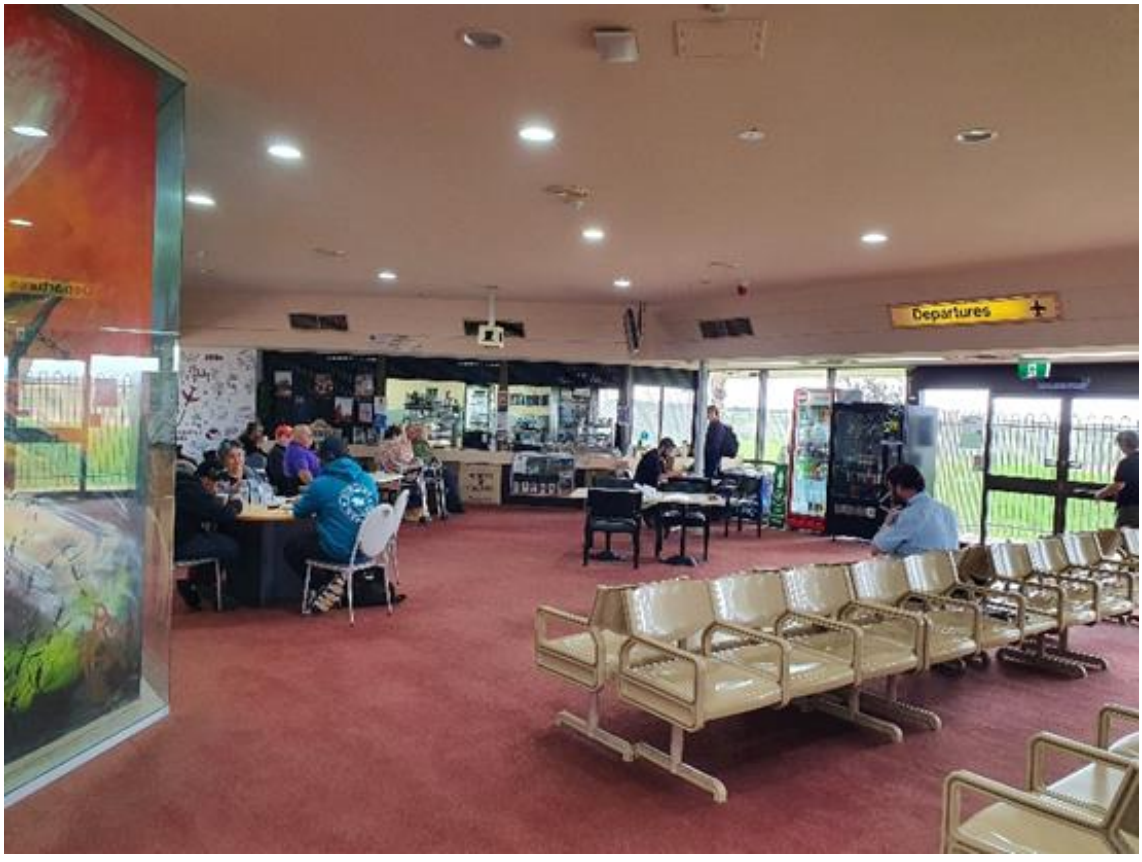


Figure 32: Back of House: Baggage Make Up

Figure 33: Back of House: Ground Handler Office

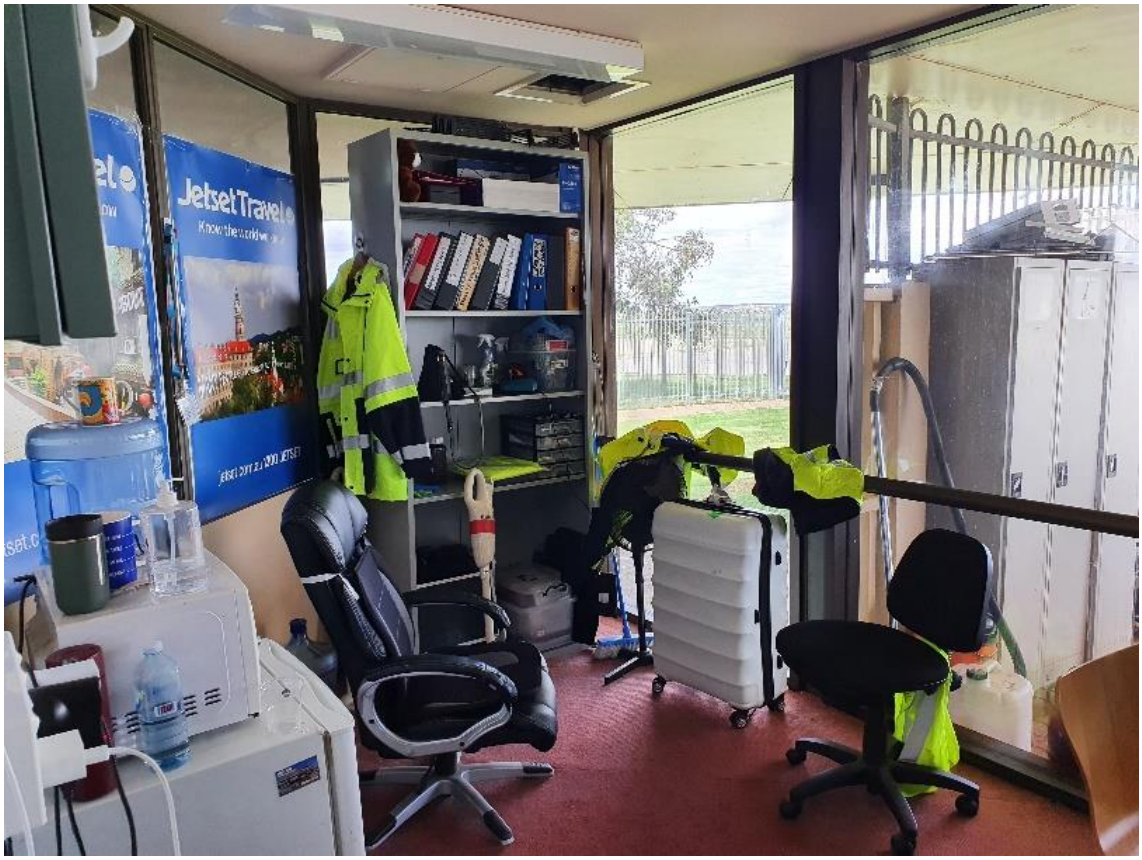


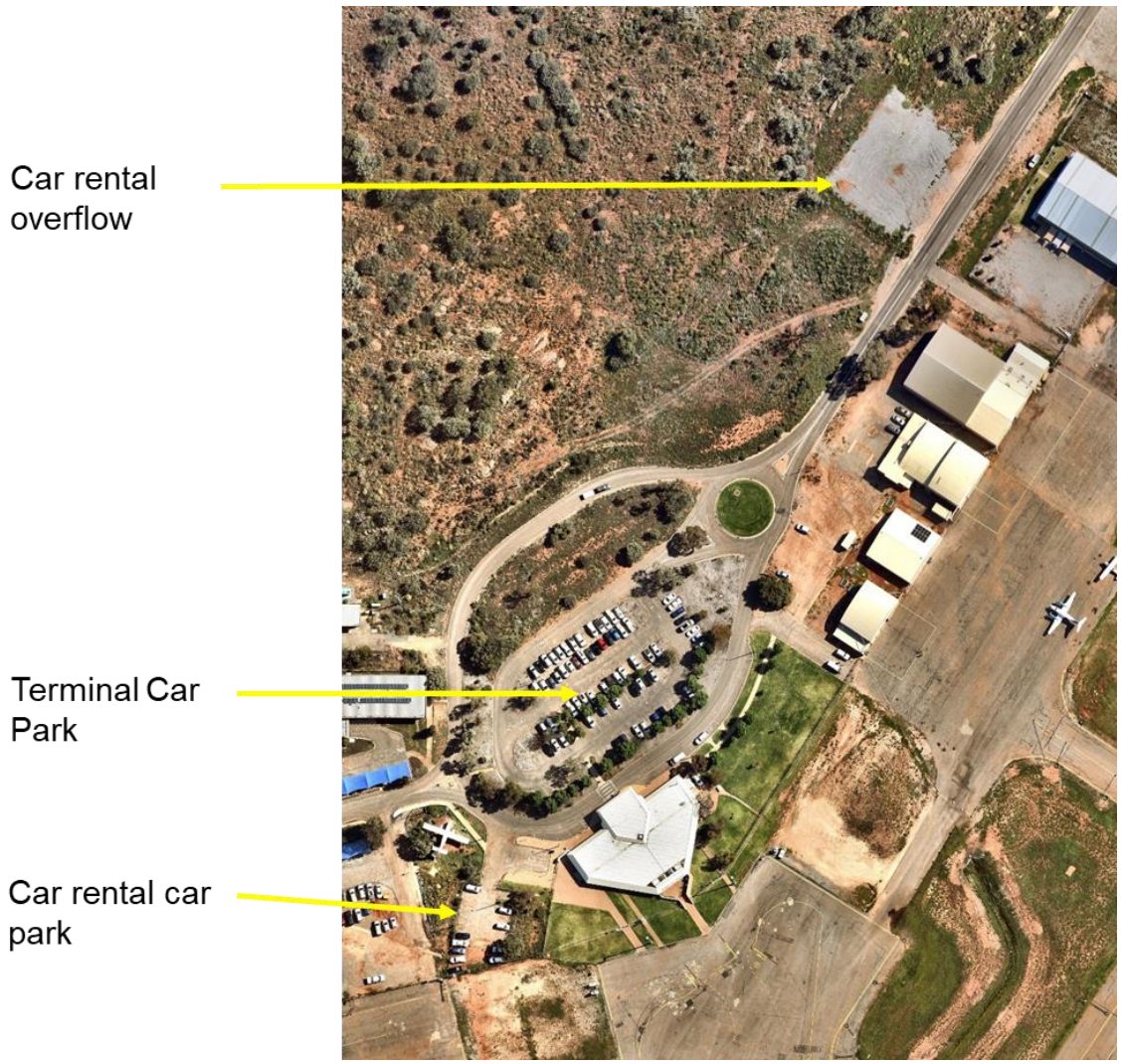
Figure 34: Baggage Claim Bay

Figure 35: Baggage Collection Area from Airside

3.3.2 Terminal Car Park and Car Rentals

There are three main car parking areas serving the terminal. These are shown in Figure 36 below.

Figure 36: Terminal Car Parking Areas[29]



The main terminal car park has 92 spaces:

- Permit: 8 spaces
- 2P: 16 spaces
- Disabled: 2 spaces
- Remainder: 66 spaces

The occupancy observed during the consultant site visit in October 2022 was approximately 85%. On this basis, there is an assumption that the car park is at capacity.

There is also a car rental park to the west of the terminal. This car park is unsealed and has approximately 20 unmarked spaces. There is also a car rental overflow area adjacent to the entrance road. An issue raised by

[29] Aerial Photo Base: Nearmap

airport management is that car park spaces are occupied by car rentals that are not parked in the car rental areas.

Paid parking is to be introduced in the near future. Its introduction has been approved by BHCC. It is considered that paid parking may provide more discipline regarding rental car parking.

The consensus reached with stakeholders is that the main parking area needs to be expanded from its current size.

Figure 37: View of Car Park

Figure 38: Car Park view towards Terminal

Car rental demand in Broken Hill is driven by corporate traffic with pick up / drop off at airport. There are currently three operators on site - Avis, Hertz, Sixt. Each operator requires up to 15 car parking bays.

Consultation with car rental operators indicated that there is a preference is for operations/ wash bays to be on the airport site. These are currently in town. A location on the airport site would be a commercial opportunity for Council.

Car rental and car rental overflow car parks are unpaved. Ideally they would be paved, but the cost of such should be taken into consideration.

Figure 39: Car Rental Car Park

Figure 40: Car Rental Overload Area

3.3.3 Royal Flying Doctor Service (RFDS) Assets

The Royal Flying Doctor Service (RFDS) is a key airport stakeholder. The Broken Hill Airport operation incudes:

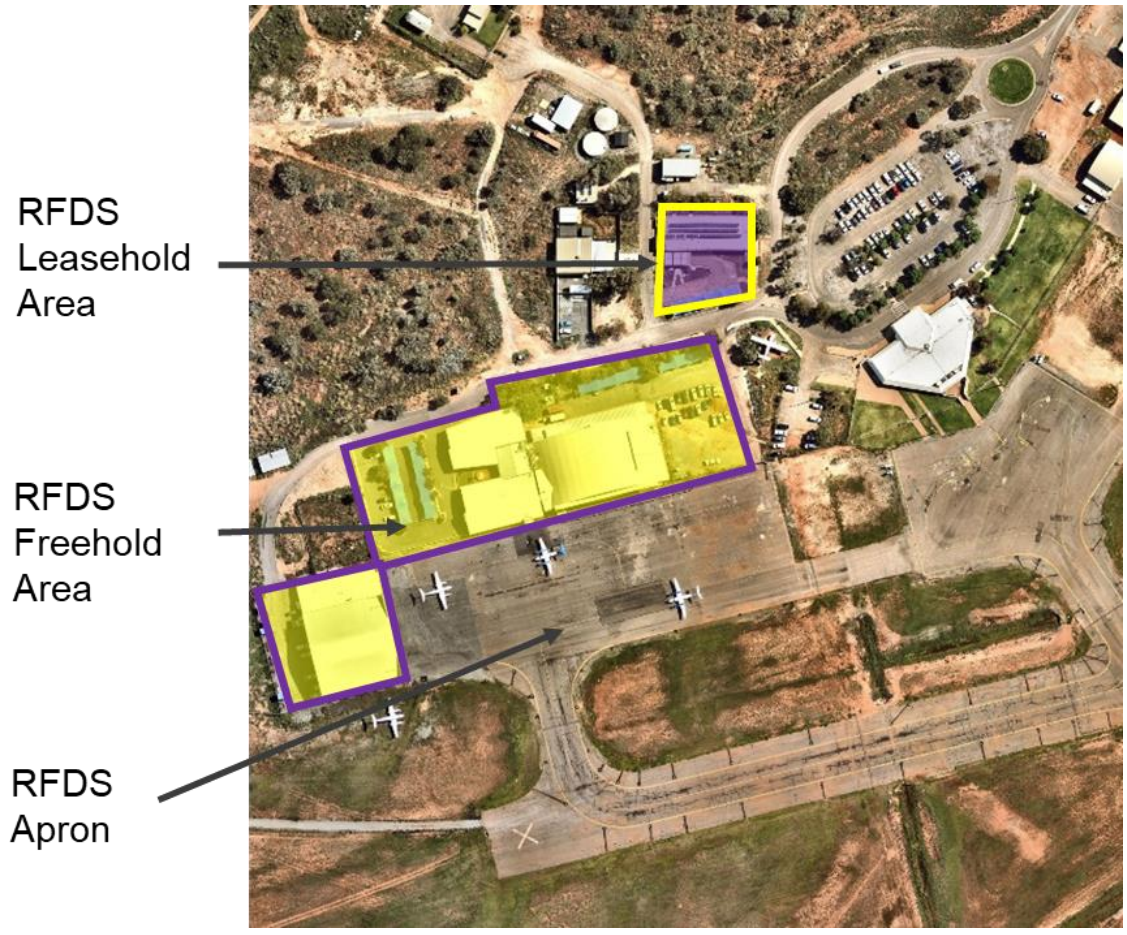
- Medical aircraft operations providing 24 hour medical emergency service from Broken Hill to remote locations in outback NSW, SA and South West Queensland.
- 2 bay aircraft maintenance centre for the three aircraft based at Broken Hill but also supporting RFDS operations at Dubbo, Essendon and Launceston. Up to five aircraft may be on the ground at any one time.
- GP Medical Clinic.
- Visitors centre.

The RFDS airport land requirements include:

- RFDS freehold areas (buildings, car park areas),
- Facilities leased from Council and used as offices,
- Council owned operational areas such as roads and aircraft aprons.

These land use areas are shown in Figure 41 below.

Figure 41: RFDS Land Holdings[30]

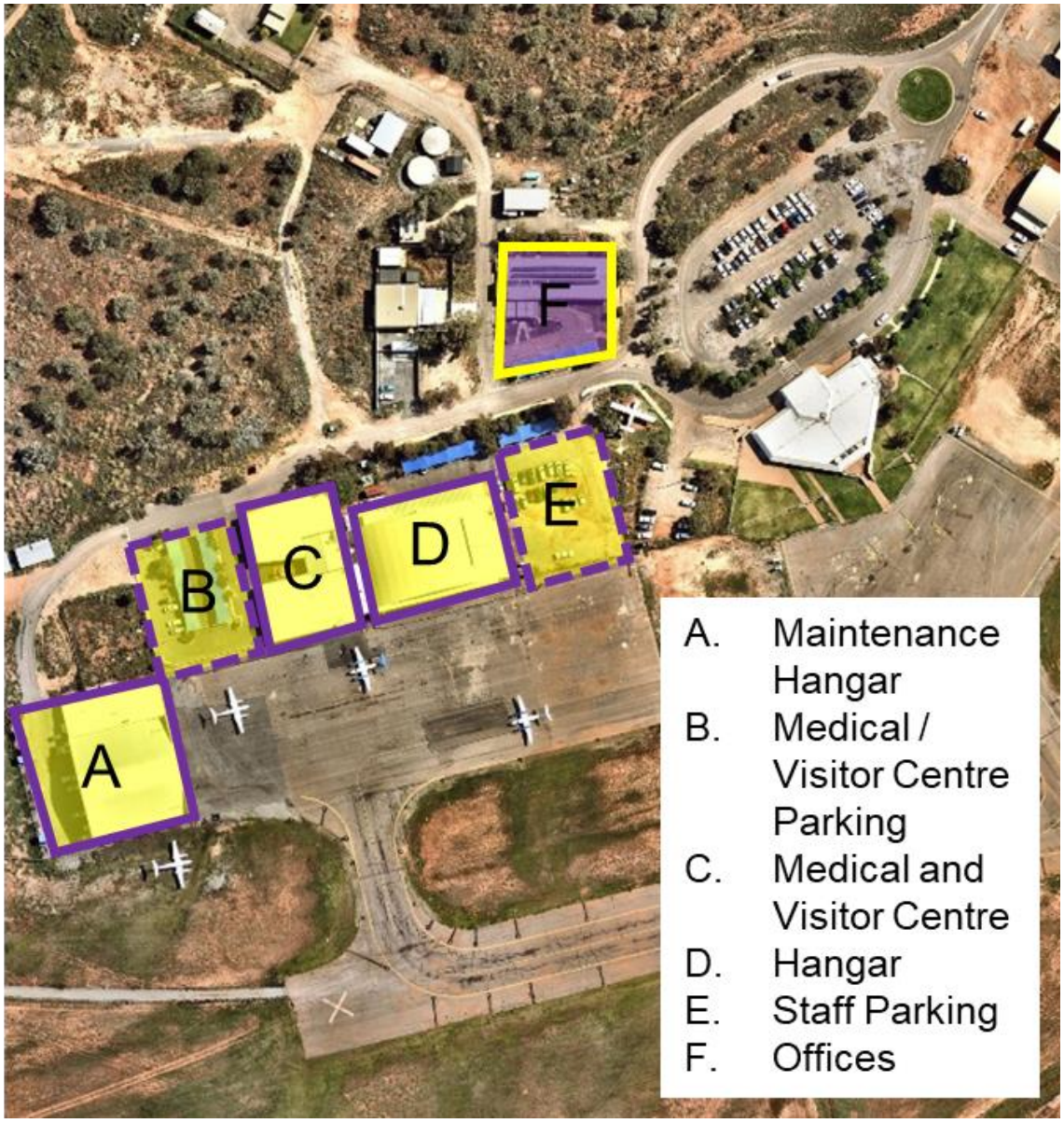


[30] Aerial Photo Base: Nearmap

There are currently (2022) 43 staff based on site.

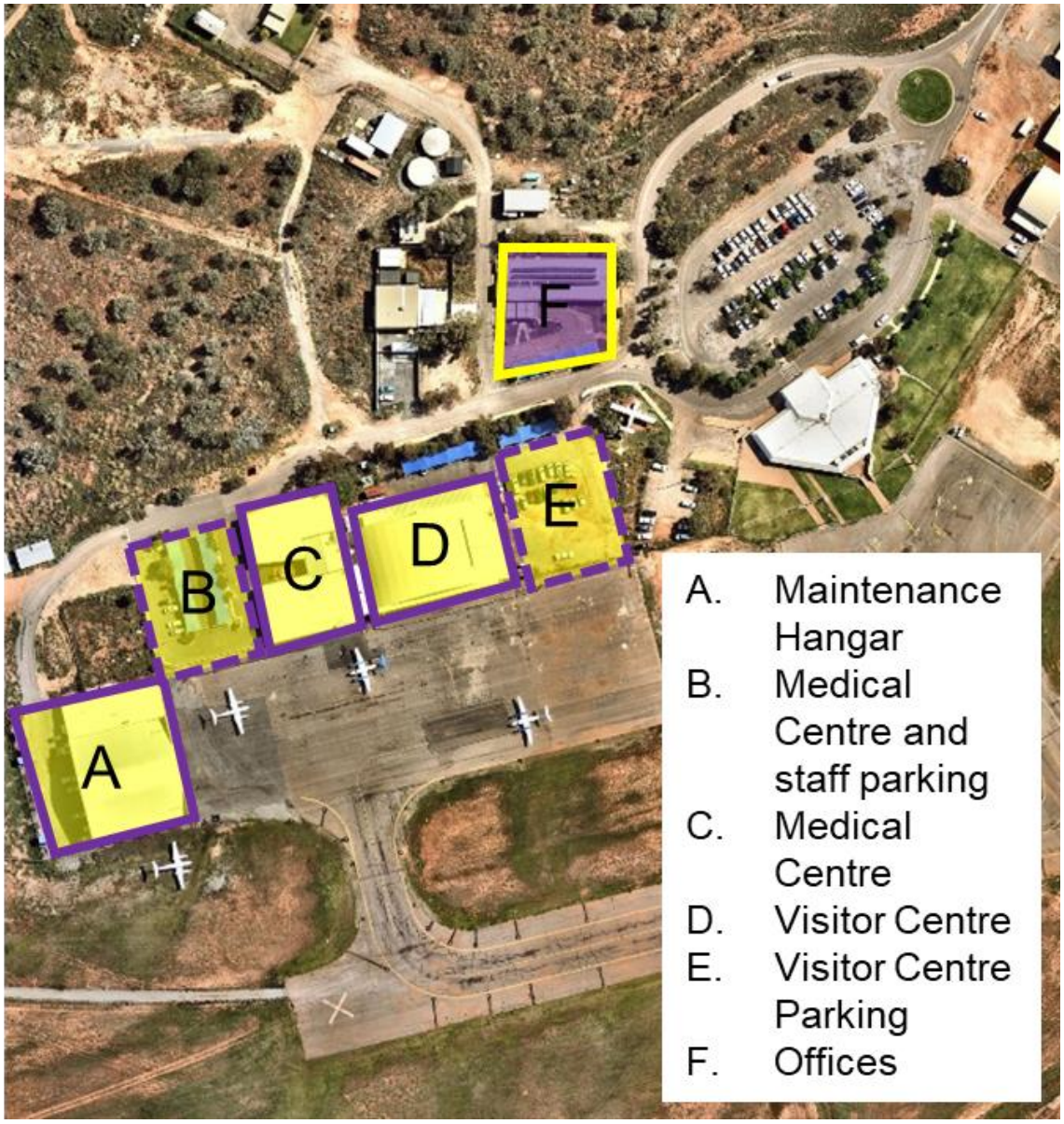
The current (2022) allocation of usages to buildings is shown in Figure 42 below. There is currently a reallocation of building uses. The new functions are shown in Figure 43.

Figure 42: RFDS Building Allocation - Current[31]



[31] Aerial Photo Base: Nearmap

Figure 43: Reallocated RFDS Building Functions[32]

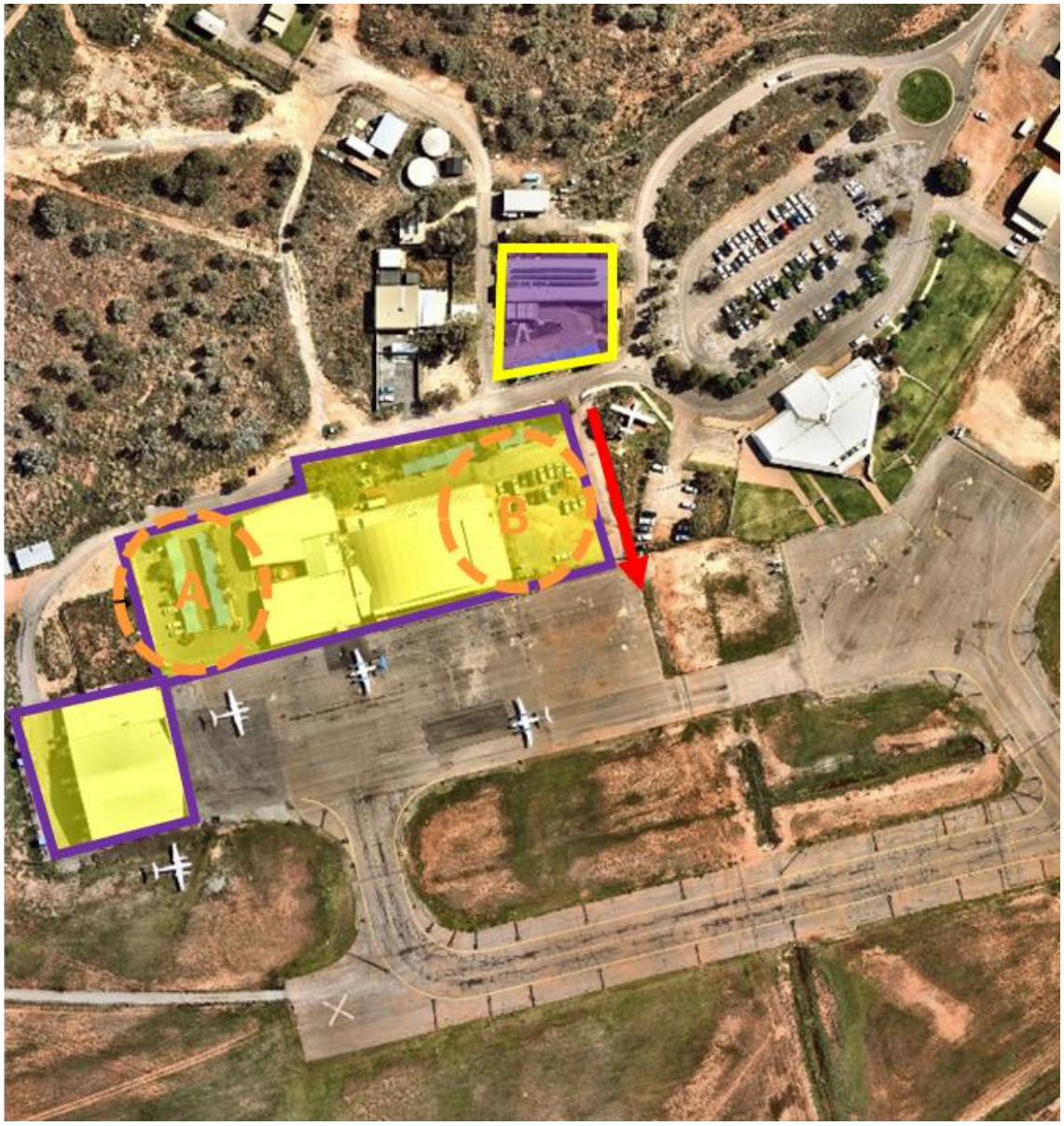


The Visitors Centre is currently being upgraded and relocated to the existing hangar and it is expected that visitor numbers will increase from 16,000 per annum to 30,000 over the next 3 – 5 years.

The existing GP medical facility will be able to expand under this plan. The visitors centre and GP clinic drive a large proportion of airport road and parking demand.

[32] Aerial Photo Base: Nearmap

Figure 44: RFDS Car Parking[33]



Currently Car Park A is used by Visitor Centre and GP clinic users.

Car Park B is used by RFDS staff.

Under the reconfiguration of RFDS uses, Car Park A will be used by staff and Clinic uses. Car Park B will be allocated to visitor parking.

Issues that were investigated further in the master planning process included:

- Access to the RFDS past the terminal frontage. All RFDS traffic must use the Departures Road.
- Maintaining 24 hour access through Car Park B to the aircraft apron
- Increased parking demand through increased Visitor Centre visitation.

[33] Aerial Photo Base: Nearmap

- Potential car parking conflicts between free RFDS parking at Car Park B and paid airport terminal parking. There is the risk that 'savvy' terminal users may park at the RFDS rather than paying at the terminal car park. Boom gates or car park closure would mitigate this issue.
- Large vehicle parking – caravans and camper vans. 'Grey Nomads' are significant RFDS visitors.
- Coach parking and turning facilities for tour groups.

RFDS assets are shown below.

Figure 45: RFDS Medical / Visitors Centre Landside View

Figure 46: RFDS Medical Centre Airside View

Figure 47: Old RFDS Hangar being converted to Visitors Centre

Figure 48: Internal View of Hangar Conversion

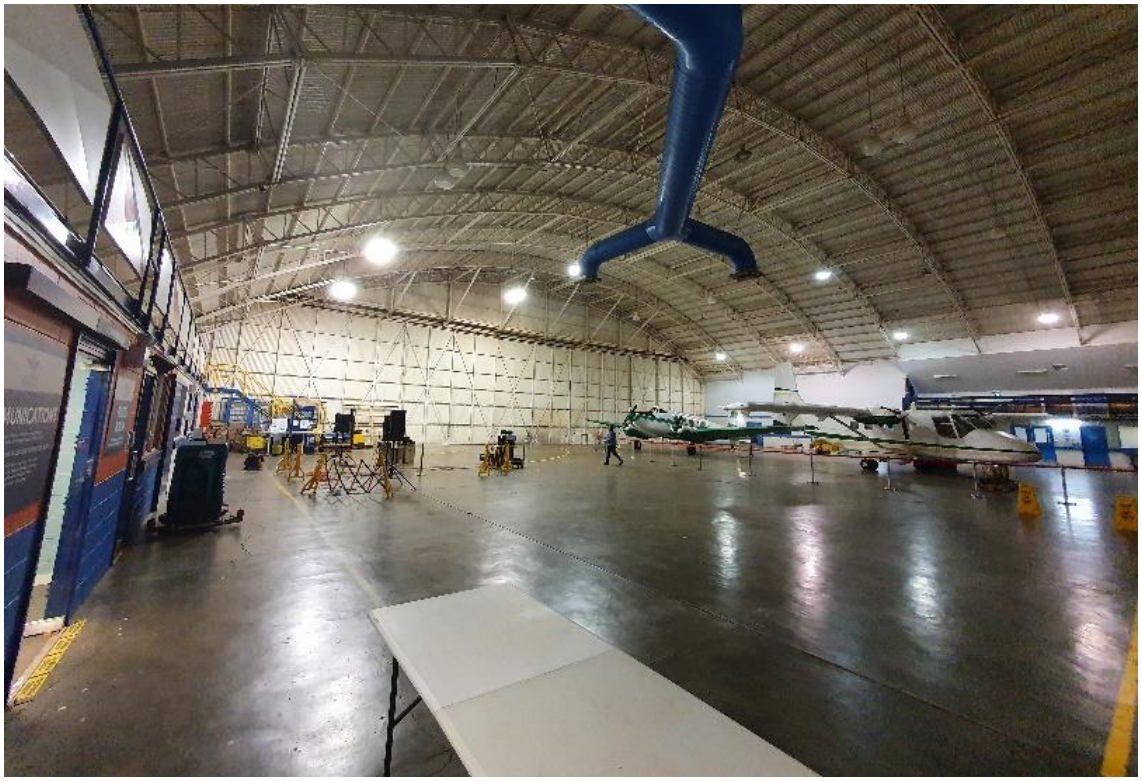


Figure 49: RFDS Maintenance Hangar

Figure 50: RFDS Offices – Leased from Council

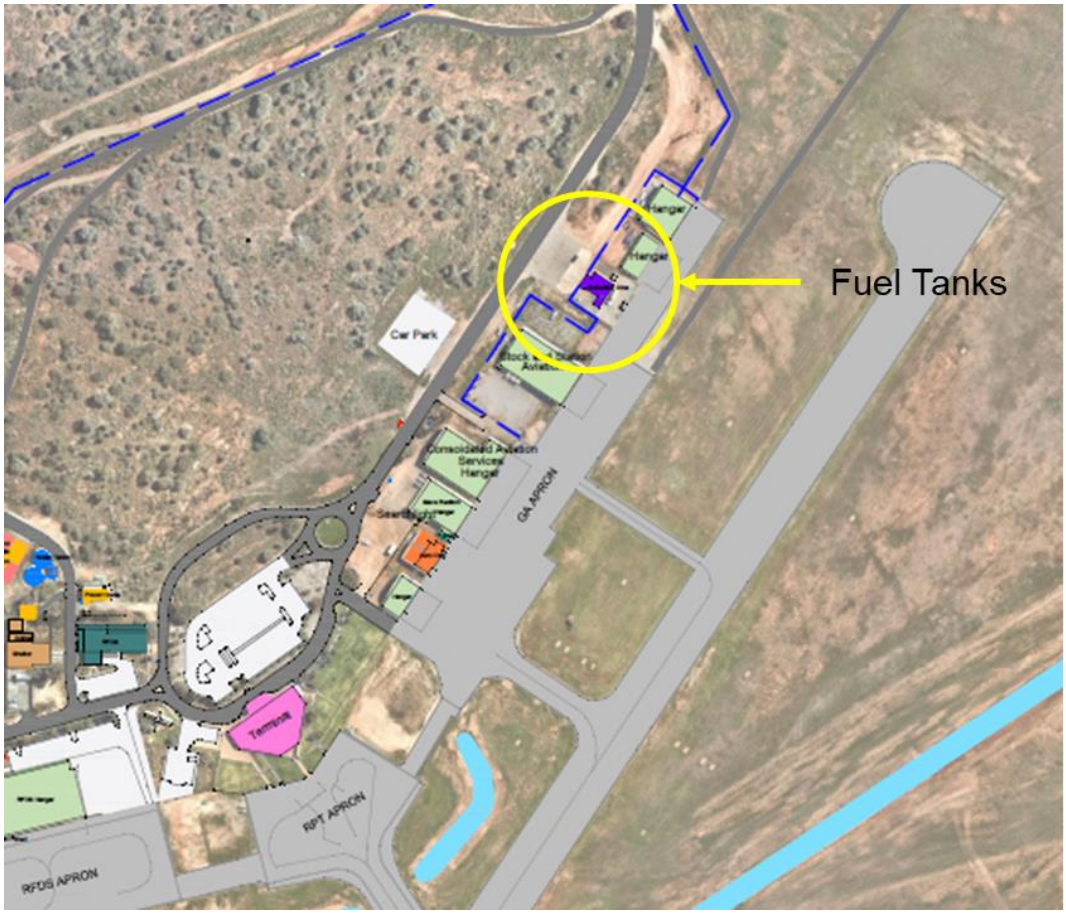
3.3.5 Fuel Assets

There are two fuel facilities located to the north of the airport on the airside / landside interface. Prior to 2023 , the only fuel facility was operated by BP. A second facility operated by Viva Energy came into operation in 2023. This is located just to the south of the existing facility. The Viva facility will supply fuel to the RFDS. Viva has recently won a nationwide contract to supply the RFDS.

At the BP facility, there are two tanks – one for Avgas and one for Jet A1.

Aircraft fuel is currently tankered in. It is considered that with the two operators there will be adequate capacity moving forward. Additional tanker deliveries would be required as demand grows.

Figure 51: Fuel Tank Location[34]



[34] Aerial Photo Base: Nearmap

Figure 52: BP Fuel Tanks

Figure 53: Viva Fuel Facility under construction

3.3.6 General Aviation (GA) Assets

All GA facilities on airport are located to the north of the airport facing onto the GA Apron.

GA hangars (as at October 2022) include:

- Martin Aviation, Hangar 13 – aircraft charters and scenic tours
- Broken Hill Aero Club – recently redeveloped
- Steve Radford hangar
- Consolidated Aviation Services – aircraft maintenance and repair – 3 to 4 staff
- Stock and Station aviation – helicopters and charters
- Uniting Church Flying Patrol Centre – Outback chaplaincy

One major characteristic of GA operations at the airport is that there is a preference for aircraft to be housed in hangars due to the harsh environmental conditions of heat and dust.

Details of particular GA operations can be found in 5.1.1 of this report. It is seen that continued development of the GA sector is a growth opportunity for the airport.

Figure 54: Existing GA Facilities[35]

[35] Aerial Photo Base: Nearmap

Figure 55: GA Facilities

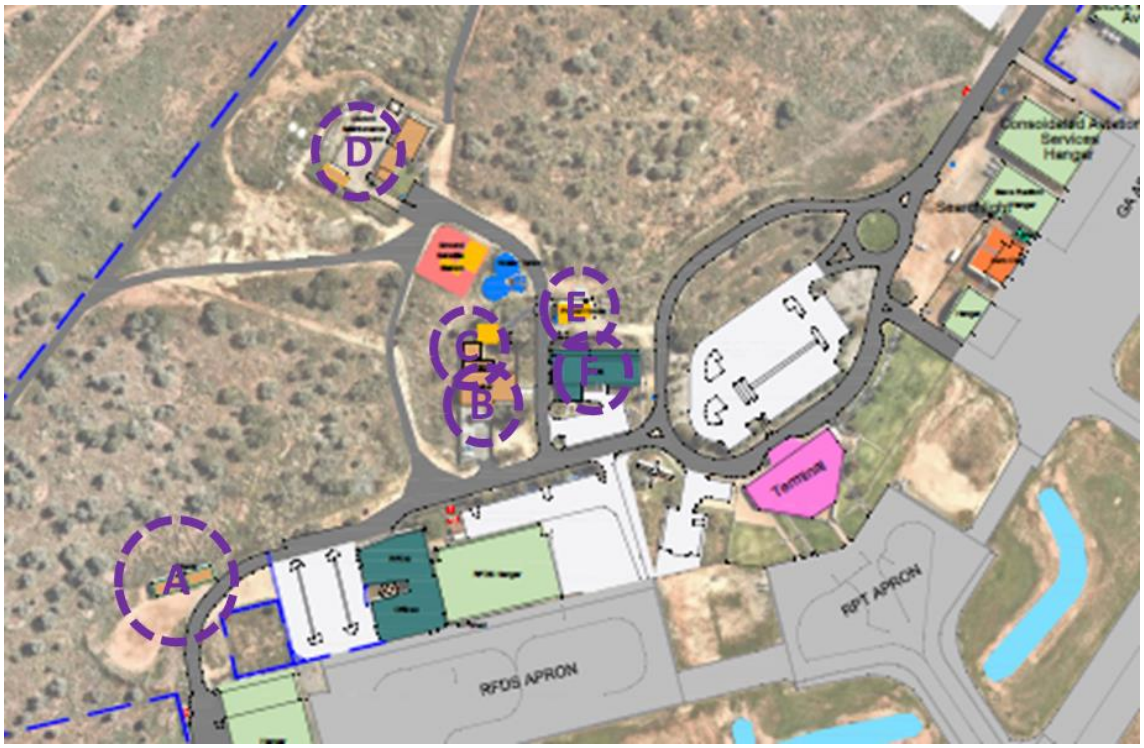
Figure 56: GA Facilities

3.3.7 Other Council Facilities on Airport

There are other Broken Hill City Council facilities on the airport:

A. Storage sheds – currently unused.
B. Council Companion Animal Shelter
C. Crematorium
D. Council and airport works depot
E. Power house / substation / generator – this serves the power needs of the airport.
F. Offices – leased to RFDS.

Figure 57: Other Council Facilities on Airport[36]



[36] Aerial Photo Base: Nearmap

4 Review of Planning and Development Documents

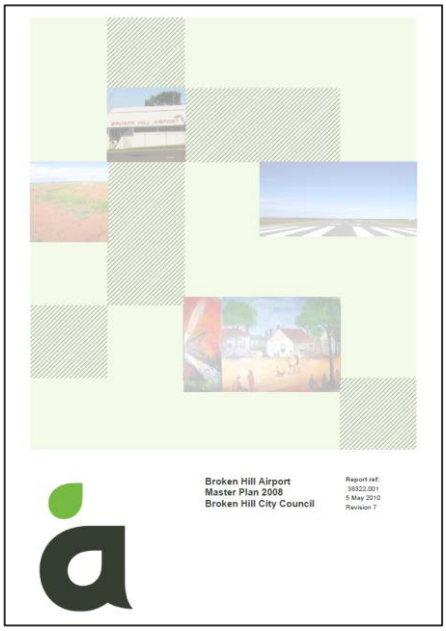
A range of previous planning and development documents have been reviewed as part of the 2022 Master Plan preparation. Summaries of these reviews are outlined in this section.

4.1 Review of Broken Hill Airport Master Plan 2008

The 2008 Broken Hill Airport Master Plan[37] was prepared by Aurecon and the final version delivered to Council in 2010. The airport is still being planned based on the Master Plan developed in 2008 by Aurecon. The Master Plan aimed to A provide 20 year plan for the airport. The key objectives of the Master Plan were to:

- Achieve the best outcomes for Council, the Broken Hill community and the Far West NSW region from the ongoing operation of the airport, and any proposed upgrade of, or lease over airport operation and the airport industry in general;
- Ensure long-term sustainability of Broken Hill Airport;
- Ensure Broken Hill Airport continues to be managed, operated and maintained at a high standard to meet the needs of existing and future users;
- Identify and facilitate any infrastructure upgrades required to cater for the use of larger jet aircraft such as A320 and B737 that are typically used by major budget carriers;
- Promote Broken Hill and the Far West region of NSW as a tourist destination and increase tourist passenger traffic at the airport;
- Facilitate the continued presence of a Royal Flying Doctor Service base at Broken Hill Airport;
- Facilitate additional business and commercial (including non-aviation) development at BHQ; and
- Consider alternative airport management and operation arrangements whether by Council or in partnership with a suitably qualified private airport management company if such arrangements present the most logical means of achieving efficient airport operation and traffic growth.

Figure 58: Broken Hill Airport Master Plan 2008 (Cover)



The key recommendations were:

- Upgrade of Runway 05/23 to a PCN of 44 to accommodate Code C jets (B737 and A320)
- Give consideration to sealing Runway 14/ 32
- Provide a full length parallel taxiway to RWY 05/23
- Provide additional connector taxiway to GA apron
- Upgrade taxiways for larger aircraft and match runway capability
- RPT apron expansion to four Code C aircraft including a Code C jet.
- Expand GA facilities and aprons
- Expand terminal building to accommodate growth, larger aircraft and security screening facilities
- Expand terminal car park
- Provide separate road access for RFDS – this would be separate from terminal access.
- Upgrades to stormwater, water supply and electrical infrastructure.
- Commercial precinct developments north of the terminal precinct.

[37] Aurecon. Broken Hill Airport Master Plan 2008. Revision 7. 5 May 2010.

Figure 59: Broken Hill Airport Master Plan 2008 Movement Area Master Plan[38]

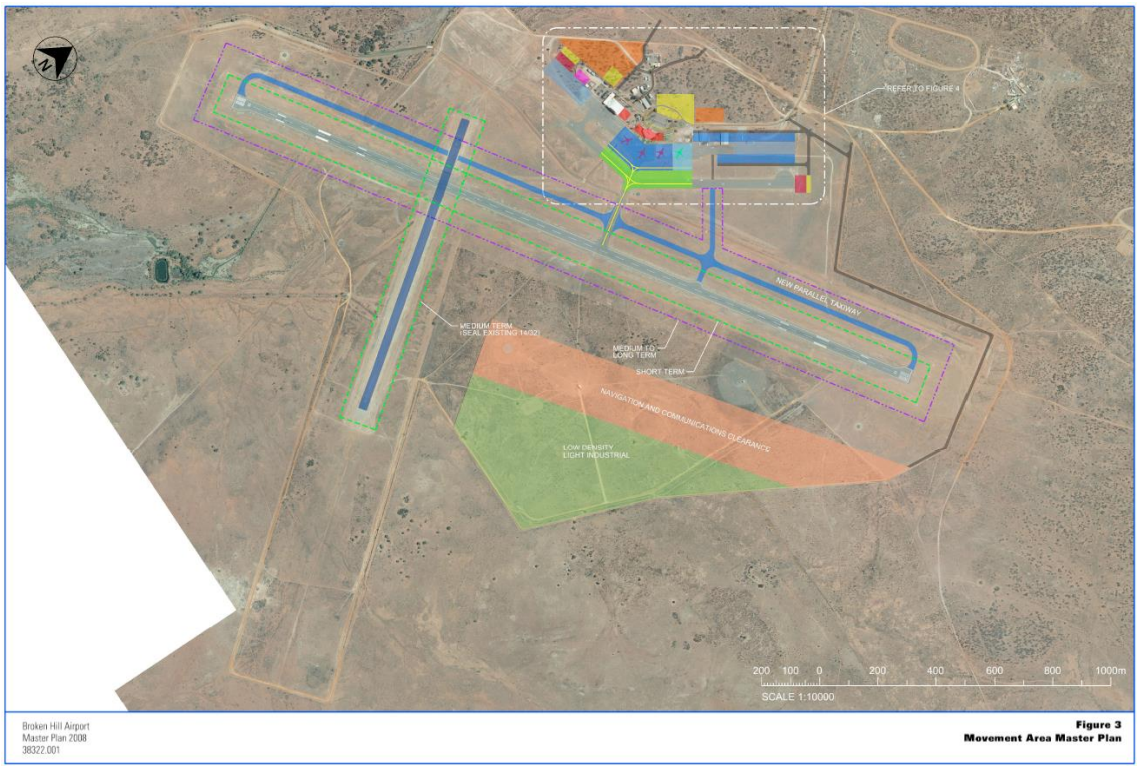
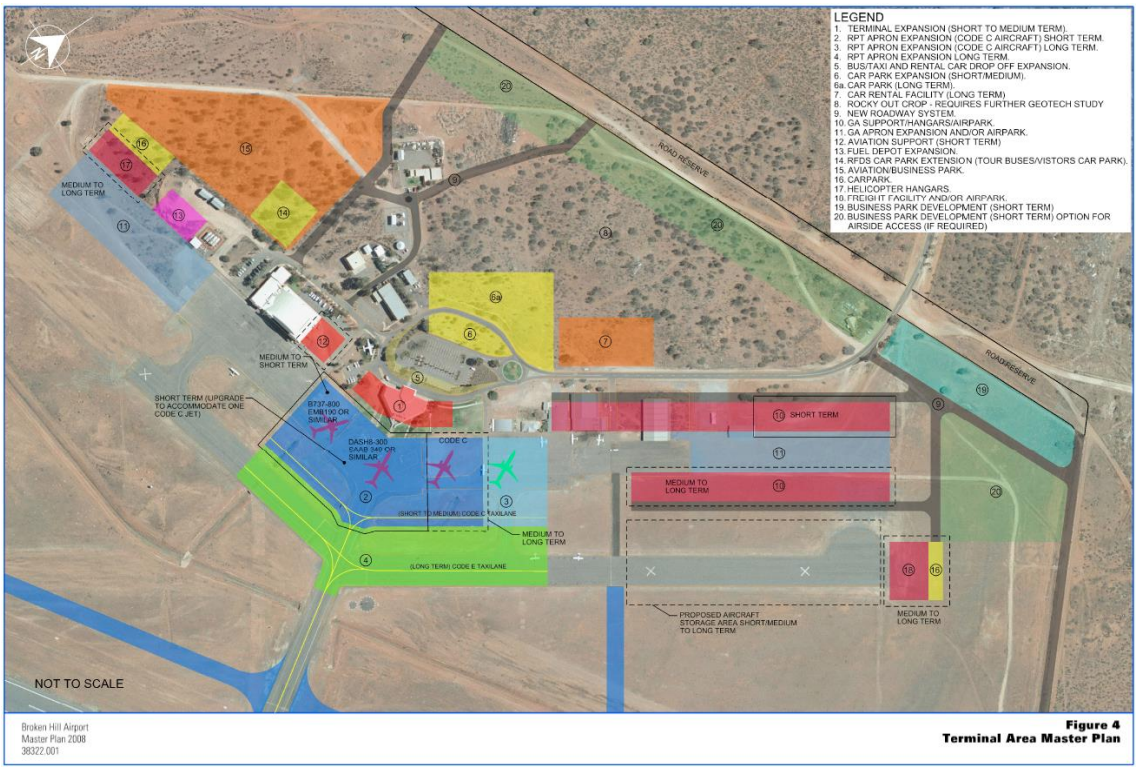


Figure 60: Broken Hill Airport Master Plan 2008: Terminal Area Plan[39].



[38] Aurecon. Broken Hill Airport Master Plan 2008. Revision 7. 5 May 2010. Appendix A Figure 3
[39] Aurecon. Broken Hill Airport Master Plan 2008. Revision 7. 5 May 2010. Appendix A Figure 4

The key elements of the master plan development strategy are outlined in Table 2 below.

Table 2: Broken Hill Airport Master Plan 2008 Development Strategy

Short Term: 2008 - 13	Medium Term: 2013 – 20	Long Term: 2020 - 28
• Additional car parking • Possible upgrade of terminal building dependent on security requirements	• Terminal upgrade and expansion • Security upgrade if required • Further car park expansion • Dedicated car rental areas and/ or service centres • Upgrade of RWY 05/23 • Expansion of GA aprons and taxiway upgrade • Parallel taxiway planning (first stage) • Expansion of the RPT apron if required	• Provide finalized parallel taxiway if required • Additional GA Apron and GA connector taxiway • Additional car parking • Terminal building upgrade (if required)

The Landrum and Brown commentary on the key master plan recommendations is outlined in Table 3 below.

Table 3: Commentary on 2008 Master Plan Recommendations

2008 Master Plan Recommendation	Landrum and Brown Commentary
Upgrade of Runway 05/23 to a PCN of 44 to accommodate Code C jets (B737 and A320)	This would provide flexibility for future growth and allow larger aircraft access (even if only as charters and itinerants). However, it is possible that existing airport users would not agree to pay for it when they would receive little or no benefit.
Give consideration to sealing Runway 14/ 32	Agreed. It is noted that it was not identified in the 2008 development plan. Runway sealing would provide access (especially for the RFDS) during all weather conditions
Provide a full length parallel taxiway to RWY 05/23	It is difficult to see this being justified until traffic levels are substantially higher than today. However, provision for a future taxiway should be provided as a long term future proofing measure
Provide additional connector taxiway to GA apron	Additional taxiway access should be provided to remove the potential single points of taxiway failure that currently exist.
Upgrade taxiways for larger aircraft and match runway capability	Agreed to be undertaken in conjunction with Runway 05/23 upgrade.
RPT apron expansion to four Code C aircraft including a Code C jet.	Agreed, provision for a Code C jet should be provided for future flexibility.

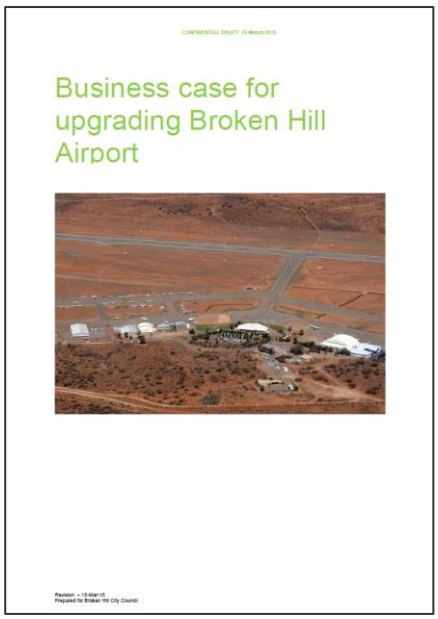
2008 Master Plan Recommendation	Landrum and Brown Commentary
Expand GA facilities and aprons	Agreed
Expand terminal building to accommodate growth, larger aircraft and security screening facilities	Terminal expansion needs to balance with development of apron and other airfield infrastructure. The issue of payment for the development will also apply.
Expand terminal car park	This will be required in line with terminal expansion and overall traffic demand
Provide separate road access for RFDS – this would be separate from terminal access.	This would remove RFDS traffic from the front of terminal. Expanded RFDS facilities such as the Visitor Centre expansion, larger medical centre and aircraft maintenance development would justify the roadway changes.
Upgrades to stormwater, water supply and electrical infrastructure.	Agreed. To be provided in line with terminal and commercial area developments.

4.2 Business Case for Upgrading Broken Hill Airport 2015

This report[40] by Strategex developed a business case for airport development funding.

This report reviewed potential economic drivers to grow the airport. It focused on mining and tourism as potential drivers of growth.

Figure 61: Business Case for upgrading Broken Hill Airport (cover)



Three options were considered by the report:

1. No development “status quo” – necessary repairs and maintenance to maintain operations
2. Development of the short and medium term options identified by the Master Plan accompanied by active tourism promotion to accelerate growth
3. Innovative airport governance – PPP or leasing – that would aggressively pursue growth.

Key findings were that high airfares, route structure, lack of airline competition and absence of low cost carriers were hindering traffic growth.

A medium case development scenario would require airport upgrades and entry of main line carriers – Jetstar, Virgin and Tiger – the latter airline which is now defunct could now be replaced by recent airline entrant, Bonza.

[40] Strategex. Business Case for upgrading Broken Hill Airport. March 2015.

Higher case growth and development scenarios would require new routes and service frequency. Air fares to Broken Hill would need to be competitive with coastal leisure destinations such as Coffs Harbour, Ballina, Gold Coast and Sunshine Coast.

Following review of this report, it is agreed that a more diversified passenger base, lower air fares and increased capacity would contribute to airport growth and a more diversified economy in the Far West Region. There is no doubt that the region is an attractive tourist destination.

It is also agreed that lower air fares – either through competition or airlines with lower cost bases than the current BHQ operators will encourage growth.

It is considered that the report took a "build it and they will come" attitude. This can lead to successful outcomes if Council or an external investor was prepared to make the long term investment required.

Three issues that were not satisfactorily addressed in the report and which have become more apparent in the Post Covid era are:

- Tourism development – particularly aviation driven tourist development in remote or comparatively remote areas – requires accommodation beds to be available. It is difficult to achieve a balance between beds and seats and tourist development has a long lead time – car based tourists can help achieve this balance in an overall tourist mix.
- An economy dependent on the twin pillars of mining and tourism has inherent accommodation problems – tourism is a largely discretionary spend and cost is an important driver when choosing a holiday destination. The itinerant nature of the Australian mining industry also requires accommodation beds but the ability to spend and absorb higher accommodation prices is higher and can drive accommodation costs up.
- There is also an inherent disbalance between the sectors in terms of air fare cost and scheduling flexibility. The mining industry can again absorb higher air fare costs but requires business driven scheduling – i.e. Monday mornings that do not necessarily reflect tourism needs.
- Developing Broken Hill as a 'weekday mining' and 'weekend tourism' destination does address some parts of the conundrum.

4.3 Business Plan and High Level Cost Benefit Analysis for the Future Development of Broken Hill Airport 2019

This report[41] developed by The Airport Group was a business plan that would support the funding application required to achieve the Airport Development Plan formulated by Council.

The aim of the Airport Development Plan was to:

- Ensure infrastructure will meet current and future CASA regulations;
- Cater for growth and employment in the region, including growth in the resource sector;
- Allow for larger aircraft to land, offering airport flexibility;
- Encourage tourism operations and low-cost carrier entry into the market;
- Promote increased tourism usage at BHQ; and
- Support growth of local aviation and non-aviation business.

[41] The Airport Group. Business Plan and High Level Cost Benefit Analysis for the Future Development of Broken Hill Airport. July 2019

Figure 62: Business Plan and High Level Cost Benefit Analysis for the Future Development of Broken Hill Airport (Cover)

Five development options were considered – all assume government grant funding:

1. Minimal capital expenditure, maintenance only, low growth, 100% funded by Council.
2. As per Option 1 plus essential safety works – lighting, fencing
3. Options 1 and 2 above plus runway, taxiway and apron upgrades.
4. As per Option 3 but medium growth scenario
5. As per Option 4 but high growth scenario

Options 3 and 4 assume higher passenger and aircraft numbers and hence higher revenue against similar levels of capital expenditure.

All of the options assume NO capital expenditure on terminal development.

Following review of the report, it is agreed that Option 1 is the least favourable option and that is does present an unacceptable risk to life safety and could lead to possible airport closure. However, in terms of cost benefit analysis, it is reasonable to consider a "do nothing" scenario such as this.

The essential safety work identified such as the kangaroo fencing and the lighting upgrade have been carried out and funded by grants. The taxiway and apron upgrades have also been approved for construction.

The report also assumed that BHQ would remain a single carrier airport. This assumption is now outdated. As there is now competition in the market since QANTAS commenced Sydney flights in 2022. However, the vagaries of the airline market may see a return to a single carrier market.

It was also assumed that there would be no aircraft up-gauge – this seems to lie behind the assumption that there be no capital spend on terminal development.

It is considered that the medium and high growth scenarios would require larger aircraft in the near term and hence require security screening of passengers and bags. Similar sized airports now have security screening. The introduction of security screening and the need for secure lounges would drive the need for a terminal expansion.

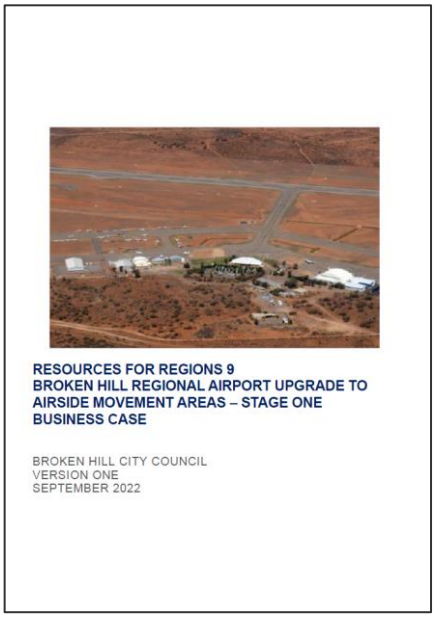
Associated with the above was the Growing Local Economies, Broken Hill Airport Business Case, 2019[42] developed by BHCC. This document basically summarises the 2019 Business Plan (refer above) and was intended as a government grant document. The content and commentary is similar to that for the Business Plan.

[42] Broken Hill City Council. Growing Local Economies, Broken Hill Airport Business Case. Version 1 July 2019

4.4 Resources for Regions 9, Broken Hill Regional Airport Upgrade to Airside Movement Areas – Stage One Business Case, 2022

This project application[43] was prepared by the BHCC and builds on the Airport Master Plan, 2019 Business Plan and 2019 Business Case (reviewed above).

Figure 63: Resources for Regions 9, Broken Hill Regional Airport Upgrade to Airside Movement Areas – Stage One Business Case, 2022 (Cover)



The aim of the Airport Development Plan was to:

- Ensure infrastructure will meet current and future CASA regulations;
- Cater for growth and employment in the region, including growth in the resource sector;
- Allow for larger aircraft to land, offering airport flexibility;
- Encourage tourism operations and low-cost carrier entry into the market;
- Promote increased tourism usage at BHQ; and
- Support growth of local aviation and non-aviation business.

Additional outcomes would be:

- Keeping the airport open. Maintaining access for passengers.
- Preventing increase in transport disadvantage and geographical isolation
- Protecting direct and indirect employment by having a regional airport.
- Securing the facility to deliver future growth particularly in mining sector.
- Maintain access for FIFO workers.
- Maintain access for current users particularly RFDS

Benefits of the project would be:

- Population growth;
- Accessibility for a wider range of aircraft;
- Regional development in mining and film requiring greater cargo requirements;
- Inbound and outbound accessibility for visitors and residents;
- Removing constraints to future opportunities
- Ensuring CASA safety compliance

Key factors of the proposal are:

- Increasing flights for all sectors
- Lowering costs to passengers and users

[43] Broken Hill City Council: Resources for Regions 9, Broken Hill Regional Airport Upgrade to Airside Movement Areas – Stage One Business Case, Version 1, September 2022

- Cheaper fares would enhance Broken Hill liveability
- Increased freight and cargo potential
- Larger aircraft would see baggage limits increased making BHQ more attractive to leisure passengers and sectors needs with heavy baggage such as film crews.
- Reducing potential leakage to Mildura.
- Removing a regional infrastructure bottleneck

After review of the proposal, it is agreed that an upgrade to the airport will safeguard the facility for future operations and at least maintain (or provide some growth potential) for existing scheduled operations and provide a secure base for RFDS operations.

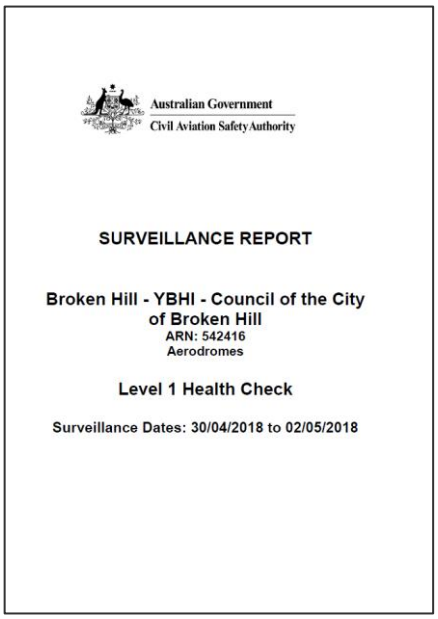
Some issues arising from the project aims outlined in the submission may require further discussion and investigation:

- The runway upgrade may be regarded by CASA as altering "the operational capability of the aerodrome"[44]– this would have knock on effects and more extensive planning and infrastructure works may be required .
- The allowance for larger aircraft and/ or a low cost jet based carrier would require larger aircraft – the terminal requirements for larger traffic numbers have not been addressed by the planning or funding proposals.
- Larger aircraft as a minimum will trigger the need for both passenger and baggage security and possibly other investment to manage the additional capacity.

4.5 CASA Surveillance Reports 2018 and 2021

The 2018 and 2021 CASA Surveillance reports reviewed safety issues at the airport.

Figure 64: 2018 and 2021 CASA Surveillance Reports (Covers)

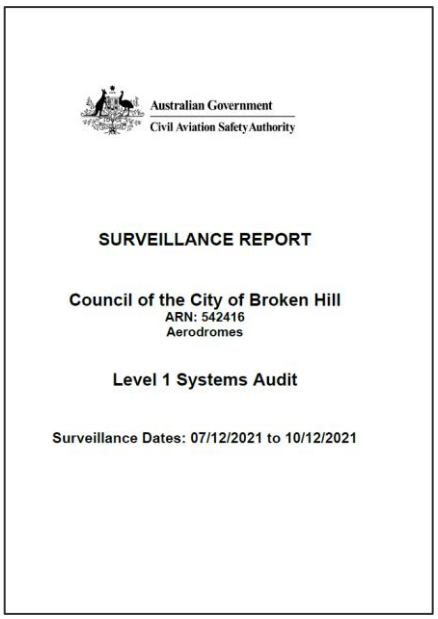

Australian Government
Civil Aviation Safety Authority

SURVEILLANCE REPORT

Broken Hill - YBHI - Council of the City of Broken Hill
ARN: 542416
Aerodromes

Level 1 Health Check

Surveillance Dates: 30/04/2018 to 02/05/2018


Australian Government
Civil Aviation Safety Authority

SURVEILLANCE REPORT

Council of the City of Broken Hill
ARN: 542416
Aerodromes

Level 1 Systems Audit

Surveillance Dates: 07/12/2021 to 10/12/2021

The major issues identified in 2018 were:

[44] CASA Advisory Circular AC139.A-03 V1.0: Application of Aerodrome Standards June 2020, p25.

- Issues with the RWY 05/23 surface;
- Loose stones on RWY 14/ 32 due to lack of compaction – rain being required for compaction;
- Apron and taxiway line markings fading;
- Animal incursion through the airport perimeter fence.

The major issues identified in 2021 were:

- GSE storage and lack of demarcation lines on aprons;
- Lighting control issues;
- Runway area rough surface;

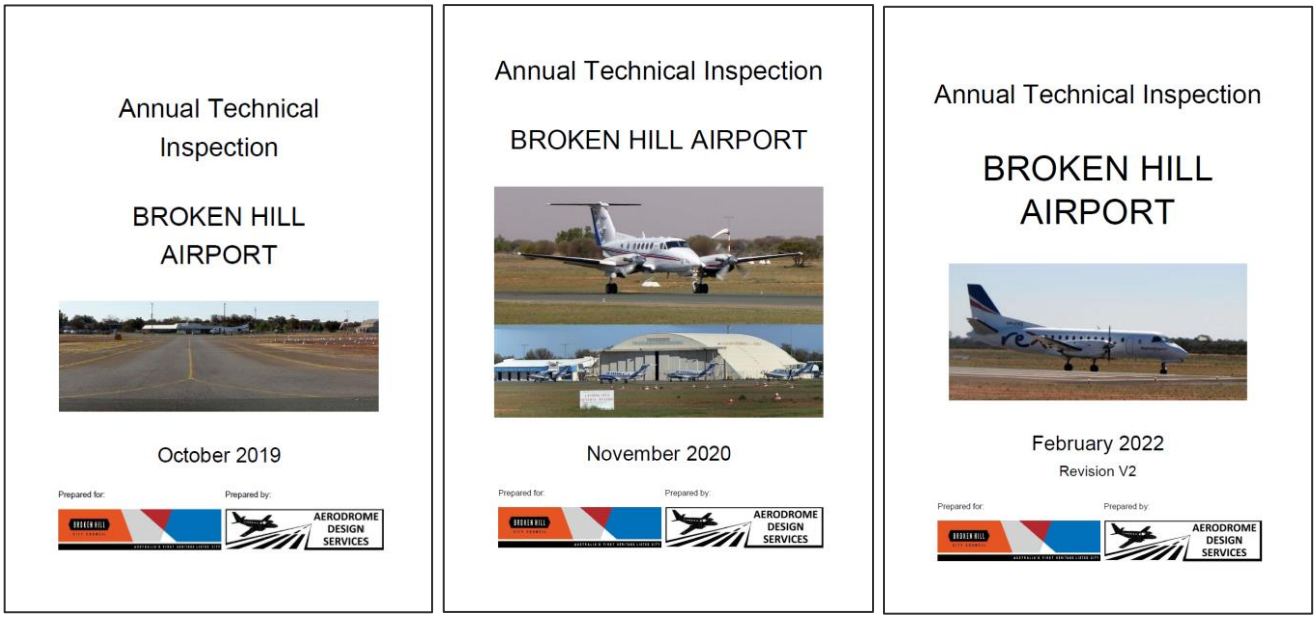
With the exception of the RWY 14/ 32 loose stones and the perimeter fence, the issues are of a maintenance nature and outside master planning scope. The runway stone issue would be solved through sealing the runway.

The animal incursion issue has been addressed through construction of the new animal proof fence.

4.6 Annual Technical Inspections – 2019, 2020, 2022

Annual technical inspections for the airport are carried out by Aerodrome Design Services. The technical inspections are carried out by a CASA approved safety inspector.

Figure .: Annual Technical Inspections – 2019, 2020, 2022 (Covers)



Most of the recommendations contained in the Technical Reports were of a strictly operational and technical nature and not strictly relevant to the master planning process.

Recommendations relevant to the master planning process included:

- Prioritise installation of a kangaroo proof fence.
- Seal runway and taxiway cracks and plan for an annual crack sealing program to all aircraft pavements as some apron areas were showing pavement failure.

- Reconstruct Taxiway Bravo to 10.5 metre width
- Plan for expansion of RPT apron.
- Replacement of airport lighting systems – high priority

Some of the issues such as the kangaroo proof fence, airport lighting and apron conditions had been carried over from the 2018 report.

Major infrastructure issues raised were:

- Runway 05/23 was reported to be in a good condition.
- Taxiways Alpha and Charlie were in largely good condition but the condition needed to be monitored
- Taxiway Bravo was considered to be 'beyond maintenance levels'. Crack repair required so that sub-base does not deteriorate.
- Some pavement failure on RFDS apron
- Pavement failure in parts of the GA apron particularly near Aero Club.
- The need for grandfathering of existing infrastructure when new 2020 MoS introduced.

Recommendations in the 2020 report that were relevant to master planning were:

- Complete installation of a kangaroo proof fence.
- Seal runway and taxiway cracks and plan for an annual crack sealing program to all aircraft pavements.
- Reconstruct Taxiway Bravo to 15.0 metre width
- Plan for expansion of RPT apron (repeat from previous).
- Repair GA apron failure areas. Heavy maintenance to GA apron.
- Replacement of airport lighting systems – high priority (repeat from previous)

It was noted that apron expansion works had not been carried out.

There was no 2021 inspection due to the Covid 19 Pandemic. The 2022 Report outlined major projects completed that included:

- Kangaroo proof fence
- Airport lighting system upgrade.

New recommendations in the 2022 report were:

- Monitoring of Taxiway Alpha condition due to introduction of heavier QF Q300 aircraft.
- Bay allocation recommendations – Bay 1 for Q300, Bay 2 for SAAB 340.

Repeat recommendations from previous reports included:

- Seal runway and taxiway cracks and plan for an annual crack sealing program to all aircraft pavements
- Reconstruct Taxiway Bravo to 15.0 metre width.
- Plan for expansion of RPT apron which had not been carried out.
- Repair GA apron failure areas. Heavy maintenance to GA apron.

It was noted that apron works had not been carried out though these were the subject of the grant application described in Section 4.4 above. This grant application has been successful and more detailed planning work undertaken.

5 Strategic Assessment of Service Requirements

5.1 Stakeholder Consultation

A process of external stakeholder consultation has been essential in developing an understanding of:

- How the airport works on a day to day basis;
- Identifying critical issues of operation and capacity;
- Stakeholders needs going into the future.

Stakeholder engagement study actively involves operators and organizations who may have an interest or could be affected by decisions regarding Broken Hill airport. It allows these stakeholders to provide input and influence the decision making and be integral parts of the planning and development process.

Relevant stakeholders were identified in conjunction with Broken Hill airport. Prior to the consultation a preliminary list of questions was circulated. These were to act as a guide only for discussion and some questions may not have been relevant to some of the external stakeholders. These questions were:

- How would you describe the nature of your operation / business at Broken Hill Airport?
- What type of equipment do you use and how many are stationed at Broken Hill Airport?
- Do you see this changing in the next 3 / 5 / 10 years?
- Does your business have any seasonality?
- Do you see this changing in the next 3 / 5 / 10 years?
- Has there been a change to the nature of your operation in recent years?
- Does your business require hangar facilities (in the foreseeable future)? And how large?
- What are your landside access needs?
- Do the existing terminal facilities meet the requirements for your operation? – question targeted at airlines.
- Does your operation ever suffer from airport congestion? And if so, when and where?
- What infrastructure improvements on airport would improve the operation of your business?
- What do you see is the single infrastructure need on the airport?
- Do you have any issues with the current charging regime at the airport?
- What infrastructure improvements would justify an increase in aeronautical fees if they were developed or could be developed sooner?
- What is your preference? Funding your own development for hangars etc. or having the airport or other parties provide the development?
- Do you have any points you would like to address?

Stakeholders consulted are listed in Table 4 below.

Table 4: Stakeholder Engagement – Contacts

Operator	Contact	Date of Discussion
Regional Express	Warrick Lodge	18/11/2022
Qantas	Luke McCabe, John Le, Gaeth Alshamsi, Christopher Mazza	11/11/2022, 22/11/2022
RFDS	Justin Marr, Jackie Hanniver, Malcolm Dening, Paula Ramien	11/11/2022, 8/12/2022
Broken Hill Aero Club	Daniel Timperio	20/12/2022
Martin Aviation	Paul Martin	9/12/2022
Consolidated Aviation Services	Mike Grogan	9/12/2022
H&A Aviation	Hugh Lord	21/12/2022

5.1.1 Aircraft Operators

As a result of stakeholder engagement, the following issues were raised or main themes were identified by aircraft operators:

5.1.1.1 Regional Express (Rex) - ZL

Rex were monopoly airline at BHQ until QANTAS commenced operations in 2022.

- As of late 2022 - three flights / day to Sydney (SYD) and two flights / day to Adelaide (ADL). As of late 2022, one SYD service was via Dubbo (DBO) on weekdays and one ADL service via Mildura (MQL) with connections to Melbourne (MEL).
- All aircraft are SAAB 340 with 34 – 38 seats
- One SYD aircraft parked overnight at BHQ.
- Additional ADL service is foreseen. This would need overnight parking – no facilities at present for additional overnight aircraft.
- There are some Rex operated charters additional to scheduled services.

Traffic patterns:

- Most traffic is government, business and medical.
- Some seasonality – December and January are quiet and some capacity is taken out, usually the overnighting SYD flight.
- The Community fare (lower cost fares available up to 30 days prior to travel) does underpin some percentage of travel.
- No plans for further route expansion from BHQ at this stage
- At some stage in the 5 – 10 year an aircraft upgauge to approx. 70 seats may occur.

Infrastructure issues:

- No issues with infrastructure at present – suits Rex needs
- No apron capacity issues as there is no overlap with QF
- No plans for any infrastructure investment

5.1.1.2 QANTAS - QF

QANTAS commenced Broken Hill operations in 2022 using Q300 (51 seat) aircraft. Initially there were 3 flights / week to Sydney (SYD) which increased to 5 weekly by late 2022.

The major issues identified have been:

- Load factors (approx. 56%) do not warrant upgauging or additional services at this stage.
- Upgauging to Q400 (74 seats) would require security screening at BHQ.
- Flight timings or day of week may change as an ongoing response to traffic and demand. The situation is being monitored.
- No plans for further route expansion at this stage.

Infrastructure issues:

- A baggage reclaim carousel would be preferred over the current cart collection on both safety and passenger convenience grounds.
- Preference for covered walkways to aircraft to provide weather protection.
- Some apron access security issues due to inadequate controls.

5.1.1.3 Royal Flying Doctor Service (RFDS)

The RFDS provide 24 hour medical emergency service from Broken Hill to remote locations in outback NSW, SA and South West Queensland. Three aircraft are based at BHQ – sometimes with aircraft in maintenance up to 5 aircraft may be on the ground.

The maintenance base has two bays. Maintenance is provided for operations from Broken Hill, Dubbo, Launceston and Essendon.

RFDS Aircraft size is limited by the capabilities of the remote air strips flown to.

Operational Issues:

- 24 hour ambulance access required to airfield through the proposed RFDS visitor centre car park

Infrastructure issues:

- The RFDS medical clinic needs expansion space. The RFDS sees an expansion into the car parking area as the logical move
- Additional car parking is required. The old fuel area is seen as ideal.
- Secure car parking is needed for after hours staff.
- There is the need for a fourth aircraft parking position.

- It is considered ideal to have additional hangar space which may also act as a paint shop. This could be an RFDS business enterprise by serving additional customers.
- Current apron and Taxiway Bravo only rated to under 5700kg. It would be preferable for apron to be rated to 10 tonnes.
- Apron lighting needs improvement
- Airside shelters are required for weather protection (sun protection).

5.1.1.4 Broken Hill Aero Club

The Broken Hill Aero Club is a social club located on airport which holds functions and undertakes some flight training. The hangar and clubhouse have recently been upgraded. The hangar has capacity for up to three small aircraft. Only one housed in late 2022. The clubhouse redevelopment was funded by a NSW Government grant.

The Aero Club has 35 – 40 members. The club is optimistic that this will increase in future.

Some members own aircraft that are housed in other hangars on site.

Infrastructure issues:

- Unavailability of 98 Octane fuel on site. Fuel needs to be obtained at local petrol stations and brought in. Availability of 98 fuel would encourage more itinerant visitors to BHQ
- Single runway access point to runway through Taxiway Alpha. Awareness of the situation is required and there is potential for conflicts.
- Aero club members like that there is a separate GA apron – no mixing with scheduled operations and RFDS.
- Aircraft need to be housed in hangars due to harsh climate conditions.
- It is thought that members would prefer to own their own hangars.

5.1.1.5 Martin Aviation

Martin Aviation is largely a charter operator. It charters aircraft to RFDS, local health service, Federal Government, Land Service and Outback tourism. As of late 2022, the business is in the process of being sold to H&A Air.

2 aircraft on site – an Aerocommander and Cherokee 6 parked in hangar.

There is seasonality of charter demand – mining and health all year, tourism only in cooler months.

Infrastructure issues identified:

- Need for bigger hangars for larger aircraft – there is unmet demand at the airport. Demand is for 9/ 10 seat aircraft – King Air 350 or Cessna Citation jets.
- Hangar investment needed before aircraft purchased as environment is harsh.
- Hangar areas could be three times as large.
- Preference indicated for airport to develop hangars and lease back to operators.
- Single taxiway (TWY Alpha) is a congestion point.
- RWY 14/ 32 necessary in crosswinds and would be used more if it was sealed. Crosswind risk to aircraft and people if runway not available.
- Preference for an ILS.
- Apron lighting needs improvement on GA and RFDS aprons.
- Taxiway conditions and lighting are poor and loose gravel can damage aircraft.

- Refuelling configuration could be improved as there is not enough space at refuelling bowser.
- Facilities at BHQ don't justify current level of airport charges.

5.1.1.6 Consolidated Aviation Services

Consolidated Aviation Services provides maintenance and repair for light aircraft under 5700kg. They also run the refuelling facility for Air BP.

Consolidated own two aircraft – a Piper 180 and a Beech Bonanza housed in the hangar.

Four full time plus three casual staff on airport

Infrastructure issues:

- Tanker access to the fuel storage tanks can be difficult when ground is muddy. and can cause contamination of underground tank
- Need for a helipad as there is wash from helicopters being located close to hangars. Rotor wash blows dust and wind into hangars.
- Preference for future hangar development land to be freehold.

5.1.1.7 H&A Aviation

H&A Aviation run scenic and charter flights as well as aerial mustering. Charters are for health, government services, mining and flood relief sectors.

H&A is a long term airport user and has recently taken over Martin Aviation. H&A own two aircraft – a four seater and six seater parked in the hangar.

A helicopter will come on line soon which will be housed at Broken Hill airport some of the time.

Seasonality of charter demand – mining and health all year, tourism only in cooler months.

Infrastructure issues:

- Would like to have expanded hangar space ideally another 6m width.
- There is a lack of hangar space at the airport for private owners.
- Demand for 9/ 10 seat aircraft – King Air 350 or Cessna Citation jets.
- There are operational issues when aircraft are parked on taxiways – usually private but occasionally military.
- Need for a full length taxiway so that aircraft – particularly RFDS – can get in and out from the runway.
- Runway 14/ 32 not used unless absolutely necessary because it is unsealed. Would probably be used more if it was sealed.
- Preference for freehold hangars so that they can be suited to the operation.

5.2 Forecasts

The development of robust forecasts is key to the success of the overall strategic planning and development process as the forecasts are a key input to all aspects of future planning provision.

5.2.1 Forecast Methodology

The previous BHQ forecasts were reviewed, and their methodology determined. Research was undertaken to determine the extent to which the existing passenger services are tied to econometric factors and existing aviation business units. Input from airport management was also incorporated into the forecasts. Key forecast development factors were:

- Econometric: a dependent variable (e.g. passenger traffic) is correlated with a set of independent or explanatory variables (e.g. price, population, personal income, etc.). The process consists in determining the model's ability to accurately predict historical values and conduct statistical tests of reasonableness. Results are also evaluated in context of historical traffic patterns and the effect of Covid-19.
- Time series: this methodology consists in projecting historic trends into the future using time (n=2020) as an independent variable. Given the effect of the Covid-19 pandemic on passenger numbers, 2019 will be used as the most recent year of data that best reflects historical trends. Near term traffic is based on a return to existing service levels and input from stakeholders.
- The peak hour methodologies have been determined by using the IATA definition (peak hour on the peak day in the average week in the peak month). Peak hour numbers will drive input into stand demand and terminal planning.

In developing the forecasts, the following were considered:

- Underlying Demand for Air Travel (Socio-economic analysis)'
- Aviation Market Assessment'
- Forecast Impact Factors'
- Forecast Methodology Summary.

These are outlined further in the sections following.

5.2.1.1 Underlying Demand for Air Travel (Socio-economic analysis)

In order to establish causal link between the level of aviation demand and economic activity, the team has researched and compiled source data relative to the business, economic, tourism, employment and population characteristics of Australian air transport market at the local, state and national level. These include trends and forecasts for:

- Gross Domestic Product/Gross Regional Product: this is perhaps the most comprehensive measure of the overall size of an economy;
- Population;
- Income per Capita and Employment.
- Industry Clusters: It is important to understand growth and diversity of industry clusters to identify correlation with air traffic at the airport;
- Tourism: Currently not in Broken Hill a critical component of passenger volumes but increases in the aviation share of tourism will flow on to airport growth.

Figure 65:Demand Drivers

The Gross Domestic Product of Australia, New South Wales and the Broken Hill region were analysed. These found:

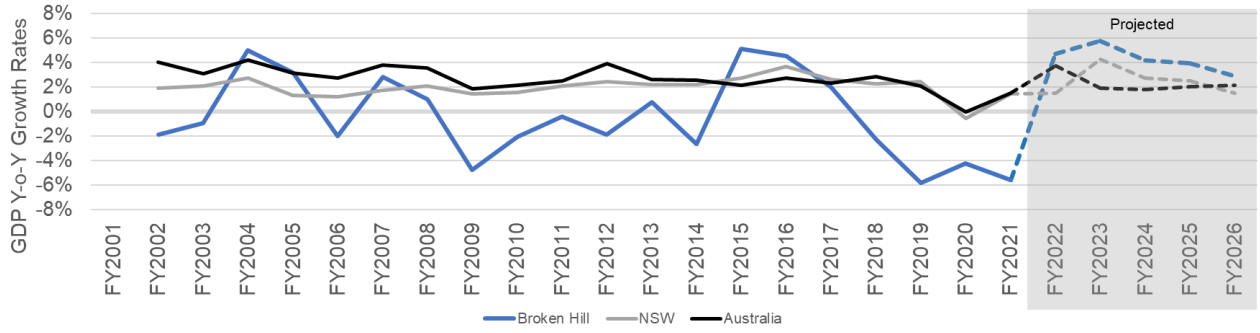
- Australia GDP: Growth rates of 3% per annum pre-COVID
- NSW GDP: Growth rates of 2% per annum pre-COVID
- Broken Hill GDP: Growth rates varied greatly based on local mining industry.

Looking forward post Covid, the analysis showed:

- NSW GDP projected to grow 2-4% per annum in the near term.
- Broken Hill GDP assumed to follow similar trends.

Historical trends and near term forecasts are shown in Figure 66 below.

Figure 66: Broken Hill, NSW, Australia GDP Growth[45]



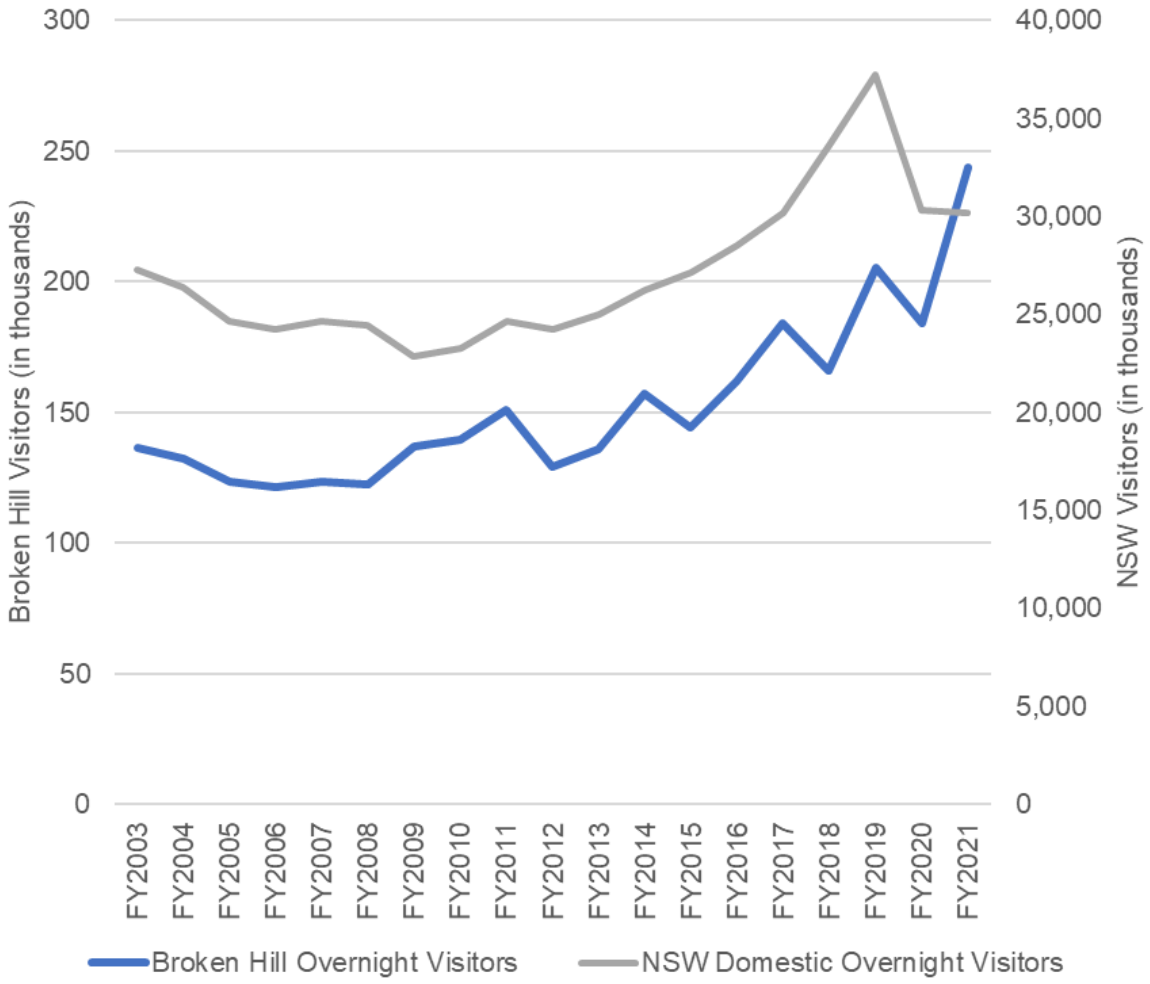
[45] Sources: Broken Hill City Council; Australian Bureau of Statistics; Government of New South Wales.

The major issues in determining local growth rates were:

- Broken Hill population:
    - Dropped from 19,361[46] in FY2006 to 17,588[47] in FY2021.
    - Council advice is that the population is projected to grow to 19,000-26,000 by FY2026.
- NSW Population:
    - 8.07 million at 2021 census.[48]
    - Projected to grow 1% per annum in the future.
- Broken Hill domestic overnight visitors grew 3.3% per annum from FY2003 to FY2021 compared to 0.6% for NSW.
- Broken Hill overnight visitors projected to grow about 3% per annum through FY2042.
- Limited hotel and housing capacities could be an issue over the forecast period.

Historical visitor trends are shown in Figure 67 below.

Figure 67: Broken Hill Historical Visitor Trends[49]

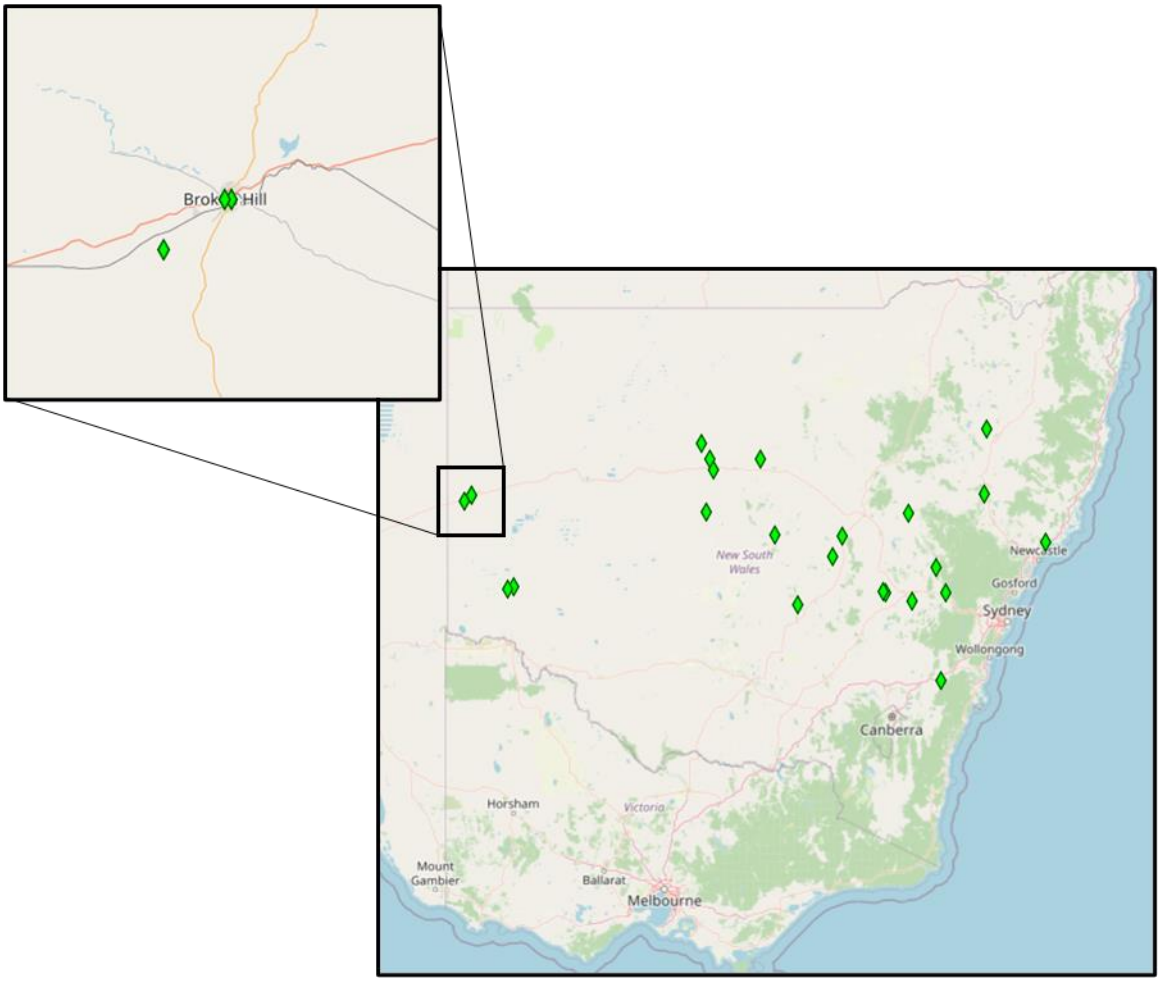


[46] https://www.abs.gov.au/census/find-census-data/quickstats/2006/LGA11250
[47] https://www.abs.gov.au/census/find-census-data/quickstats/2021/105021097
[48] https://www.abs.gov.au/census/find-census-data/quickstats/2021/1
[49] Sources: Broken Hill City Council; Tourism Research Australia

The impact of actual or potential mining projects were also analysed. These projects have the potential to generate additional charter and/ or FIFO traffic at BHQ. These projects include:

- Main ongoing projects: Cobalt Blue, Hawsons Iron Ore Project
- Upcoming project: Hydrostor (~2024) with an estimated contribution of $450+ million to the economy

Figure 68: Planned NSW Mining Projects (Broken Hill area shown in inset)



5.2.1.2 Aviation Market Assessment

The objective of this task was to update and compile historical data for passenger movements and aircraft movements at BHQ to better understand historical trends and air service offerings.

The focus was on the following aviation activity components:

- Aircraft Gauge and Range Analysis: Based on the existing runway length, possible maximum aircraft sizes and their potential range or payload were considered. These were then factored into the forecast development.
- Commercial Passenger Service (passenger base, air service): analytic considerations included carrier mix (existing airlines users and possibility of new entrants), importance and effect of the local fare scheme, number of markets served, average airfares, aircraft types deployed at the airport. An

analysis of potential regional air service competition focussed on the amount of market overlap between airlines, airfare competitiveness, uniqueness of services, and determined which airlines are providing competition.

- A major assumption that impacts both annual passenger growth and the fleet mix is that there would not be a substantial upgauging of scheduled services during the reference period of the master plan. Therefore, the largest scheduled aircraft forecast to use the airport would be the 74 seat Q400 (used currently by QF). Larger Code C jet aircraft (F100, B737 or A320) would be limited to itinerant or mining charters.
- The possibility of scheduled service upgauging to Code C jets provides opportunities to open new routes to Broken Hill and would be of major benefit to the tourist industry. However, significant growth in the tourism sector could not occur without a major expansion of hotel beds and associated tourism infrastructure.

5.2.1.3 Forecast Impact Factors

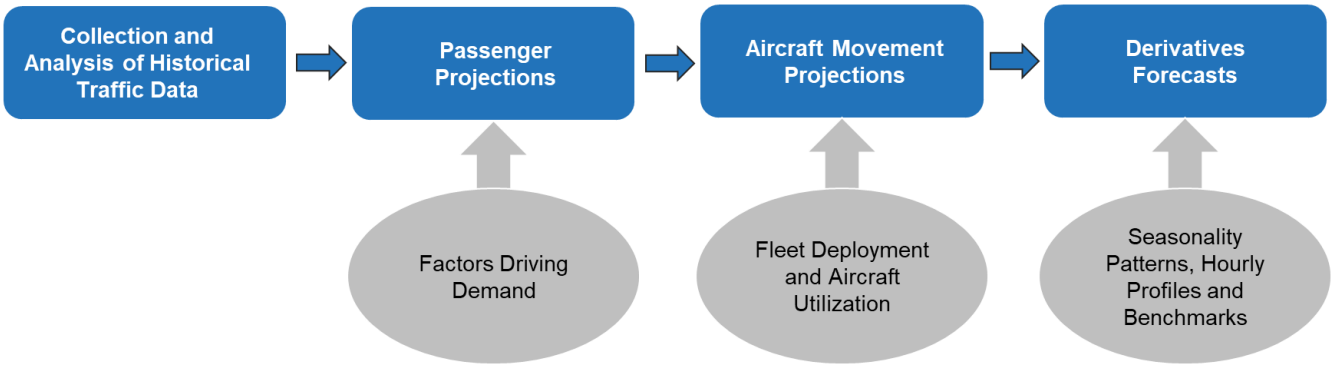
The objective of this task is to develop an overview and discussion of trends and changes occurring at the local, national, and potential future international level that have the potential to influence the activity level, service pattern or type of aviation activity likely to occur in the future at the airport. Factors that could affect the forecasts could include:

- Fuel prices;
- Market competition;
- Airline fare subsidy schemes;
- Future changes in economic indicators;
- Expansion of regional services;
- Aircraft orders and fleet trends;
- Financial stability of airline sector;
- Economic projections.

5.2.1.4 Forecast Methodology Summary

Aviation activity forecast was developed for 20 year design horizon including high and low sensibility scenarios. Passenger activity levels are translated into aircraft movements and fleet mix trends. Annual forecasts are interpreted into busy day and peak hour equivalents for the purpose of facility planning.

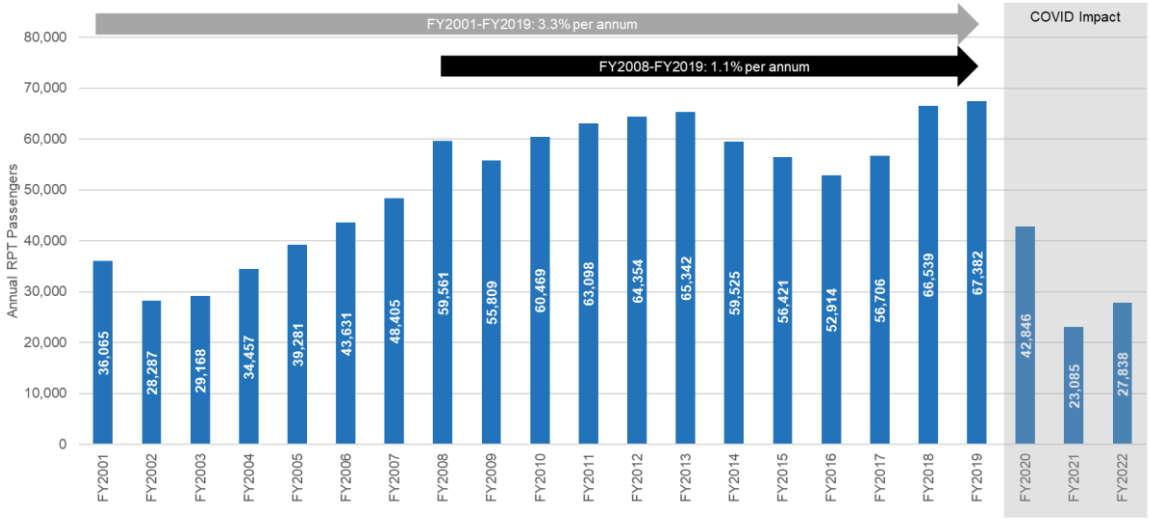
Figure 69: Demand Forecast Process



5.2.2 Historical Passengers

Historical regular passenger traffic (RPT) trends at BHQ are shown in Figure 70 below. These show traffic has been largely stable for periods of time with occasional step ups of activity. During this time, Rex (ZL) has been the major carrier providing scheduled services QANTAS entered the market in 2022 – the impact of an additional carrier is not clear at this time.

Figure 70: Historical RPT Passengers[50]



Regional Express operate the Community Fare scheme at BHQ. This provides discounts if tickets are booked prior to 30 days prior to travel or with 24 hours of travel if tickets are available. Rex have indicated that the scheme underpins some of the traffic at BHQ though this is hard to quantify without access to data.

Historically there has been some – but not a substantial - charter market operating at BHQ. It is expected that as mining activity increases in the region, there will be a greater demand for mining related charter and Fly In Fly Out (FIFO) services to BHQ.

Airline market share including the recent entry of QF is shown in Figure 71 below.

[50] Sources: BITRE; Landrum and Brown

Figure 71: Historical Airline Market Share[51]

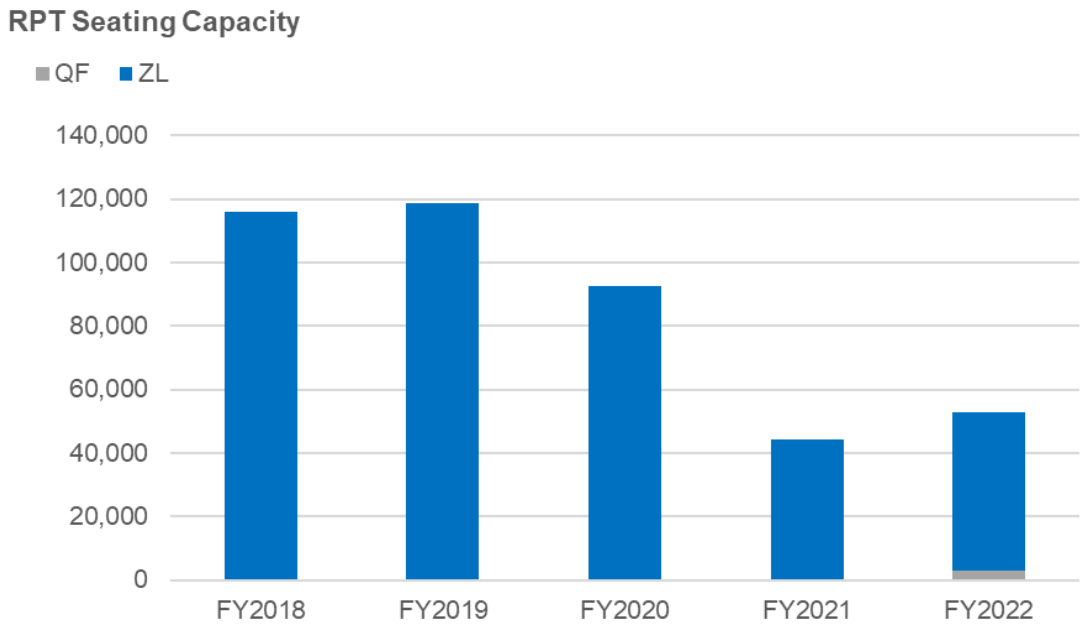
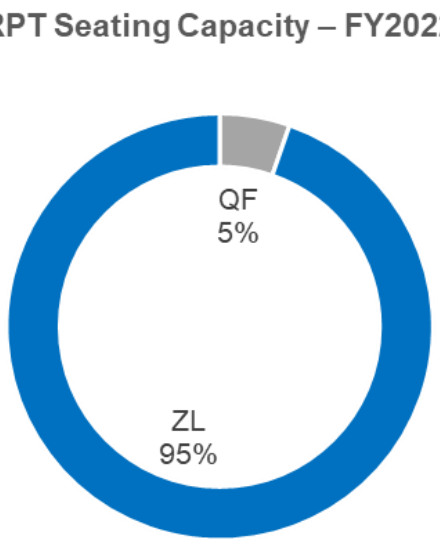


Figure 72: RPT Seating Capacity – FY2022[52]



[51] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown.
[52] Sources: *Diio Mi by Cirium; Landrum & Brown*

5.2.4 Activity Sector Market Share

Broken Hill overall air traffic movements have dropped in recent years from 7,770 in FY2020 to 6,482 in FY2022. This was largely due to the fall in scheduled services. Charters, RFDS and government movements were stable during the pandemic.

Figure 73: BHQ Total Aircraft Movements[53]

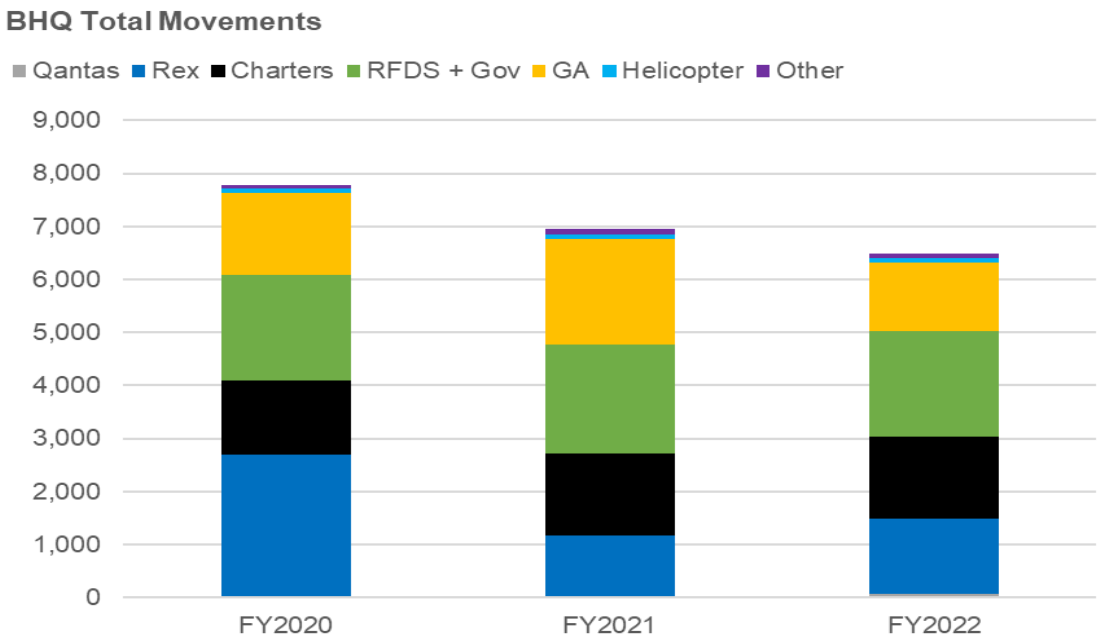
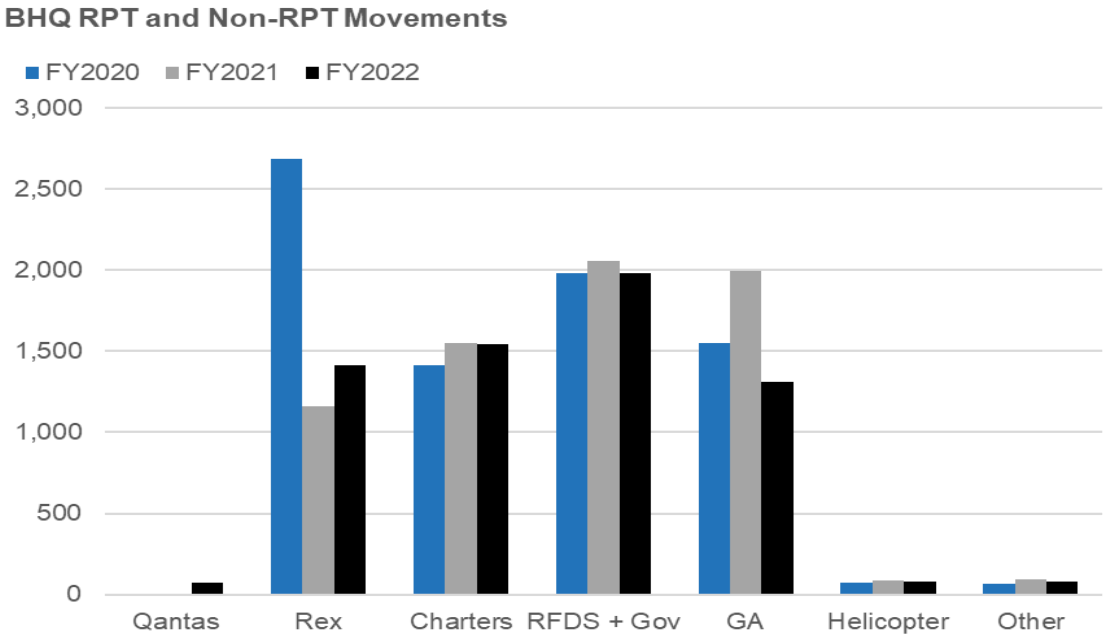


Figure 74: Activity Sector Aircraft Movements



[53] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown

The outcomes of analysis and stakeholder inputs for scheduled (RPT) operation were:

- Regional Express:
    - Rex accounts for the majority of scheduled traffic.
    - No changes in fleet and market expected in the near term.
    - Additional services will occur if demand dictates
- QANTAS:
    - No changes in fleet and market expected in the near term
    - Upgauging will occur if demand dictates however lack of terminal security will be an issue to be resolved.

5.2.5 FIFO Operations

In recent decades, the development of mining operations in remote areas of Australia has become highly dependent on aviation services. These are referred to as FIFO (Fly In Fly Out) services where mining staff from a metropolitan location (Adelaide, Sydney or Brisbane would be the most likely for Broken Hill) to a mining location for a six, seven or eight day shift. There are three types of FIFO operations:

- Closed charters – aircraft are chartered by a mining company and only the staff from that company or site are allowed to fly. Due to the nature of the traffic, neither passengers nor bags are required to be security screened. Closed charters may or may not operate to fixed schedules.
- Open Charters – these are operated by charters companies aimed primarily at the mining industry but there is some capacity for paying passengers. These services generally operate on fixed schedules. As there are paying passengers, it is necessary to security passengers and baggage if the aircraft is of sufficient size – 40 seats or over.
- Scheduled Services – mining companies will make block bookings on scheduled services. As scheduled services, security screening will occur of required.

With mining industry expansion, there is the potential for additional charter and FIFO service at BHQ. In determining the forecast for Broken Hill Airport, the major mining charter operators, their fleets, and their primary focus of operation was considered.

The locations of the various charter airlines and the mining markets they serve is shown in Table 5..

Table 5: Charter operators bases and markets served

Airline Operator	Parent Company	Main Base	Markets Served (States)
Air Link	Aviation Logistics	DBO	**NSW**
Airnorth	Bristow Helicopters	DRW	NT, QLD, VIC, WA
Alliance	Alliance Aviation	BNE	**All states**
National Jet/ Cobham Aviation	REX	ADL	SA, WA
FlyPelican		NTL	ACT, **NSW**

Airline Operator	Parent Company	Main Base	Markets Served (States)
Hinterland		CNS	QLD
Link Airways	Corporate Air	BNE	ACT, **NSW**, QLD, TAS, VIC
Maroomba Airlines	Nantay Pty Ltd	PER	WA
Pel-Air	REX	BNE	**NSW**, QLD, SA
Sharp	Sharp Aviation	MEB	TAS, VIC
Skippers Aviation		PER	WA
Skytrans	Collings Aircraft	CNS	QLD

It is considered that FIFO operations to Broken Hill would focus on turboprops (Q100s, Q300s, EMB120) or small jets (up to ERJ-170 or F70).

As there is little current charter/ FIFO activity at BHQ, forecasts of future activities have to rely on a range of assumptions. It should be noted that it is difficult to quantify the actual number of charter/FIFO operations to be expected at BHQ over the forecast period. As a result, high level assumptions were adopted based on projected mining operations as well as socio-economic trends projected for the local region.

The first investigation was what aircraft types are operated by the various airlines offering charter and FIFO services. These are shown in Table 6 below.

Table 6: Regional / Charter Operators Fleet

Aircraft Type	MTOW (tonnes)	Air Link	Airnorth	Alliance	National Jet / Cobham Aviation	FlyPelican	Hinterland	Link Airways	Maroomba Airlines	Pel-Air	Sharp	Skippers Aviation	Skytrans
Bae 146-300	44.2				4								
Beech Baron	2.3	1											
Cessna 208	3.9						10						6
Cessna 310	2.5	2					4						
Cessna 441	4.5							4				3	
Cessna 510	3.9	5											
EMB-120	11.5		6									6	
ERJ-170	38.6		4										
ERJ-190	51.8		2	25	6								
Fokker 70	39.9			14									
Fokker 100	45.8			25								2	
Jetstream 32	7.0					5							
King Air	4.6	1					2			9			
Metro III	7.3							3			23	5	
PA-31	2.9	3											
Q100	15.6								3			4	4
Q300	19.5								2			6	
Q400	30.5				8								
Saab 340	13.2							11		3			
Westwind	10.7									4			

Those MTOW weights shown in red would exceed proposed runway upgrades.

5.2.6 Annual Forecasts

When considering scheduled traffic, the near-term growth schedule fillings show that seating capacity at BHQ will be back to pre-COVID levels in Q4 2022. For medium/ long-term growth the BHQ RPT passengers projections use a combination of linear regressions and trend analyses against the following variables:

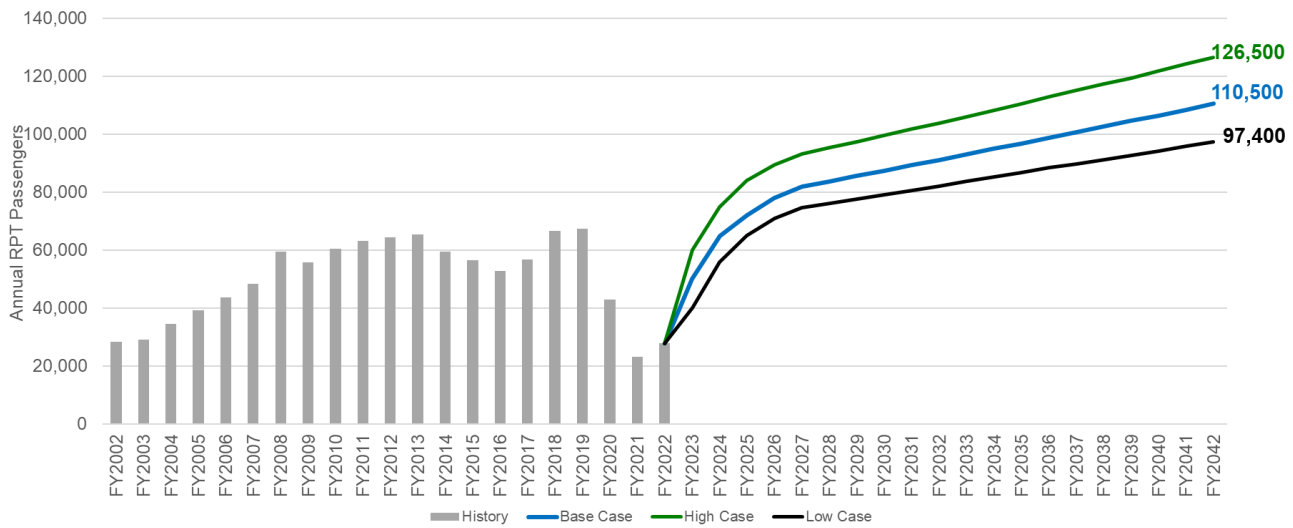
- Australia: GDP and population
- NSW: GDP and population
- Broken Hill: GDP and population
- NSW domestic overnight visitors
- Broken Hill domestic overnight visitors
- Since non-RPT data was only available for FY2020 to FY2022, the forecast focused a ratio analysis

For non RPT and charter traffic It is assumed that this traffic is likely to be driven by local socio-economic and tourism trends. The forecast looked at relationships between non-RPT traffic and:

- Broken Hill GDP
- Broken Hill population
- Broken Hill domestic overnight visitors

Low, medium and high range annual passenger forecasts are shown in Figure 75 below. Growth projections are based on 2022 returning to a level similar to a Pre Covid 'normal'. On the medium range projection, passenger traffic is forecast to grow to 157,100 passengers by 2036 with a CAGR (Combined Annual Growth Rate) of 1.5%. The medium range projection has been adopted for this study.

Figure 75: Scheduled Passenger Demand Projection to 2042[54]



[54] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown.

The key RPT load factor assumptions are based on the equation:

$$\text{Passenger ATMs} = \frac{\text{Total Passengers}}{\text{Average Load Factor} * \text{Average Aircraft Size}}$$

The key assumptions are:

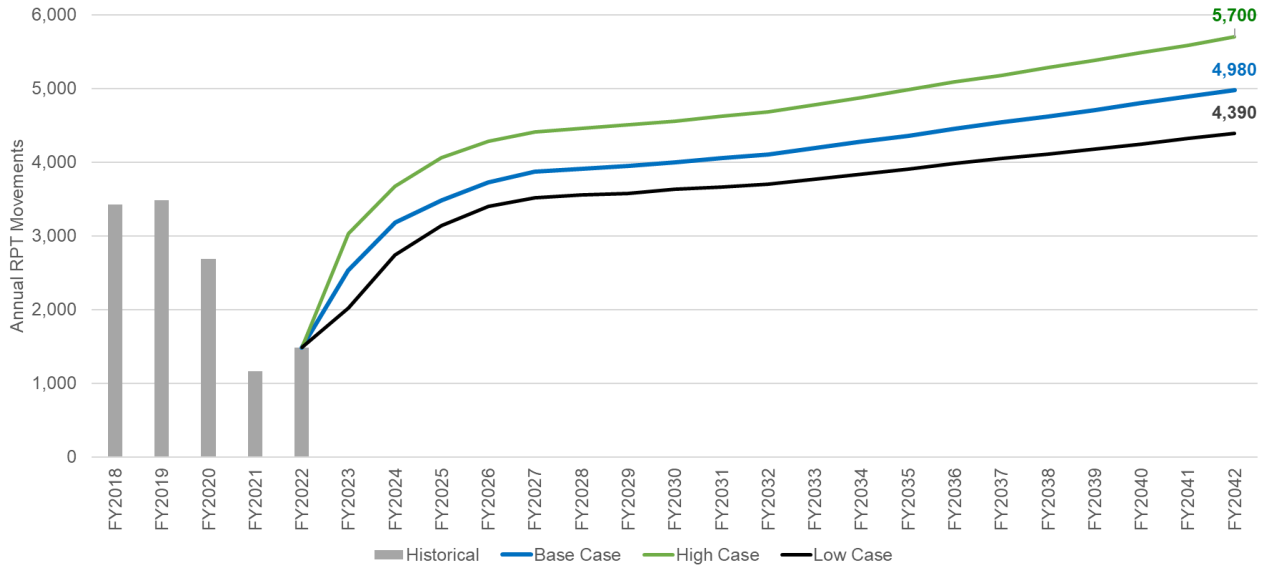
- RPT airlines to continue operating turboprops over forecast period.
- Slight increase in gauge expected over time but most growth to be realised through increases in load factors.

Table 7: Forecast Load Factor and Gauge (Aircraft Seats)[55]

	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023 – FY2042
Load Factors	57%	57%	47%	59%	55%	55-60%
Gauge (Seats)	34	34	34	34		35-37

Annual aircraft movements are forecast at a slightly slower rate than passenger movements as it is anticipated that there will be a higher number of passengers per aircraft. This will be driven by some degree of aircraft upgauging and increased load factors.

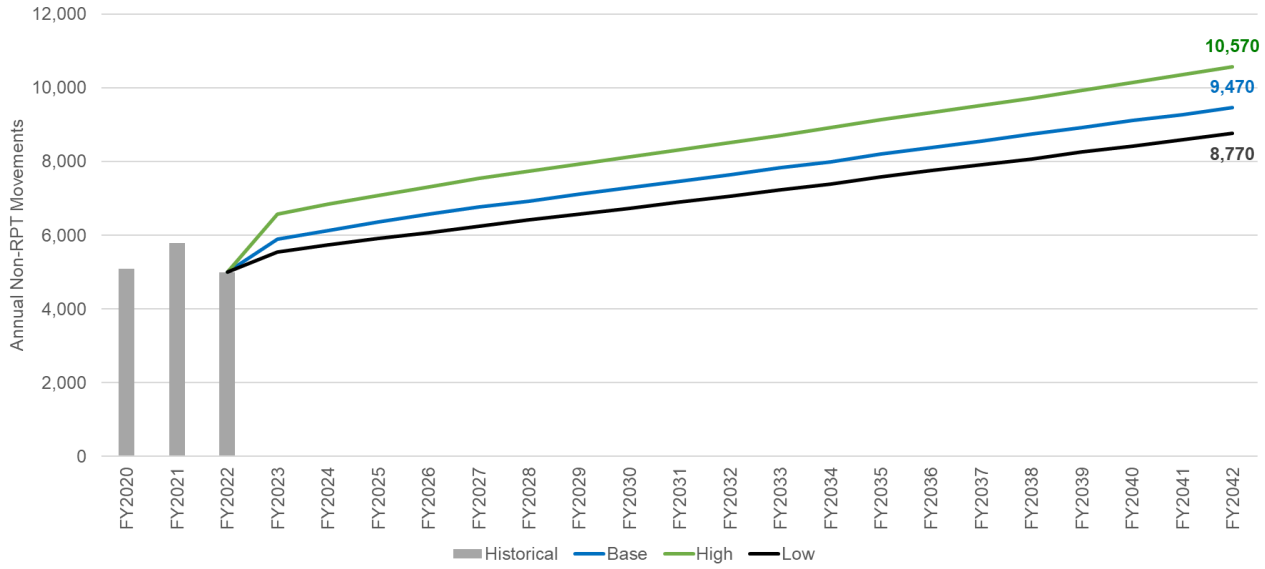
Figure 76: RPT Annual Movements Projection[56]



Non RPT annual movements are shown in Figure 79.

[55] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown.
[56] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown

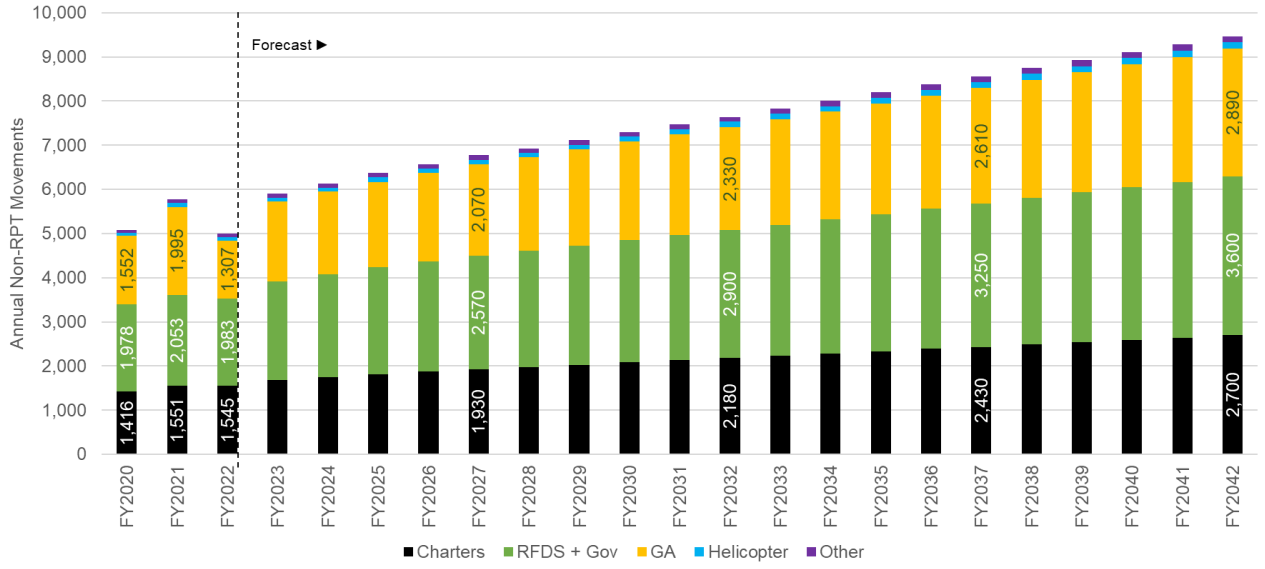
Figure 77: Non RPT Annual Movements Projection



The Non RPT ATM forecast by sector is shown in Figure 78 below. The proportion of the sectors is forecast to be reasonably constant.

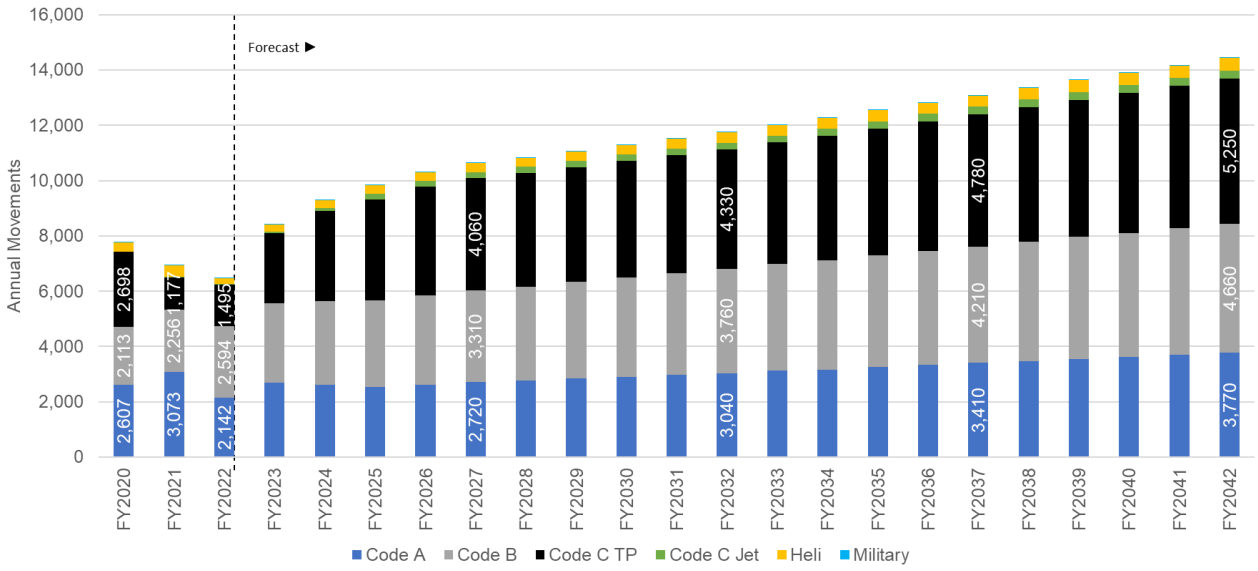
The fleet mix across the RPT and Non RPT sectors is also forecast to be reasonably constant though Code C jets will become important with the increase in mining charters. This is shown in Figure 79.

Figure 78: Non RPT Forecast by Sector[57]



[57] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown

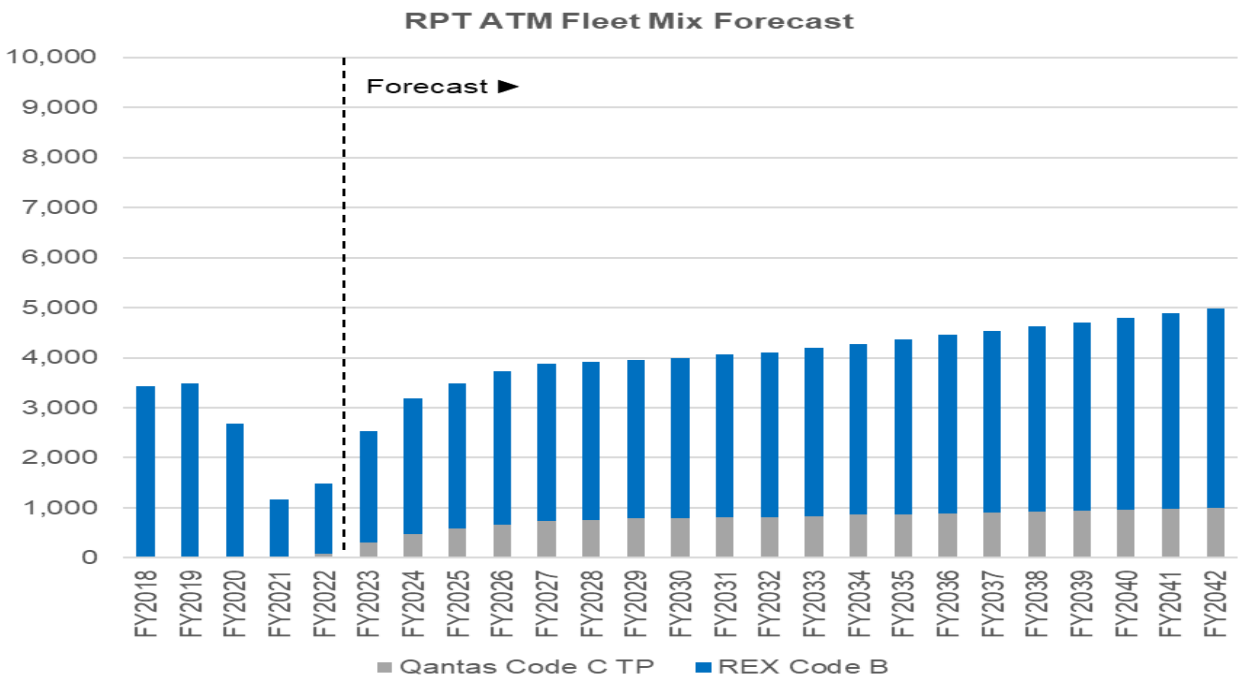
Figure 79: Fleet Mix Projection[58]



The RPT fleet mix and gauge is forecast to remain similar to what is occurring today. Rex is not seen to make a change to its fleet for some time. The QF forecast allows for upgrading to 74 seat Q400 aircraft at a future stage. This is shown in Figure 80.

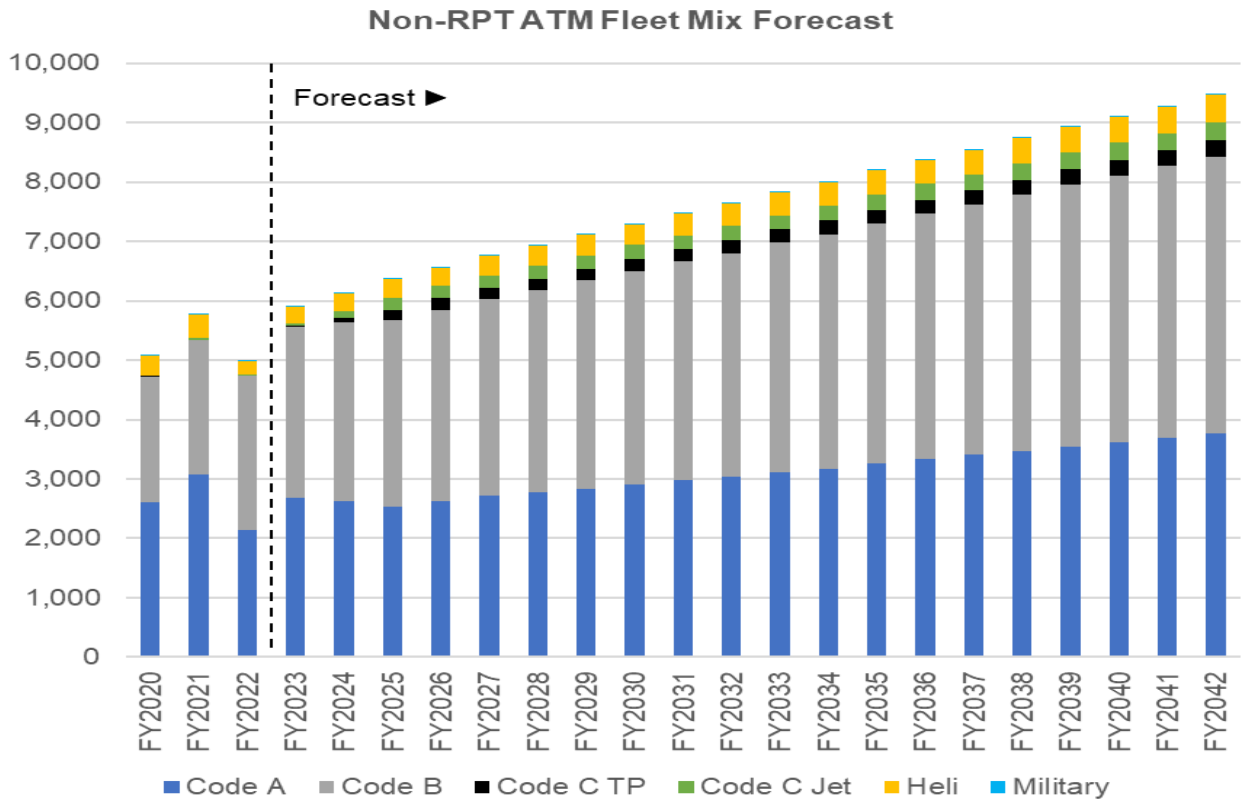
The Non RPT fleet mix will see the biggest forecast growth in the Code B aircraft range. This is shown in Figure 81 below.

Figure 80: RPT Fleet Mix Forecast[59]



[58] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown
[59] *Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown*

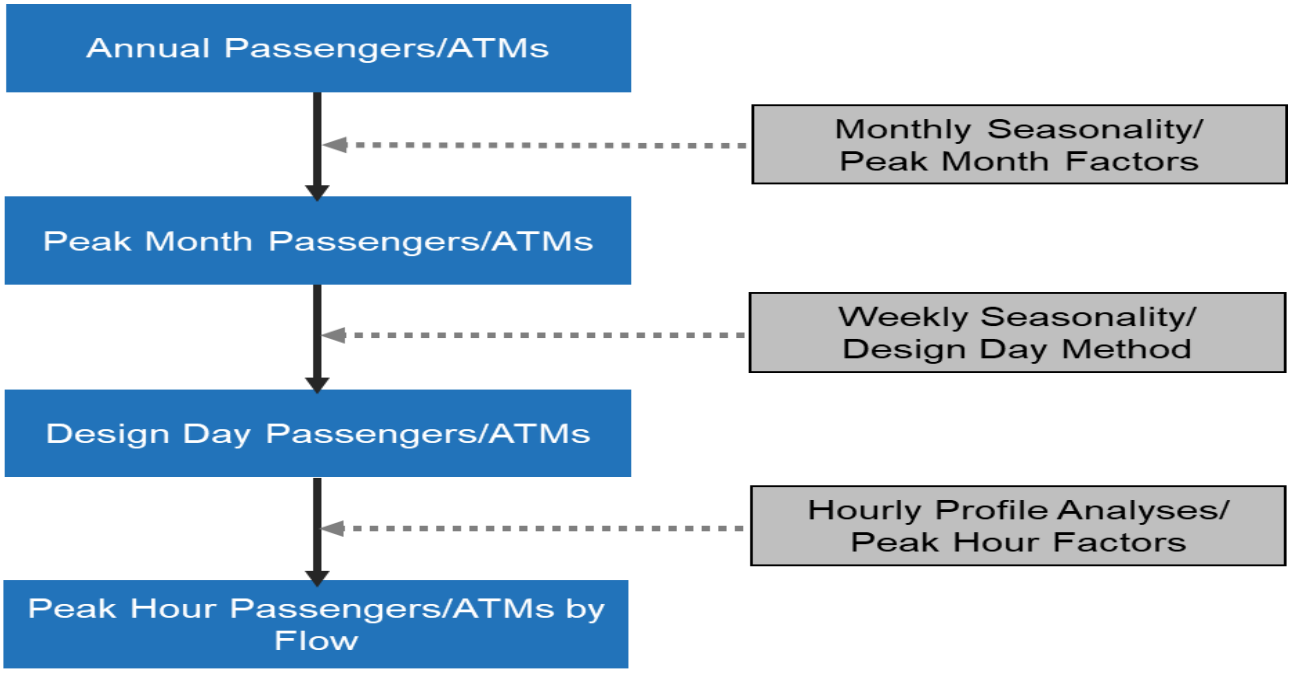
Figure 81: Non RPT Fleet Mix Forecast



5.2.8 Derivative forecasts

Derivative forecasts include peak hours (passenger and aircraft movements) and aircraft stand demand. The approach to developing the derivative forecasts from the annual forecasts is shown in Figure 82.

Figure 82: Derivatives Forecasts Approach



5.2.8.1 Monthly Seasonality

As discussed above, 2019 is considered the base year for forecasting as there was no Covid disruption. Figure 83 below shows the monthly passenger traffic profile from July 2019 through to June 2023 – the latter based on schedule analysis. In this case, the scheduled seat numbers have been taken as a proxy for passenger trends. The numbers are relatively stable for most of the year with a distinct drop in traffic in December, January and to some extent in February. Figure 84 shows similar patterns for ATM aircraft movements.

Figure 83: Monthly Seasonality – Passengers[60]

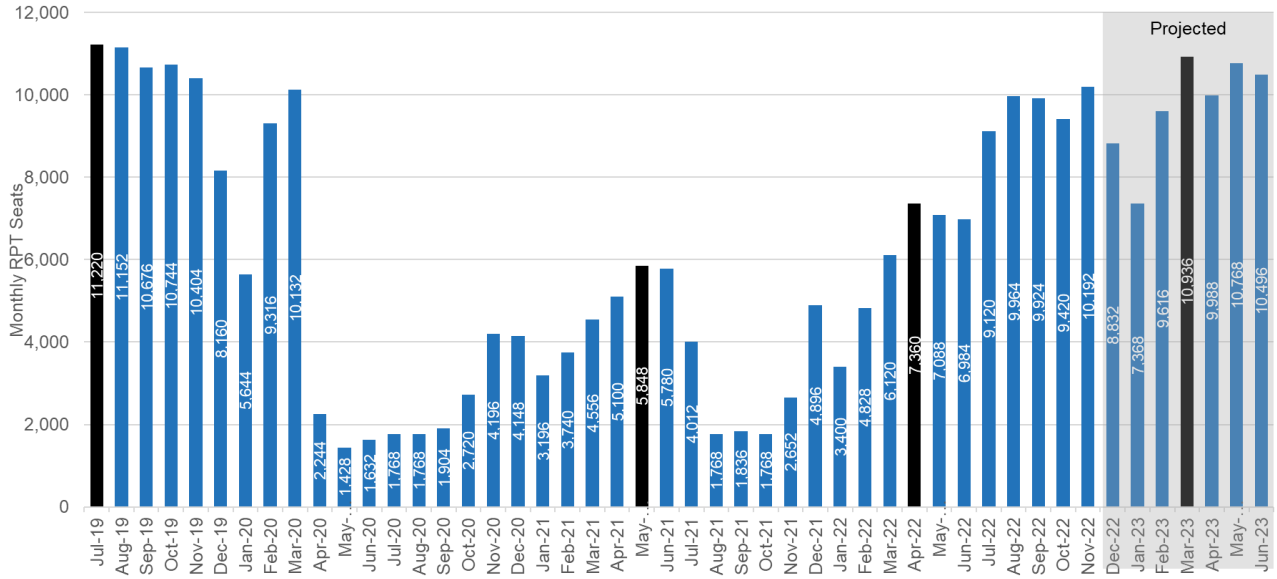


Figure 84: Monthly Seasonality – RPT ATMs

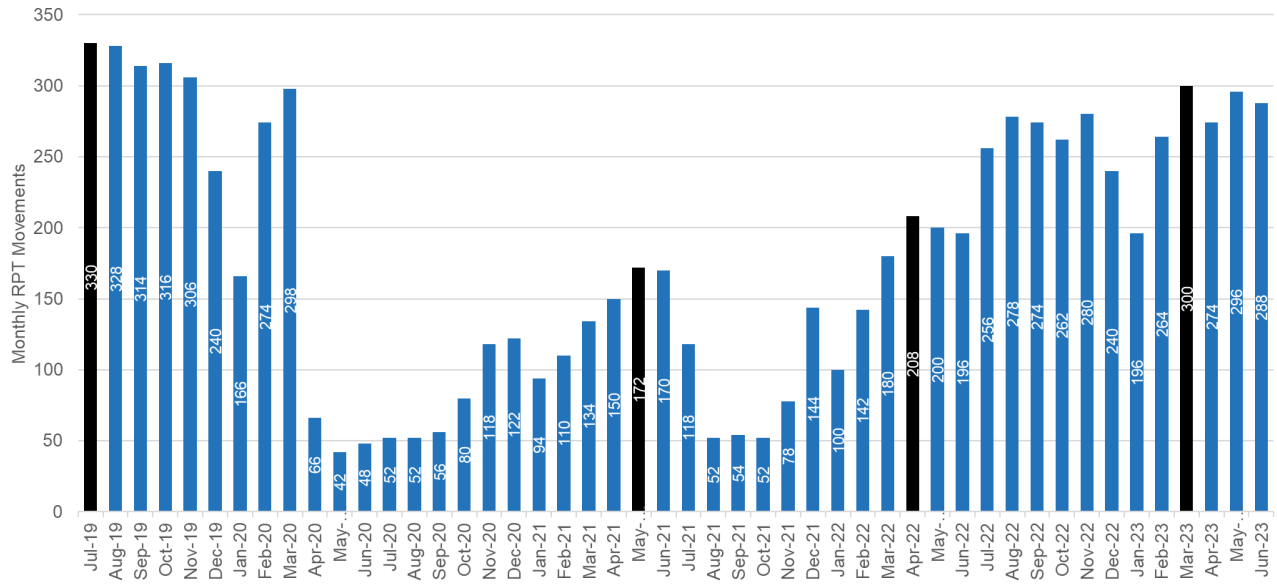
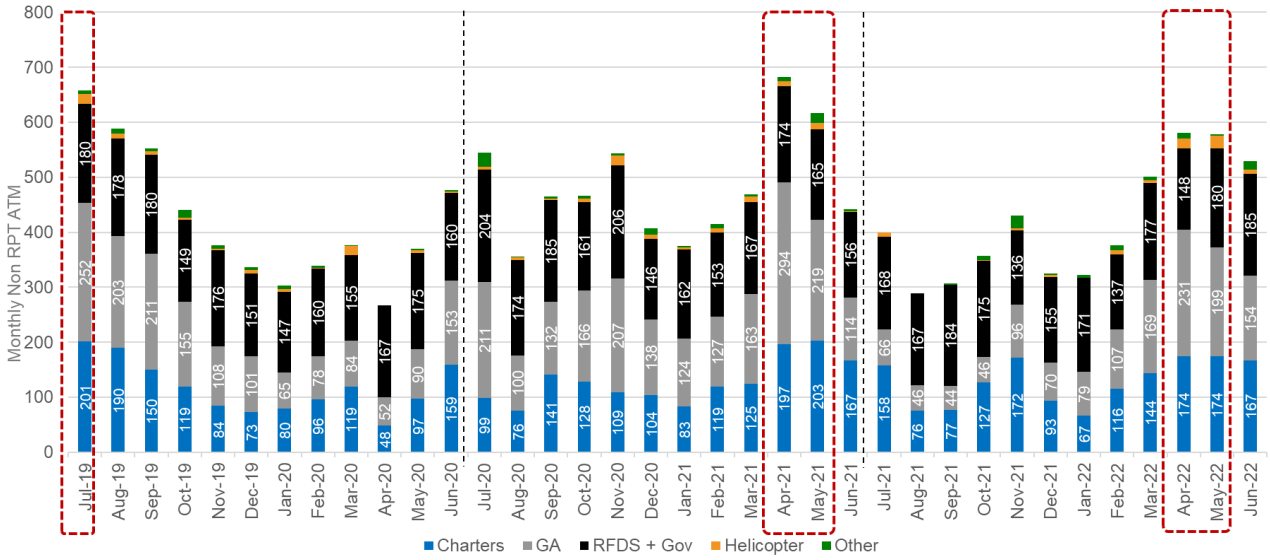


Figure 85 shows the monthly seasonality for Non RPT movements over the July 2019 to June 2022 period. It is notable that the overall traffic did not noticeably decline over the COVID period. As with RPT traffic, there is a distinct decline in traffic over the summer months but unlike RPT traffic, there is a distinct peak mid year.

[60] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown

Figure 85: Monthly Seasonality – Non RPT Movements

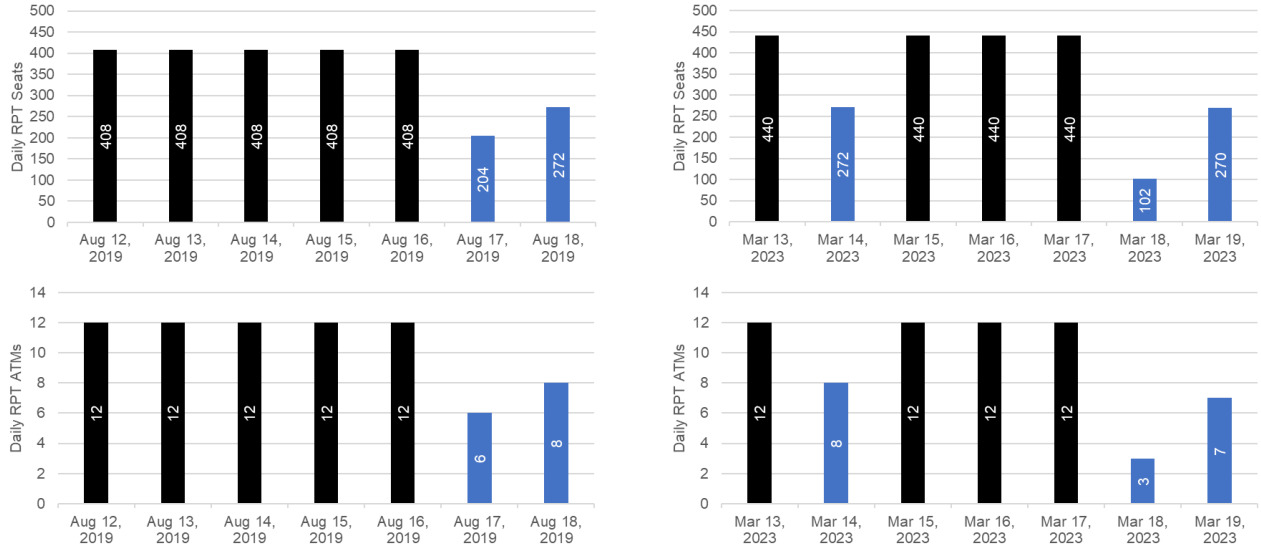


5.2.8.2 Weekly Seasonality

The design day has been identified using the IATA definition of second busiest day of average week of peak month. As for peak month, a design day representative of all activity sectors was selected. Wednesday fits these criteria though there is little difference over other days of the week. This lack of difference between days has facility benefits as there will be a high level of utilization of assets over the week and future facility provision will not be driven by one day or a poor level of service on one day of the week.

Figure 86 below shows a comparison of weekly RPT traffic patterns between 2019 and 2023. The number of weekly seats is slightly higher partly due to the introduction of QF services. However, there has been a distinct decline in weekend services and capacity.

Figure 86: 2019 – 2023 Weekly Comparison



Daily non-RPT ATM levels vary greatly from day to day. Analysis shows busy days would fall somewhere around 29-37 daily ATMs.

Several days in FY2020, FY2021, and FY2022 were analysed in order to find a busy representative of all non-RPT operations (charters, RFDS, GA, helicopter and other). These are shown below.

Figure 87: Daily Non RPT ATM July 2019[61]

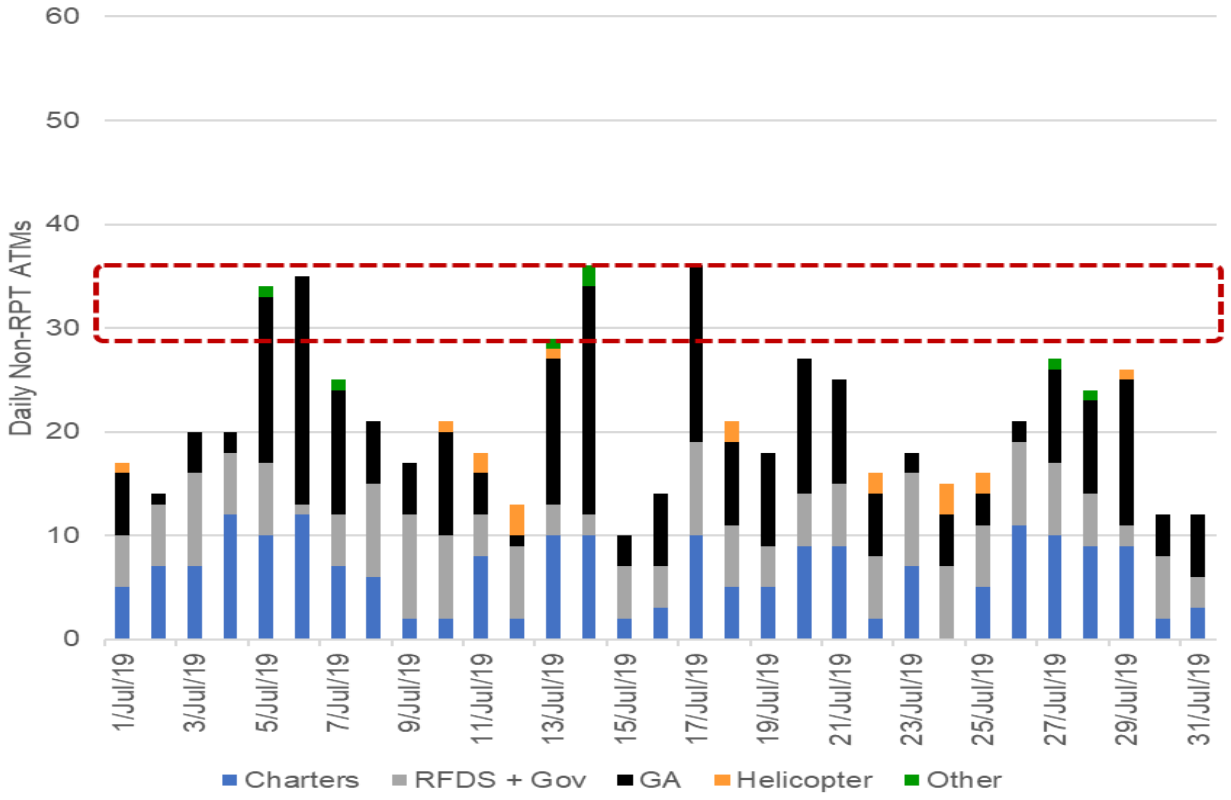
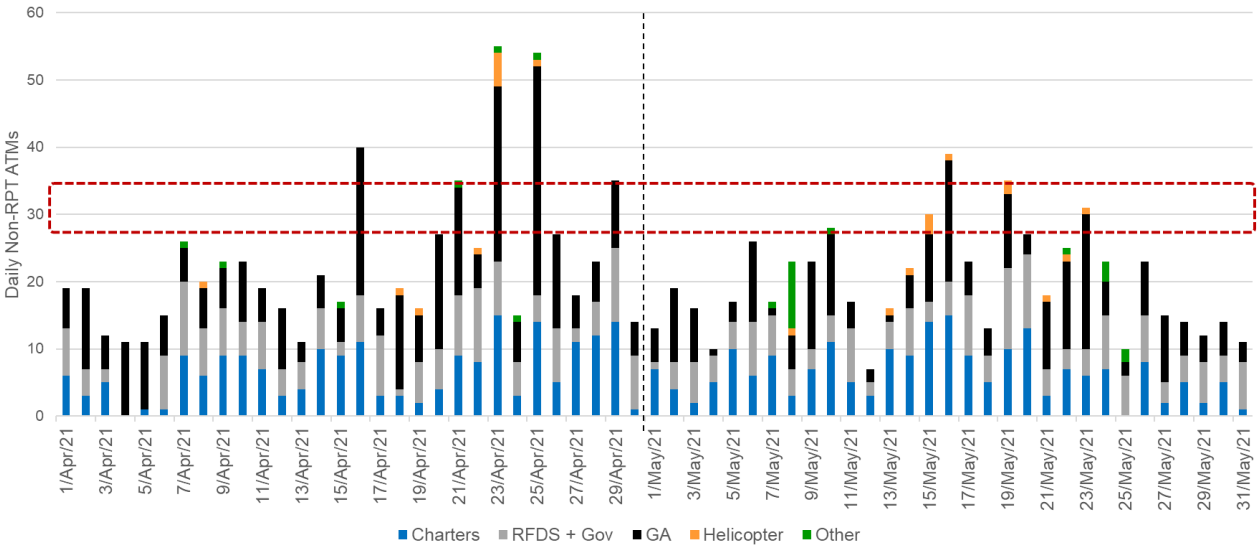
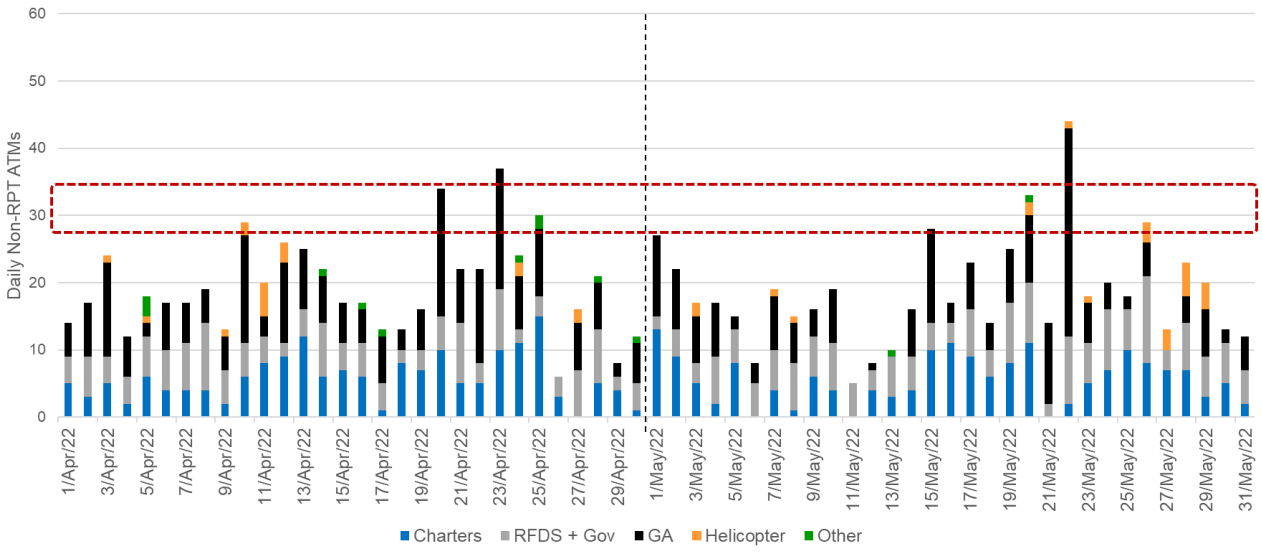


Figure 88: Daily Non RPT ATM April – May 2021[62]



[61] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown
[62] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown

Figure 89: Daily Non RPT ATM April – May 2022[63]

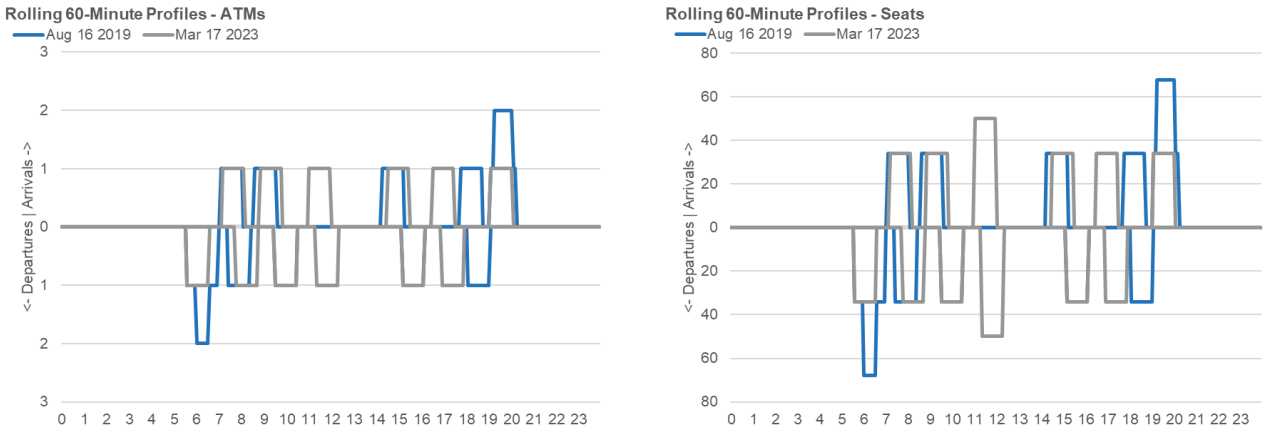


5.2.8.3 Hourly trends

In the post COVID period, there have been changes in the hourly seat and ATM profiles. These are shown in Figure 90 below. The pre-COVID peaks showed arrivals in the evening and departures in the early morning (for both ATMs and seats) with the overlap of 2 REX flights. At the time there were two Rex aircraft overnighting at Broken Hill.

The post-COVID peaks have largely flattened though is now a midday peak for seats that is driven by larger 51 seat QF Q300 aircraft.

Figure 90: Rolling 60 minute ATM / Seats Comparison[64]

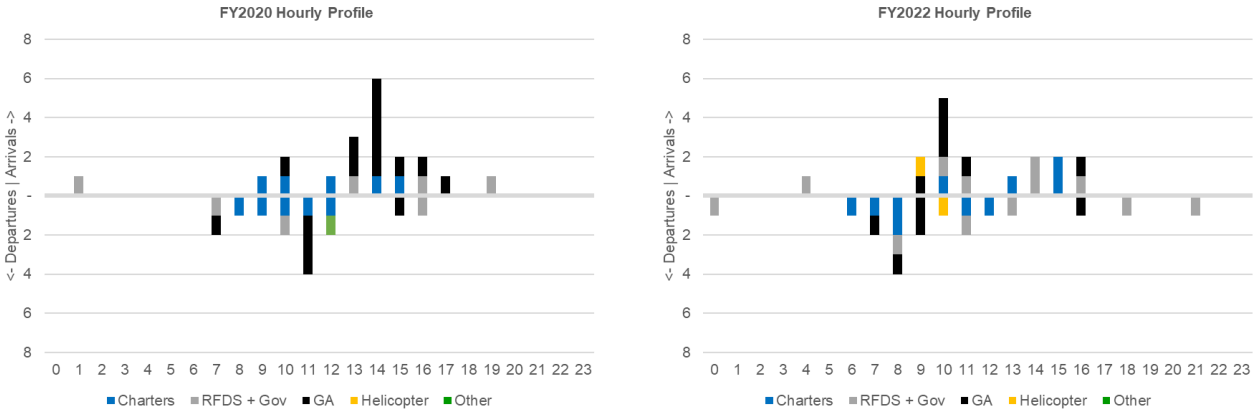


The non-RPT hourly profile (and activity sector mix in the peaks) also varies from day to day. The peaking patterns show non-RPT arrivals peaking at about 4-6 ATMs per hour while departures peak at about 4-5

[63] Sources: BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown
[64] BITRE; AvData Analysis; Diio Mi by Cirium; Landrum & Brown

ATMs per hour. Hourly movements in 2022 were slightly down in 2020 as there was still reduced GA activity post COVID. These are shown in Figure 91 below.

Figure 91: Non RPT ATM Hourly Trends 2020 and 2022



5.2.8.4 Derivatives Summary

Table 8: Derivatives Summary – Passengers

							Forecast ▶			
			FY2019	FY2020	FY2021	FY2022	FY2027	FY2032	FY2037	FY2042
RPT Passengers	Annual		67,382	42,846	23,085	27,838	81,900	91,200	100,700	110,500
	Peak Month		7,530	6,287	3,535	4,603	9,000	10,000	11,000	12,100
	Design Day		272	231	170	224	360	400	440	480
	Peak Hour	Arr	45	39	23	**22**	**70**	**76**	**84**	**92**
		Dep	45	39	23	**22**	**70**	**76**	**84**	**92**
		2-Way	45	39	47	**44**	**111**	**122**	**134**	**147**
RPT ATMs	Annual		3,489	2,684	1,161	1,486	3,870	4,110	4,540	4,980
	Peak Month		332	325	152	203	360	380	420	470
	Design Day		12	12	7	10	14	15	17	19
	Peak Hour	Arr	2	2	1	**1**	**2**	**2**	**3**	**3**
		Dep	2	2	1	**1**	**2**	**2**	**3**	**3**
		2-Way	2	2	2	**2**	**3**	**3**	**3**	**4**

Table 9: Derivatives Summary – Non RPT Movements

						Forecast ▶			
			FY2020	FY2021	FY2022	FY2027	FY2032	FY2037	FY2042
Charters	Design Day		12	11	12	14	16	18	19
	Peak Hour	Arr	2	2	2	2	3	3	3
		Dep	2	3	3	3	3	4	4
		2-Way	3	4	4	4	4	5	5
RFDS + Gov	Design Day		7	10	9	11	12	14	15
	Peak Hour	Arr	1	2	1	2	2	3	3
		Dep	1	2	2	2	2	3	3
		2-Way	2	3	3	3	3	4	4
GA	Design Day		16	15	16	20	23	26	28
	Peak Hour	Arr	4	4	3	5	5	6	7
		Dep	5	2	4	5	5	6	7
		2-Way	7	5	6	7	7	8	9
Helicopters	Design Day		1	1	1	1	1	1	1
	Peak Hour	Arr	0	0	0	0	0	0	0
		Dep	1	1	1	1	1	1	1
		2-Way	1	1	1	1	1	1	1
Other	Design Day		1	1	1	1	1	1	1
	Peak Hour	Arr	0	0	0	0	0	0	0
		Dep	1	1	1	1	1	1	1
		2-Way	1	1	1	1	1	1	1

Table 10: RPT AND Non RPT Movements

						Forecast ▶			
			FY2020	FY2021	FY2022	FY2027	FY2032	FY2037	FY2042
Non-RPT ATMs	Annual		5,086	5,781	4,996	6,770	7,640	8,550	9,470
	Peak Month		658	660	570	771	871	973	1,078
	Design Day		37	38	39	47	53	61	66
	Peak Hour	Arr	5	4	4	6	7	8	8
		Dep	5	5	5	6	7	8	8
		2-Way	8	7	7	9	11	12	12
RPT + Non-RPT ATMs	Annual		7,770	6,942	6,482	10,640	11,750	13,090	14,450
	Peak Month		983	812	773	1,131	1,251	1,393	1,548
	Design Day		49	45	49	61	68	78	85
	Peak Hour	Arr	6	5	5	7	9	10	10
		Dep	6	6	6	7	9	10	10
		2-Way	9	8	8	10	13	14	14

The forecast demand in FY2042 of up to 14 two way movements per hour would not drive sufficient demand for long lengths of parallel taxiway to Runway 05/23.

6 Future Demand Assessment

6.1 Aircraft Apron

There are currently two stands on the RPT apron and this will rise to four when the committed works have been completed. It is generally acknowledged that the current two stands are inadequate.

REX used to have two aircraft remain overnight at BHQ pre-COVID but this has been reduced to one. As of Q4 2022, REX and QF do not have overlapping stand demand needs but this could change as the QF scheduling is regarded as fluid.

Based on projected RPT traffic growth, RPT stand needs will grow to 3 stands by FY2027 and 4 stands by FY2037 onwards. The stand demand includes a contingency factor of the stand requirement plus one. The contingency factor provides an operational buffer should there be disruption.

The forecast assumption is that aircraft will be turboprops similar to current operations.

Table 11: RPT Aircraft on Ground Forecast

					Forecast ▶			
	FY2019	FY2020	FY2021	FY2022	FY2027	FY2032	FY2037	FY2042
Design Day ATMs	12	12	7	10	14	15	17	19
Turns per Stand	3.0	3.0	3.5	5.0	3.5	3.5	3.5	3.5
RPT Stand Needs	2	2	1	1	2	2	3	3
Code B	2	2	1	0	1	1	2	2
Code C	0	0	0	1	1	1	1	1
RPT Stand Needs (including +1 contingency)	3	3	2	2	3	3	4	4

Aircraft parking requirements for Charter and FIFO (Fly In Fly Out) sectors are difficult to define as this segment has been traditionally irregular at BHQ. Unlike other airports with significant mining sector traffic, there is not a base to build a forecast from. The sector, in other ports, has been historically erratic and dependent on the vicissitudes of the mining industry. Therefore, the Charter/ FIFO forecasts have a low degree of certainty.

The forecasts were based on the following assumptions:

- RFDS and GA will have their own aprons for aircraft parking.
- Charters/FIFO are assumed to use the RPT apron resulting in overlapping stand needs for RPT and Charters traffic.
- Charters/FIFO stand needs for FY2020-FY2022 were estimated at 3-5 stands on a typical design day (mostly Code A and some Code B).
- Based on projected Charters/FIFO traffic growth, stand needs will grow to 7 stands in the long term with an overall increase in aircraft gauge.

Table 12: Charter/ FIFO Aircraft on Ground Forecast

	FY2020	FY2021	FY2022	Forecast ▶ FY2027	FY2032	FY2037	FY2042
Design Day ATMs	12	11	12	14	16	18	19
Turns per Stand	1.5	1.1	1.2	1.3	1.4	1.4	1.5
Charters/FIFO Stand Needs	3	5	4	5	6	6	7
Code A	3	4	3	2	3	3	4
Code B	0	1	1	2	2	2	2
Code C	0	0	0	1	1	1	1

Historical combined RPT and charter activity shows that there is an overlap of activity particularly during overnight hours pre-COVID. The overlap in stand needs still occurred post-COVID during daytime hours. This is shown in Figure 92 and Figure 92 below.

Figure 92: RPT vs Charter Needs – FY2020

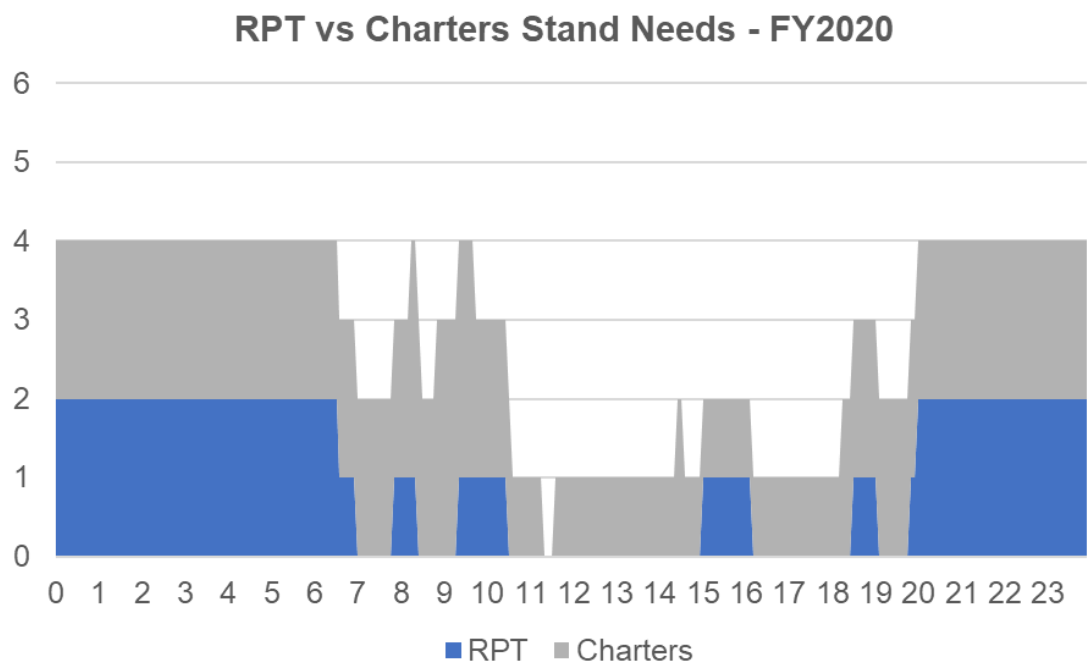
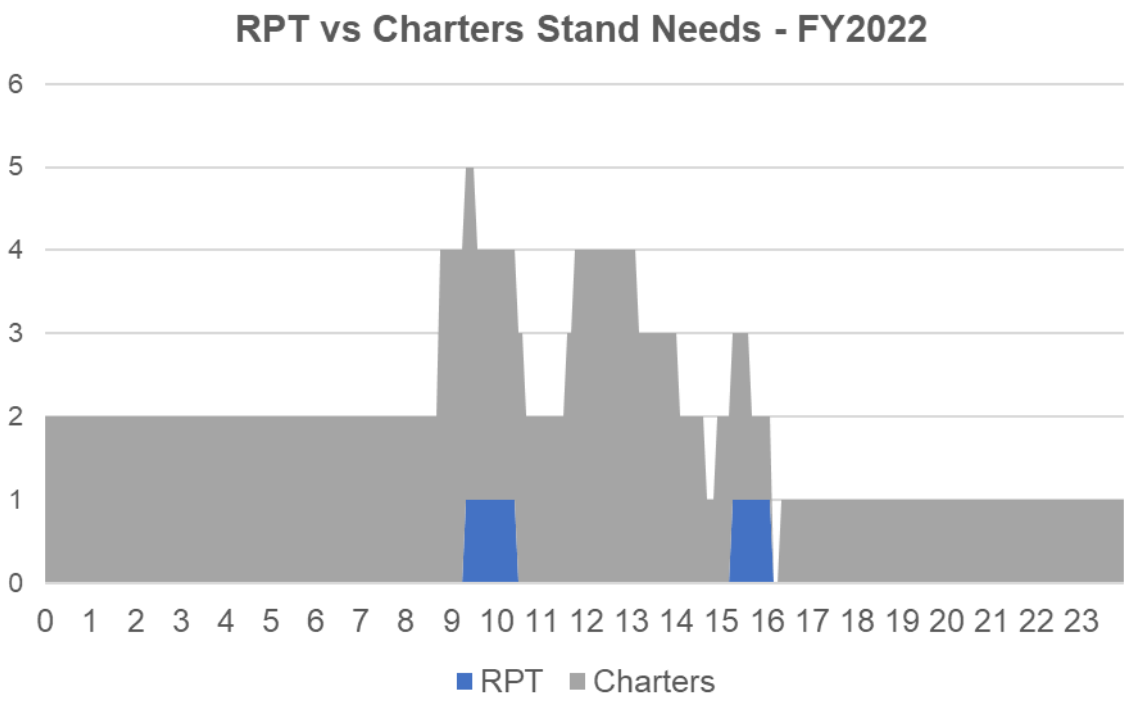


Figure 93: RPT vs Charter Needs – FY2022



While it is difficult to assess at what time the new Charters/FIFO flights will take place, it is reasonable to assume that some overlap in RPT and Charters/FIFO stand needs will propagate over the forecast period.

Overall RPT + Charters/FIFO stand needs are expected to grow to 6 stands by FY2027 and 9 stands long term.

Table 13: Overall Stand Demand

				Forecast ▶			
	FY2020	FY2021	FY2022	FY2027	FY2032	FY2037	FY2042
RPT Stand Needs (Code B + C)	2	1	1	2	2	3	3
Charters/FIFO Stand Needs	3	5	4	5	6	6	7
Code A	3	4	3	2	3	3	4
Code B	0	1	1	2	2	2	2
Code C	0	0	0	1	1	1	1
RPT + Charters/FIFO Stand Needs	4	5	5	6	7	8	9
Code A	2	3	3	2	3	3	4
Code B	2	2	1	2	2	3	3
Code C	0	0	1	2	2	2	2

For the purposes of 2042 planning it was agreed that aircraft parking planning would be based on requirements of 3 x Code A, 3 x Code B and 3 x Code C aircraft. This includes the following assumptions:

- At least one of the Code C stands would be a B737 or A320 to full 36 metre wingspan.

- No provision has been made for longer Code C jets such as the A321 or B737 – 900 range.
- The uncertainty around Charter provision provides the overall contingency. No additional contingency has been applied.
- Code A includes provision for small Code B aircraft such as the Cessna Caravan which are just marginally inside the Code B range i.e have wingspans just over 15 metres.

In addition to aircraft parking stands, a need for additional rotary wing (helicopter) landing and operational areas has been identified. This would be ideally located in a dedicated rotary wing area close to associated GA hangar facilities.

6.2 Terminal Building

Future terminal requirements have been defined through the use of a Terminal Space program. This defines requirements at five yearly intervals from 2022 through to the 2042 planning horizon. This has been developed and takes into account:

- Annual and peak hour passenger numbers.
- Peak hour aircraft movements and stand demand.
- Agreed passenger processing rates.
- Agreed level of service criteria.

Terminal footprint requirements have been determined for both Scheduled RPT services only and taking into account Charter / FIFO operations.

The terminal space program has acted as a guide to the high level terminal plans that have been developed. The outputs include both facilities to be provided and spatial requirements.

Table 14: Terminal Footprint Outputs – Scheduled Services

Scheduled Services Only					
	2027 (no security)	**2027 (security)**	**2032**	**2037**	**2042**
Dep Peak Hour	70	76	76	84	92
Arr Peak Hour	70	76	76	84	92
Terminal Area (m^2)	1,125	1,575*	1,575*	1,575	1,625

If current traffic patterns continue and the terminal only serviced scheduled RPT services, then the current terminal building would suffice for the master plan period. It is likely that in the next few years, there will be a mandated requirement for security screening of passengers and checked baggage.

As the peak hour forecasts are only forecast to rise by a small amount, there is not a need to increase the terminal significantly after the initial security requirements have been met. An expanded terminal is likely to have a long asset life.

The terminal footprint requirements for a significantly expanded Charter and FIFO market have also been formulated.

The charter and FIFO assumption is that 1 x Code B and 1 x Code C are added to the peak hour. Code B aircraft are assumed to have 34 seats (equivalent to SAAB 340 or Q200), Code C to have 74 seats (Q400)

rising to 100 seats (F100/ E190) from 2032 onwards. A 75% load factor for charters and FIFO has been assumed.

The increase in the overall peak hour will require a larger terminal footprint particularly in check in, baggage make up and passenger hold area. These footprint requirements are shown in **Error! Reference source not found.** below.

Table 15: Terminal Footprint Outputs – Scheduled plus FIFO / Charter

Scheduled Services + FIFO Charter				
	2027	**2032**	**2037**	**2042**
Dep Peak Hour	155	181	189	197
Arr Peak Hour	155	181	189	197
Terminal Area (m^2)	2,400	2,450	2,650	2,650

A substantial FIFO charter operation as forecast would require approximately an additional 1,000 sq m terminal space over a terminal for scheduled services only.

6.3 Carparking

Car parking requirements for Broken Hill airport have been based on an assessment of BHQ current usage and then benchmarked against public car parking provided at Dubbo, Orange, Albury, Mildura, Mount Isa and Kalgoorlie Airports. The airports chosen for benchmarking represent a range of inland NSW and Victorian regional airports as well as airports serving mining centres that have a substantial inbound traffic profile.

The metric used was annual RPT pax per car parking space. The 2018 – 2019 financial year was used as benchmark. A similar ratio method was used for assessing rental car space requirements.

The benchmarked findings are shown in

Table 16: Car Parking Benchmarks

Annual Pax per Space (2018-19)			
	Public Car Parking	**Rental Cars**	**Notes**
Broken Hill (BHQ)	732	4813	Rental car parking based on dedicated 14 spaces only – rental cars also parked in public car park
Dubbo (DBO)	460	1660	
Orange (OAG)	314	unknown	
Albury (ABX)	596	6275	
Mildura (MQL)	811	5250	
Mount Isa (ISA)	1052	3470	
Kalgoorlie (KGI)	1471	3270	

Based on the current usage and the benchmark the assumptions made for Broken Hill are:

- 700 pax / car space in public car park – similar but slightly better than existing. No rental cars to be parked in the public car park.
- 3250 pax / car space for rental cars – this is similar to Mount Isa and Kalgoorlie which have high levels of inbound traffic.

The forecast car parking requirements are shown in Table 17 below.

Table 17: Car Parking Requirements

Scheduled Services Only					
	Existing	**2027**	**2032**	**2037**	**2042**
Public Car Park	92	120	135	145	160
Rental Cars	14	26	29	32	35

The public car parking figures shown above does not take into account any product differentiation such as covered parking, long term parking, etc.

Rental car parking does not include any parking provided if rental car companies have their base for storage and washing at the airport.

6.4 Roads

Pro Hart Way links the airport to the Broken Hill CBD. There are also internal roads within the airport that access the terminal and ancillary facilities. The roads are maintained by Broken Hill City Council.

Expansion of the airport road system will be required as part of the airport expansion. Road volumes will be comparatively low so only two lane roads will be required and no complicated intersections will need to be provided.

6.5 Support Facilities

The role of support facilities at Broken Hill Airport is limited by the airport size and remote location. Support facilities are limited to:

- Fuel
- Hangars and Commercial facilities
- Navaids.

Due to the present and projected airport size, there is no provision at present of ARFF (Aviation Rescue Fire Fighting) services or Air Traffic Control (ATC) tower, and it is considered that these services will not be provided during the life of the master plan through to 2042.

There are two fuel suppliers on site – BP and Viva. The BP facility has been in operation for a long period of time. The Viva facility is newly built and has come into operation in 2023. It is considered that with the second operator on site there will be sufficient fuel capacity going forward.

6.6 RFDS Facilities

The future requirements of the RFDS will be significant to future airport planning as they are a significant airport user and stakeholder. As the RFDS facilities are largely located on freehold land, the role of the airport in future development is limited except as a possible provider of additional land.

Future RFDS requirements identified in the stakeholder consultations (refer Section 5.1.1.3) are:

- Expanded medical centre,
- Expanded visitor car park,
- Additional apron space,
- Additional hangar space which could be used for either maintenance or maintenance related commercial activities.

6.7 Commercial Development

Commercial activities on the airport are currently limited to the GA hangars located north of the terminal.

Future commercial activities will fall into two categories:

- Aviation related – directly related activities such as hangars, base facilities, aircraft repair and maintenance. This will include additional hangars for aircraft housing as a response to the harsh environmental conditions. These facilities would require direct connection to both landside and airfield.
- Non aviation related. – It has been identified that there is a shortage of industrial land in Broken Hill. Areas of the airport estate have been identified as suitable for industrial and commercial development. The precise type of development, land requirements and development timings will be determined by future market soundings. These market sounding are beyond the scope this Master Plan. The land areas identified as suitable are those with ease of access to roads and where ground conditions may be suitable.

Even though areas may be identified as suitable for either aviation or non-aviation commercial development, there is a degree of flexibility available depending on which use wishes to utilize the resource first and at the highest possible return to Council.

The underlying rocky geological formations on the airport – particularly those to the west of the terminal – limit potential large scale commercial development due to the difficulty of excavation and construction. There are possible land resources available to the south east of the airport beyond the navaids. Development will be limited by the navaids clearance radii and height surfaces. This area is also difficult to access as there no easily available road infrastructure.

7 Airport Development Proposal

7.1 Key Issues

The summary of key development issues has been based on:

- Review of existing facilities and their operation.
- Stakeholder consultation – Council and airport users.
- Forecasting and facilities analysis.

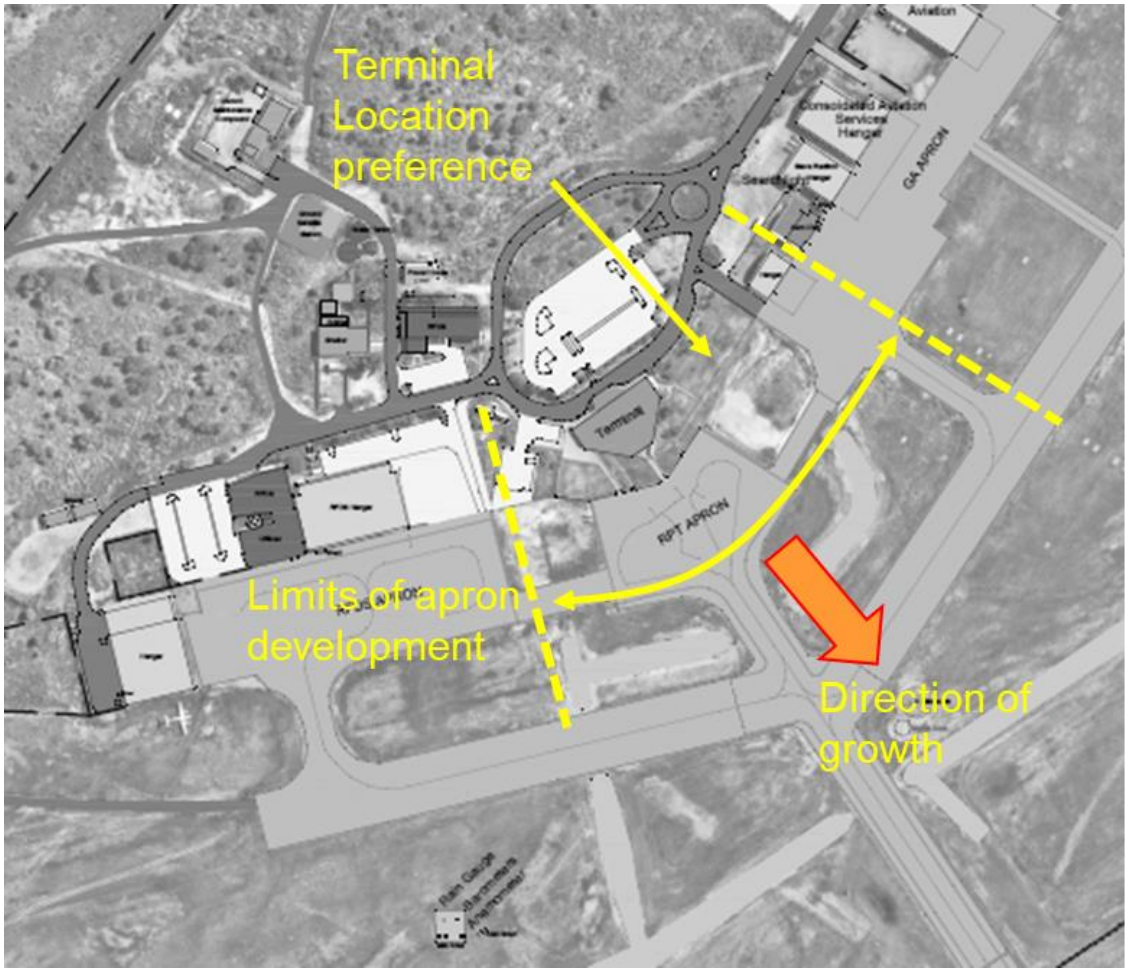
The major developments issues are laid out in Table 18.

Table 18: Key Development Issues

Key Issues	Issue Details
Future Growth	Strengthening of Runway 05/23 to provide capability and capacity for Code C jets up to B737 and A320
	Future proofing – making provision for full length parallel taxiway to Runway 05/ 23 and 280 metre wide runway strip.
Congestion	One taxiway only – Taxiway Alpha – as access to all aprons is a major operational risk should there be aircraft breakdown or major taxiway repairs required. Alternative access to runways required.
	Provision of some parallel taxiway will provide overall airport capacity benefits.
Capacity Issues	RPT apron requires expansion – undersized at current traffic levels. Funds are committed to expansion.
	Terminal will require capacity increase when passenger and baggage screening required and to cater for possible FIFO operations.
	Additional car parking capacity required.
Asset Replacement	End of life asset replacement required for RFDS Apron, Taxiways Bravo and Charlie.
Constrained Development Location	Terminal and Apron expansion is constrained due to the RFDS to the west and GA assets to the east. The development direction of the RPT apron and terminal is limited to an outward direction as shown in Figure 94 below.

Key Issues	Issue Details
RFDS Precinct	Expansion space is needed for core aviation operations and future business opportunities. Additional car parking space also required.
Non Aviation Commercial Development	There are opportunities for significant non aviation commercial on the airport site. Suitable sites have been identified.

Figure 94: Development Constraints[65]



Key development opportunities are shown in Figure 95 below.

These include:

1. Safeguarding and future proofing for:
    - 280m wide runway strip – should runway improvements require it.
    - Future Code C parallel taxiway – unlikely to be required for many decades.

[65] Aerial Photo Base: Nearmap

- Runway future proofing unlikely to affect other planning decisions.

2. Commercial and/ or RFDS land development

    - Provide additional taxiway and apron to facilitate RFDS expansion and commercial development.
    - Provide additional RFDS car parking

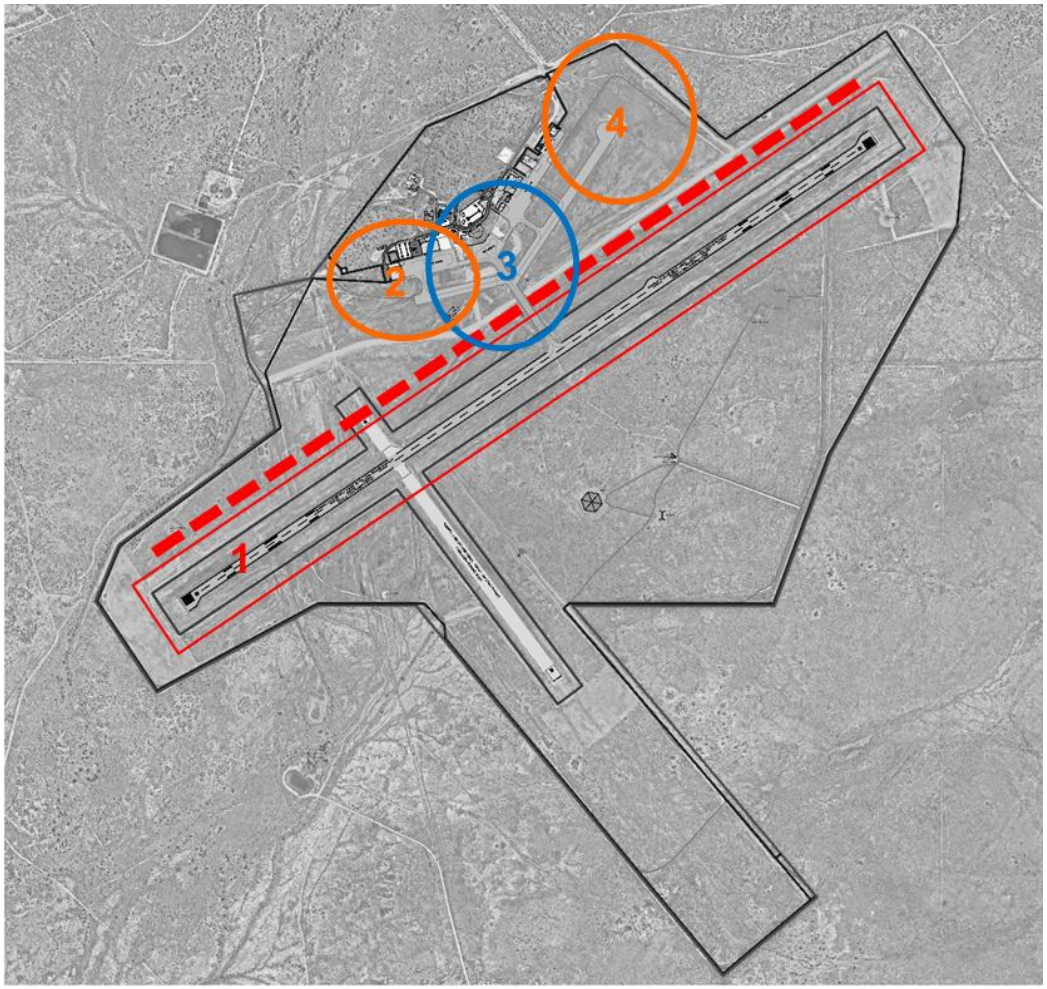
3. Terminal Precinct development

    - Apron and car park expansion to be first priority
    - Terminal expansion required should security requirements and operation of larger aircraft.

4. Commercial land development

    - Reconfigure Taxiway Charlie, an end of life asset, to open up land resources suitable for aviation and non aviation commercial development
    - This area has flat available land and is close to town access and airport entry.

Figure 95: Key Development Opportunities[66]



[66] Aerial Photo Base: Nearmap

7.2 Option Development

A range of master planning options were explored and developed before refinement and a decision was made with Broken Hill City Council on a preferred option that will be taken forward. The options developed can be found in Appendixes ……

Common to all options were:

- Safeguarding for a 280 metre wide runway strip.
- Safeguarding for a full length parallel Code C taxiway based on a 280 metre runway strip. This would 158 metres north of Runway 05/23.
- Provision of some of the parallel taxiway during the twenty year development period – it is considered will be beyond the 20 year master plan period that the full length taxiway will be required.
- Greater alignment of the taxiway system and development planning with the existing Runway 05/23 alignment. This would include removing some of the historical taxiway geometry and allowing for more efficient land use.
- Flexible development pathways for aviation related and non aviation commercial development.
- Terminal expansion – this would allow for future RPT and larger charter security requirements.
- Terminal expansion is based on retention and refurbishment of the existing terminal building.
- Expansion of RPT apron to include provision for future growth of both Scheduled and Charter/ FIFO services – all 20 year apron layouts in the options show a layout of – 3 x Code A+ (small Code B), 3 x Code B, 3 x Code C with at least one stand capable of B737 or A320 operations.
- All operations on RPT Apron to be power in / power out.
- Separate roadway access to the RFDS and major commercial precincts.
- Existing weather station to remain in situ.
- Some of the existing open drains will need to be piped to facilitate development.

The options not taken forward explored:

- Different aircraft parking configurations
- Differing locations of taxiways and airfield items
- Terminal location options
- Differing configurations for the non aviation commercial area.

7.3 Preferred Development Option

A preferred development option was identified after consultation with Broken City Council stakeholders. The preferred option is shown in Figure 97 below.

The key features of this option are:

- Flexible development pathways for RPT apron and commercial development – both aviation related and no aviation.
- Expansion is based on retention of existing assets and committed projects.
- Provides more aircraft parking capacity than forecast for 2042 with flexible aircraft parking outcomes.
- Multiple runway entry / exit points are provided.
- Provides distinct GA parking apron.
- Provides rotary apron.
- Dual access is provided to RFDS Apron.
- Makes greater use of easily accessible land resource.
- Optimal non aviation commercial land resource development.

The proposed Master Plan divides the focal north parts of the airport into three zones (from east to west) shown in Figure 96 below:

- Commercial Development Zone – both Aviation and Non Aviation
- Terminal
- RFDS Zone.

Figure 96: Proposed Development Zones

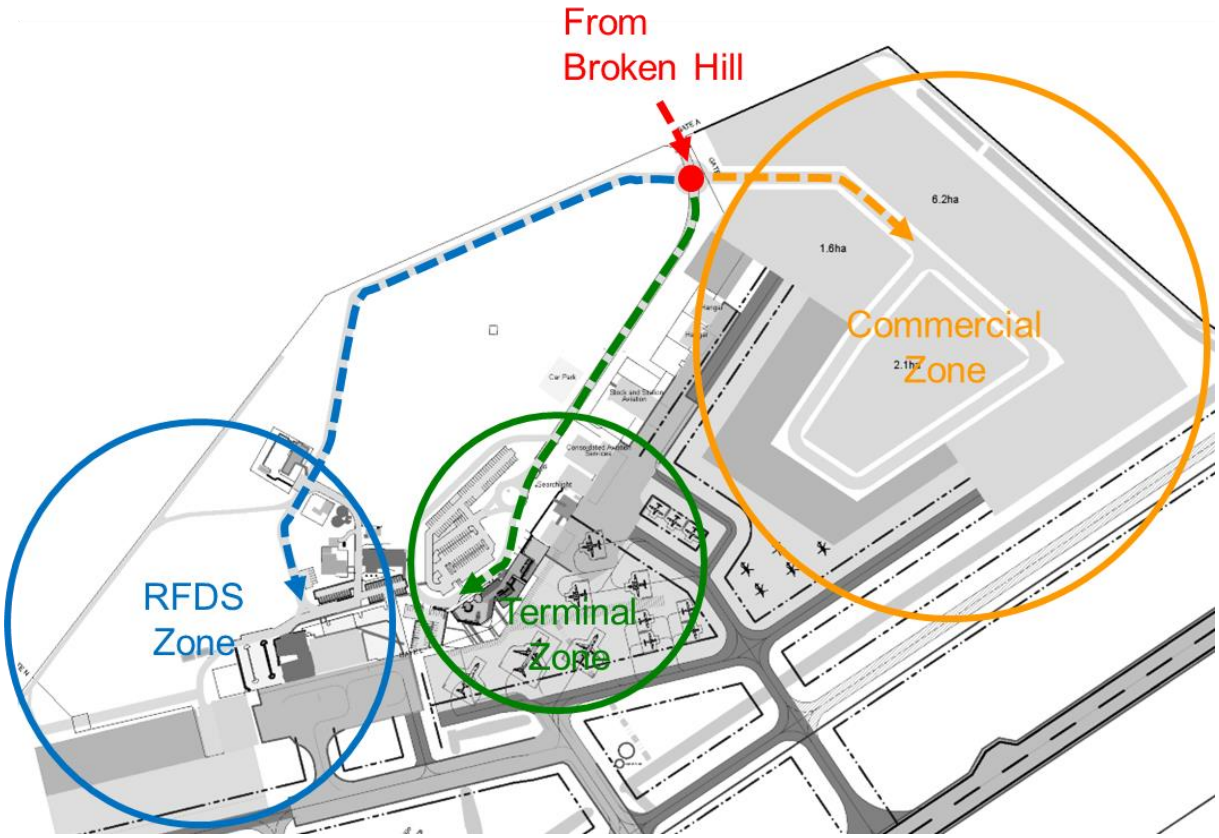
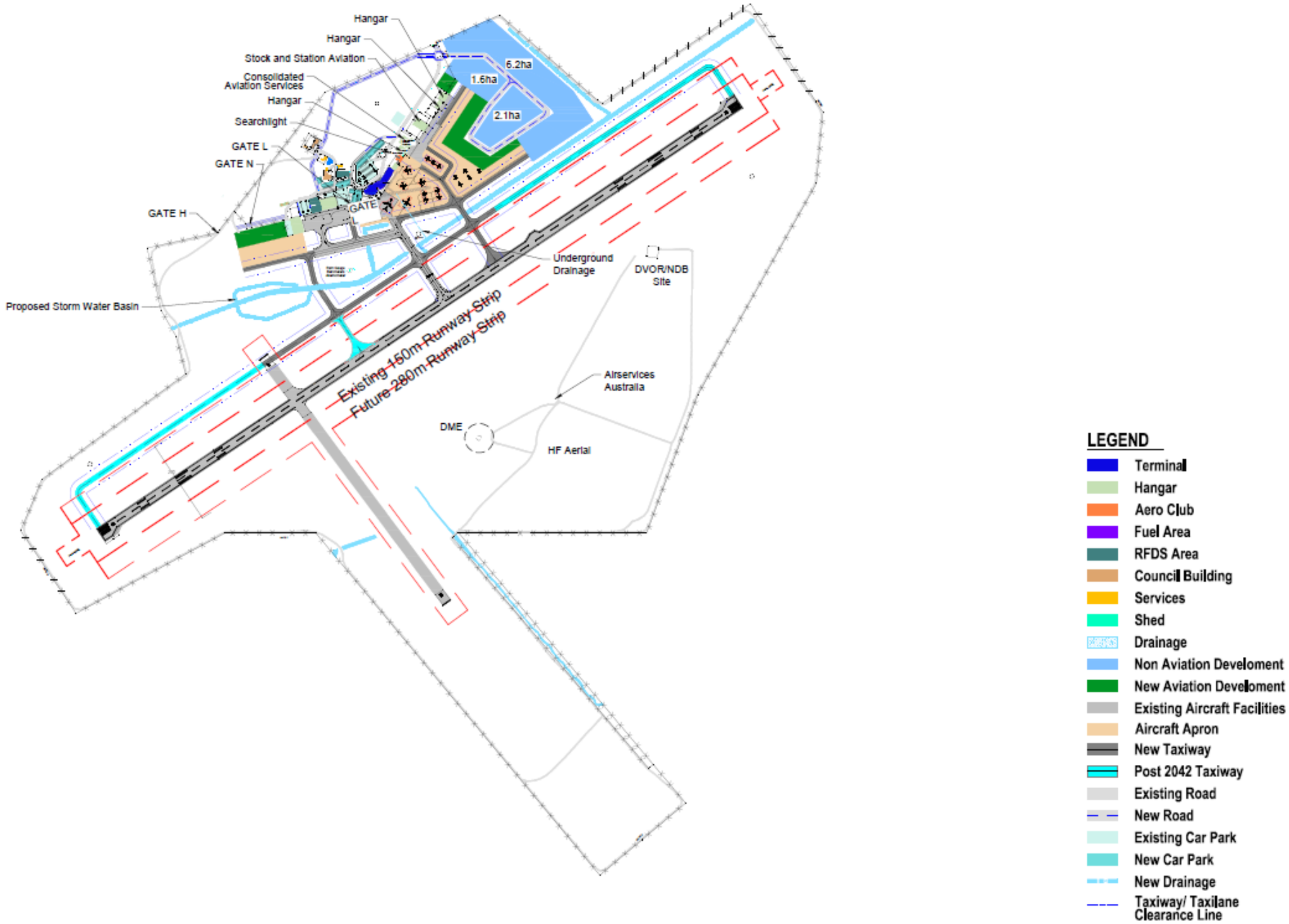


Figure 97: Overall Airport Development Plan – 2042



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7.3.1 Airfield

The key airfield development aspects of the preferred option at 2042 are:

- The existing runway length and width are proposed to be maintained. Safety cases will be required to operate foreshadowed larger aircraft on a 30 metre wide runway.
- Strengthening of Runway 05/23 to a PCN of 44. This will allow the regular operation of Code C jet aircraft up to the equivalent of B737-800 or A320.
- Enlarged runway turning pads at each end of the runway to allow for larger jet operations.
- Safeguarding for a 280 metre wide runway strip should this be required at any during or beyond the master plan period.
- Provision for a future 90 metre long x 60 metre wide Runway End Safety Area (RESA) at both the Runway 05 and Runway 23 end of the runway.
- Safeguarding for a full length parallel taxiway (15 metres wide) to Runway 05/23. This would be 158 metres north of the runway. During the Master Plan period to 2042, it is only envisaged that a 860 metre part between the new apron access taxiway and Runway 14/ 32 will be provided.
- Sealing of Runway 14/ 32 to allow for all weather usage by aircraft under 5700kg. Current emergency lighting only would be retained.
- Upgrading of existing Taxiway Alpha to allow for B737 and A320 operations.
- All new taxiways serving the RPT aircraft parking apron will be Code C and have Code C clearances (26 metres from taxiway centreline) to accommodate full sized Code C (36 metre wingspan) aircraft.
- All Code B taxiways are sized for full sized Code B (24 metre wingspan) aircraft . It may be decided during an implementation phase that these taxiways could be reduced as a cost saving measure to accommodate local aircraft size conditions.
- Second runway access taxiway to be provided east of the existing taxiway. A minimum of 15 metre wide taxiway to be provided. This shall be constructed to serve B737 and A320 aircraft.
- Link taxiway between RFDS Apron and Parallel taxiway.

The intermediate development requirements are outlined in Section 7.4.

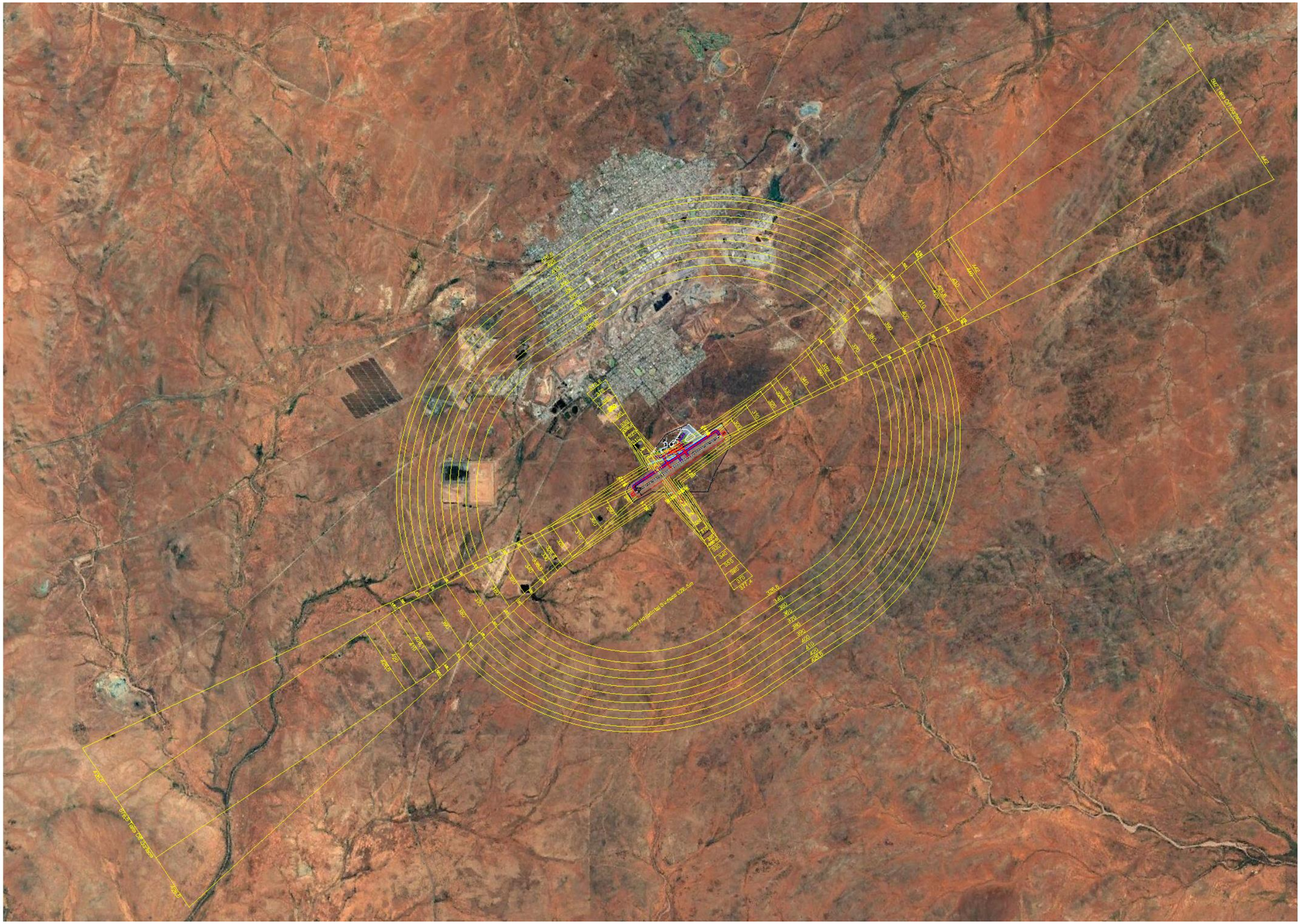
Works above will include required and CASA compliant taxiway lighting, apron signage and line marking.

Drainage culverts will be required to existing open air stormwater drains where they are to be crossed by taxiways.

Maintenance will also be required to Taxiway Bravo to ensure continued safe operations through the planning period. Maintenance will also be required to Taxiway Charlie to extend its life until its forecast replacement.

The safeguarding for a 280 metre wide runway strip for Runway 05/23 will require new OLS surfaces to be defined. An indicative OLS diagram for the 280 metre wide runway strip is shown in Figure 98 below.

Figure 98: Indicative OLS diagram for Runway 05/23 280 metre runway strip[67]



[67] Aerial Photo Base: Nearmap

7.3.2 Aircraft Parking Aprons

There are three major areas of apron development to be provided by 2042:

- The RPT Apron will be upgraded and expanded to support charter and FIFO services as well as scheduled services.
- An expanded GA apron has been planned to the north east of the terminal.
- An expanded RDFS or GA apron has been proposed to the west of the existing RFDS facility.

The progressive development of the aircraft parking aprons can be seen in Section 6.4.

The RPT apron has been planned to meet the requirements of 4 x Code A, 3 x Code B and 3 x Code C aircraft. As discussed in 6.1, small Code B aircraft have been allowed but relate to Code A in the forecasts. At least one of the Code C stands would be a B737 or A320 to full 36 metre wingspan. The aim of the apron planning is that there be flexible operations so that changes in forecast and aircraft type can be accommodated in the future. It is assumed that smaller aircraft can be accommodated on larger stands.

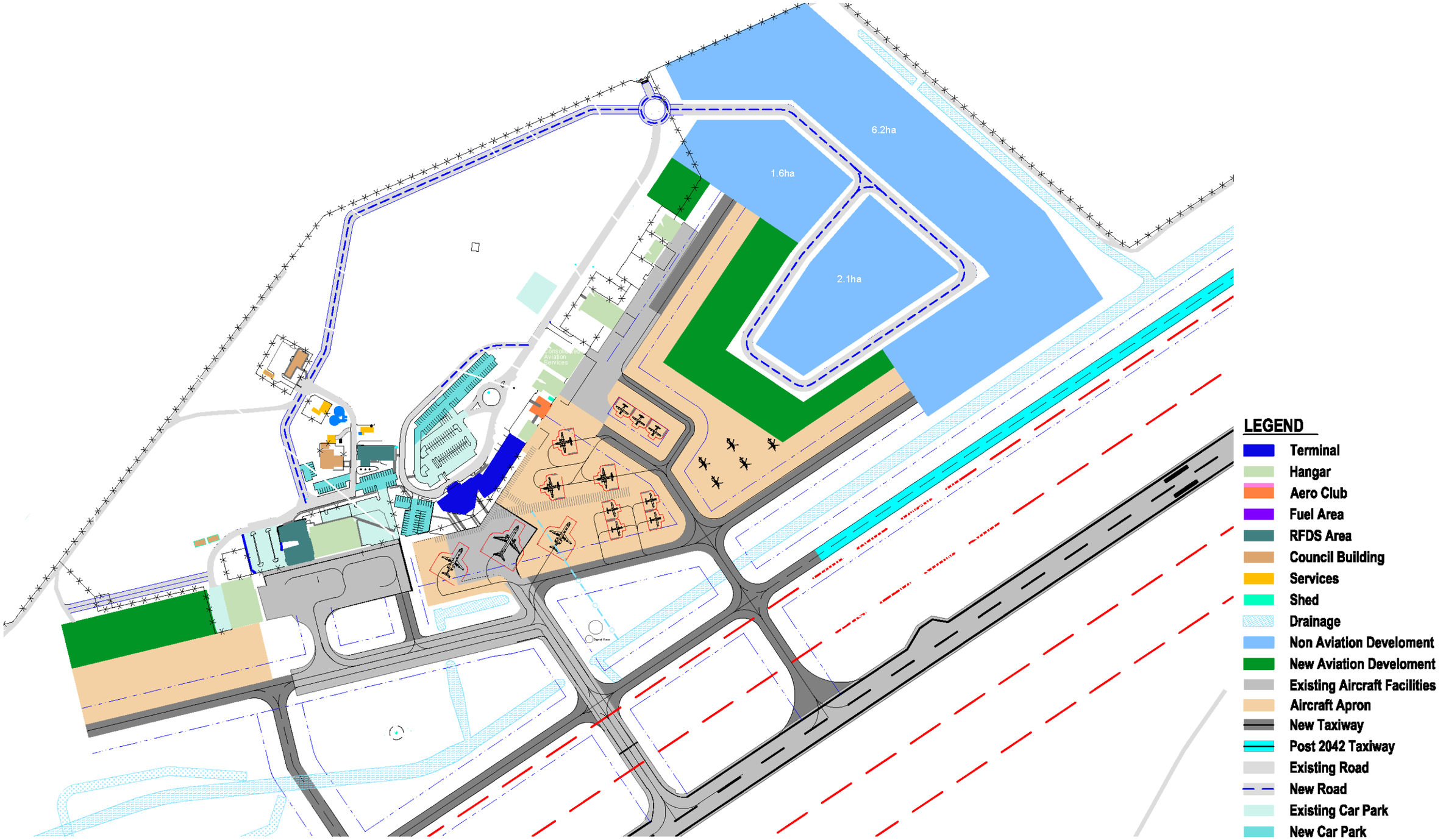
All stands will be power in / power out.

The RPT apron will include walkways for aircraft access, GSE storage areas, high mast apron lighting to appropriate CASA lux levels, provision for power reticulation and line marking.

The expanded GA apron will provide greater opportunities for aviation related commercial development at the airport. The apron will be focused on access to hangars for smaller and rotary wing aircraft. There will be minimal open air aircraft parking as stakeholder feedback has indicated a preference for aircraft to be parked in hangars due to the harsh environmental conditions. Apron taxilanes in the GA area have been provided to Code B standard with a 16.5 metre clearance from taxilane centreline.

Aircraft parking aprons and terminal area taxiways are shown in Figure 99 below.

Figure 99: Aircraft Parking Aprons and Development Plan – 2042



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7.3.3 Terminal Development

There is the assumption that the terminal will require expansion to accommodate foreseen passenger and baggage security screening as well as providing facilities for high numbers of passengers particularly driven by growth in the FIFO and charter markets.

The area for terminal expansion is limited by constraints of GA hangars, rental car parking and a desire for no expansion onto the aircraft parking apron. The existing terminal is considered to be in good condition and it will form the basis of the terminal expansion.

Indicative terminal plans have been developed that align with the overall airport development plan. These terminal plans have been developed as a guide to future design development. The terminal plans that have been developed reflect the discussions that were held with airport, Council and external stakeholders. The areas shown are based on the terminal space program that was developed and acts as the footprint determinant.

The planning approach has been based on:

- Once the initial terminal expansion has been undertaken the terminal does not need to substantially grow over the 20 year master plan period as there is only minimal growth forecast for the peak hours over the period.
- Addressing the issues and limitations that exist or have arisen over time in the existing terminal building.
- Continuation of two distinct flows – secure (security screened) for most flights and non secure for smaller charters. Closed charters may not be security screened.
- The building being 'low tech' – minimal technological inclusions. This is seen as necessary in a remote location as skilled technicians and spare parts may not be readily accessible.

The proposed terminal has a footprint area of 2,470m2. The expansion component of this is approximately 1,300m^2. This does not include covered walkways or roofed canopies except to the baggage makeup and breakdown areas.

The overall enclosed area of the proposed terminal building is 2,050m^2. The roofed area covers baggage make up areas that are proposed to be open sided. The assumption for costing has been that all of the of the enclosed terminal would be air conditioned space.

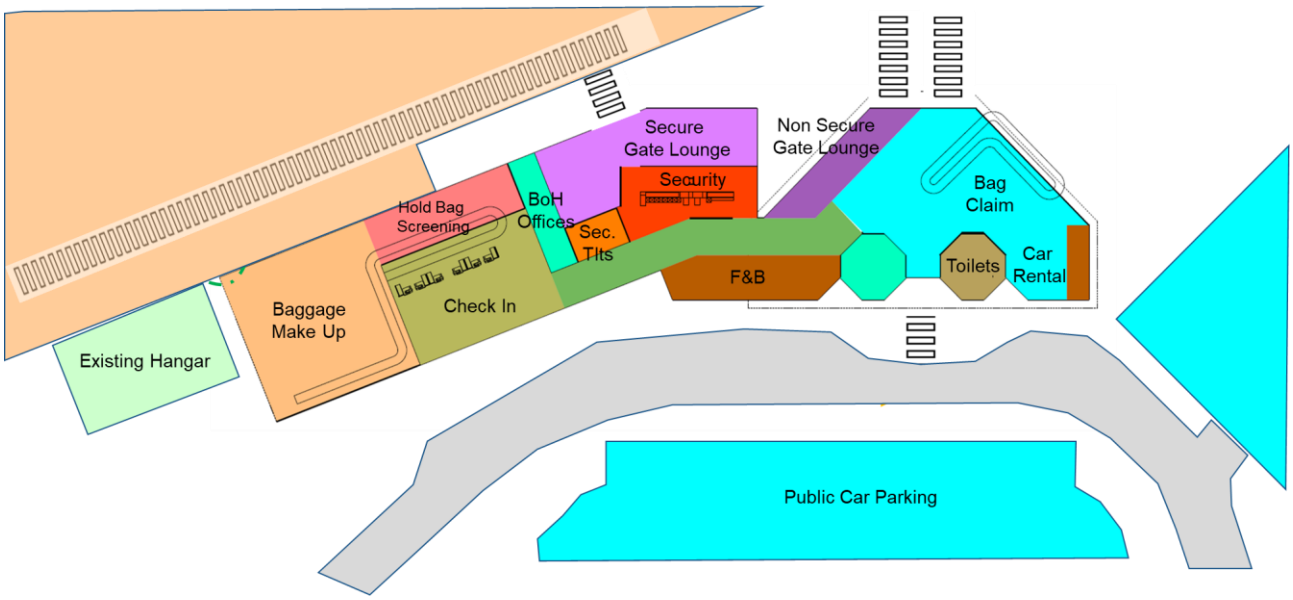
The key features of the overall plan are:

- An enlarged check in area. There may be separate facilities for secure and non secure operations. At this stage it is assumed that there will only be secure baggage make up areas.
- Provision has been made for additional check in facilities to be provided.
- Covered baggage make up areas. This includes providing weather protection to all baggage operations.
- Additional office space within the terminal to support airport management and airline users.
- A larger food and beverage facility including seating.
- Separate secure and non secure waiting areas. These will include separate toilets.

- The existing terminal building is proposed to be reconfigured for baggage reclaim including a bag claim carousel. The baggage reclaim area would include car rental counters.
- Toilets and office areas in the existing terminal would be retained.
- Passengers would access aircraft or inbound passengers the terminal by controlled walkways.

Indicative terminal plans are shown in Figure 100 below.

Figure 100: Indicative Terminal Development Plan



7.3.4 Car Park Development

The existing terminal car park is proposed to be extended as part of the 2042 development. It is proposed that the car park be expanded to provided 170 spaces by 2042. This is slightly beyond the requirement for 160 spaces defined. There is scope for future provision of different parking products such as long term or covered but this has not been included at this stage.

Car park expansion is considered to be constrained by the high rocky ground north of the existing car park.

To achieve the full proposed car park expansion it will be necessary to reconfigure the existing terminal exit road.

It is proposed that the existing rental car park (to the west of the terminal) be expanded to 35 spaces. It is also proposed that this currently unsealed car park be sealed to allow for all weather use. The numbers are for short term pick up and drop off only. Rental car storage may be located elsewhere on the airport as part of the non-aviation commercial development.

The expansion of the rental car park will require relocation of the RFDS Nomad aircraft. Further expansion of the rental car park is constrained by the RFDS land holding to the west.

RFDS parking needs will be discussed in the RFDS section of this report.

7.3.5 Roads

As part of the overall development, an upgrade of airport roads is proposed.

The key feature of the future road plan is that separate road systems will serve each of the key airport zones:

- Commercial Development Zone – both Aviation and Non Aviation
- Terminal
- RFDS Zone.

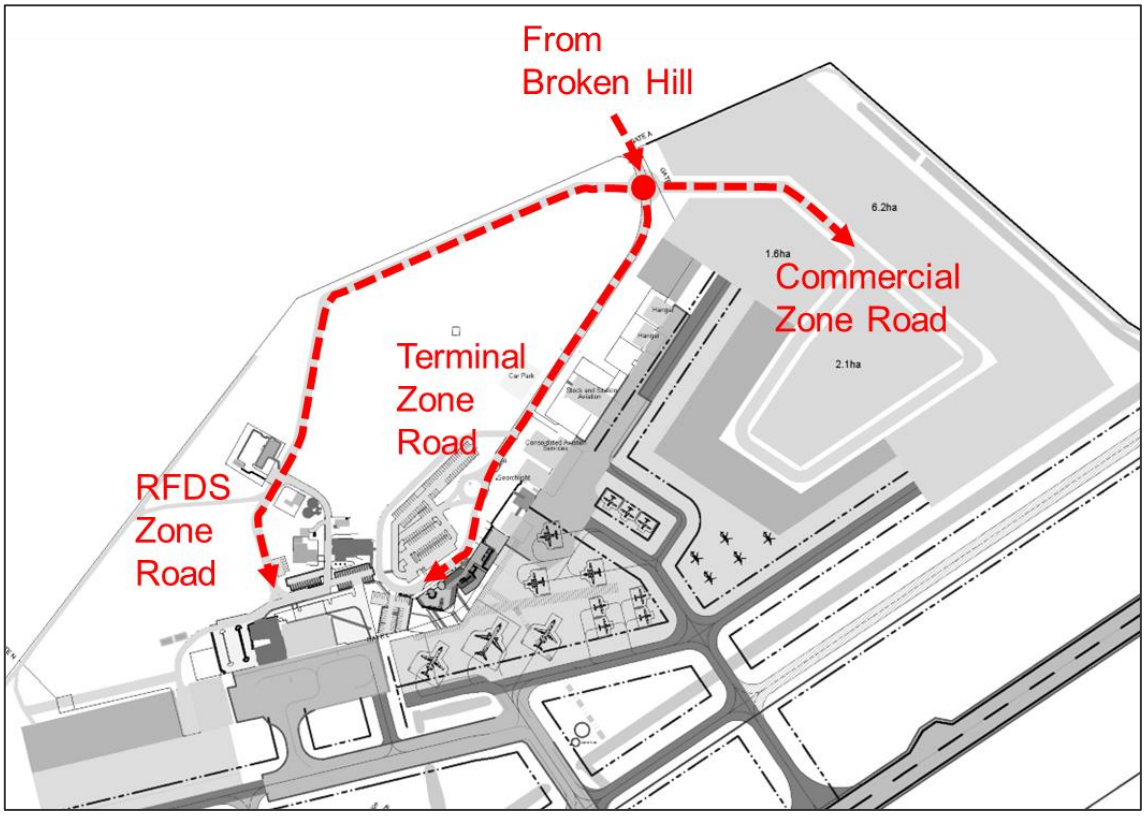
It is proposed that a new roundabout be constructed just inside the airport boundary. At the roundabout. airport users will make a decision on which road to take to reach their designated road. The proposed road structure is shown in Figure 101 below.

The proposed road structure will separate heavy vehicles entering the commercial zone from other vehicles going to either the terminal or RFDS. The provision of a separate RFDS access road removes non terminal users from the direct terminal face.

Airport growth will see increased traffic volumes but these are considered not to require substantial road capacity increases such as extra traffic lanes.

New roads to be provided will be 8 metres wide. 25 metre wide road reservations have been allowed for in the new Commercial Zone. These road reservations will also include provision for electricity, water, stormwater and sewage removal.

Figure 101: Proposed Road Structure



7.3.6 Support Facilities

The major aviation support facilities provided on the airport are fuel and navigation aids.

It is considered that there will be sufficient capacity on site for future needs through to 2042. Tank capacity has been increased with the recent opening of the Viva facility. More regular deliveries of aviation fuel will provide the increase in capacity.

At this stage, there is no indication that there will be any change to existing navigation aids through to 2042. New technologies may be introduced but these will be the responsibility of AirServices Australia should they be required. Similarly, the Bureau of Meteorology weather station would be upgraded by that organisation if required.

The airport is not forecast to reach traffic levels during the master plan period that would require either and Air Traffic Control tower or Airport Fire and Rescue station.

7.3.7 Commercial Development

The proposed Broken Hill Airport Master Plan unlocks a significant commercial land development resource. The land areas identified as suitable are those with ease of access to roads and where ground conditions may be suitable. This commercial land development will fall into two categories:

- Aviation related – directly related activities such as hangars, base facilities, flight schools, aircraft repair and maintenance. This will include additional hangars for aircraft housing as a response to the harsh environmental conditions. These facilities would require direct connection to both landside and airfield.
- Non aviation related. – Areas of the airport estate have been identified as suitable for industrial and commercial development. Foreshadowed uses are warehousing, light fabrication and/ or repair and companies providing services to the mining industry.

The master plan provides flexibility so that commercial development could fall into either one of those two categories.

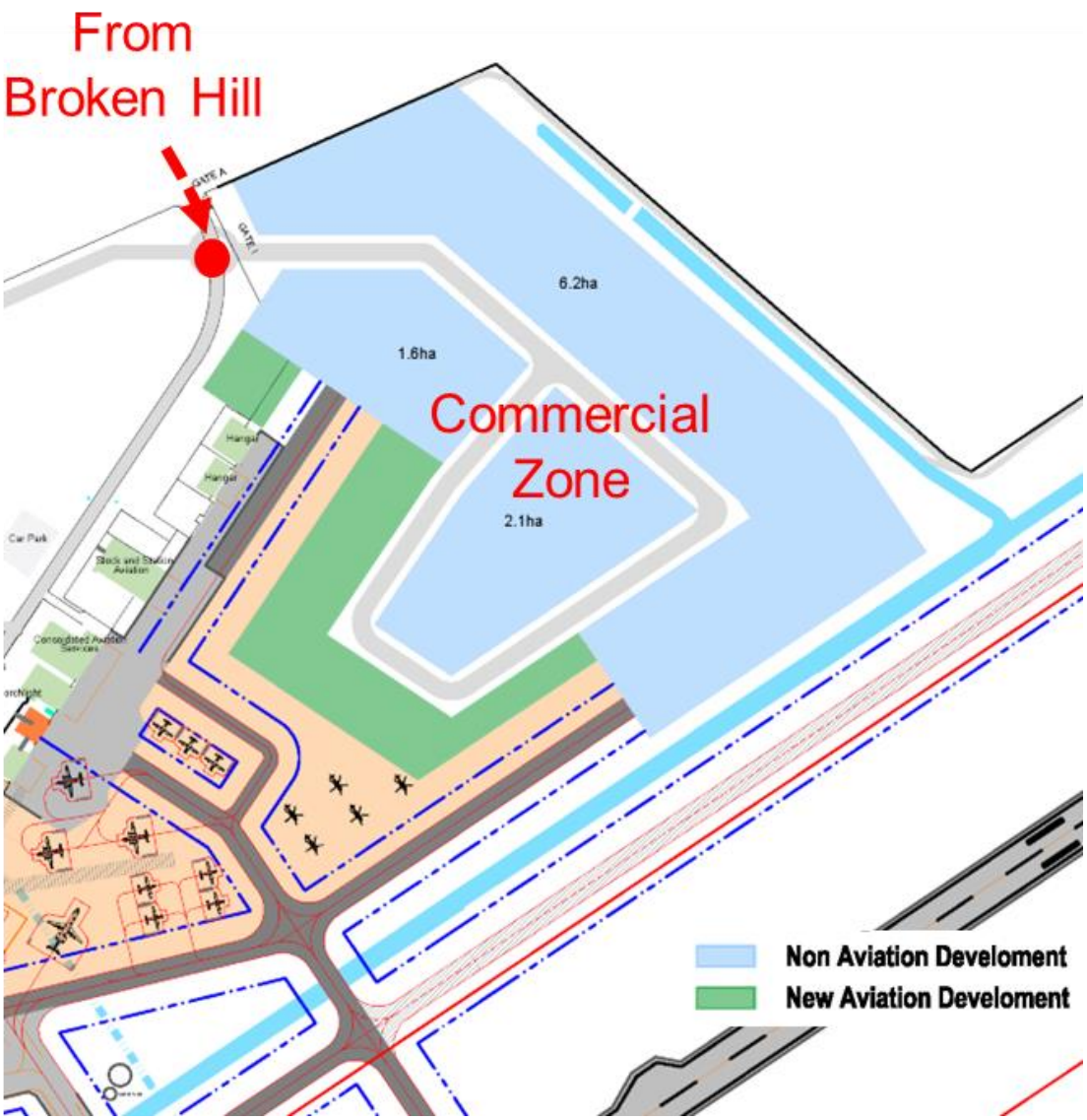
The primary commercial zone will be located in the North East corner of the airport site adjacent to the airport entry. The location is shown in Figure 102 below.

The areas allocated for aviation and non – aviation commercial development are indicative only as further market sounding studies will need to be undertaken to determine the highest and best use for the land. These further market sounding studies will identify more precisely the needs of prospective commercial occupiers.

The indicative areas shown are:

- Non aviation commercial – 9.9 hectares across three land parcels
- Aviation commercial – 2.05 hectares across two land parcels.

Figure 102: Primary Commercial Zone Location



The indicative block depths are:

- Non aviation commercial – 90 metres.
- Aviation commercial – 25 – 50 metres. A 20 metre deep aircraft parking apron is additional to this depth.

These block depths are based on what is found at other airports or in similar type industrial estates.

A second aviation commercial zone has been designated west of the RFDS area. This will be discussed further below.

The future landholding status (freehold, leasehold, etc.) of the commercial zone is yet to be determined and will require decisions to be made by BHCC at the appropriate time.

7.3.8 RFDS Development

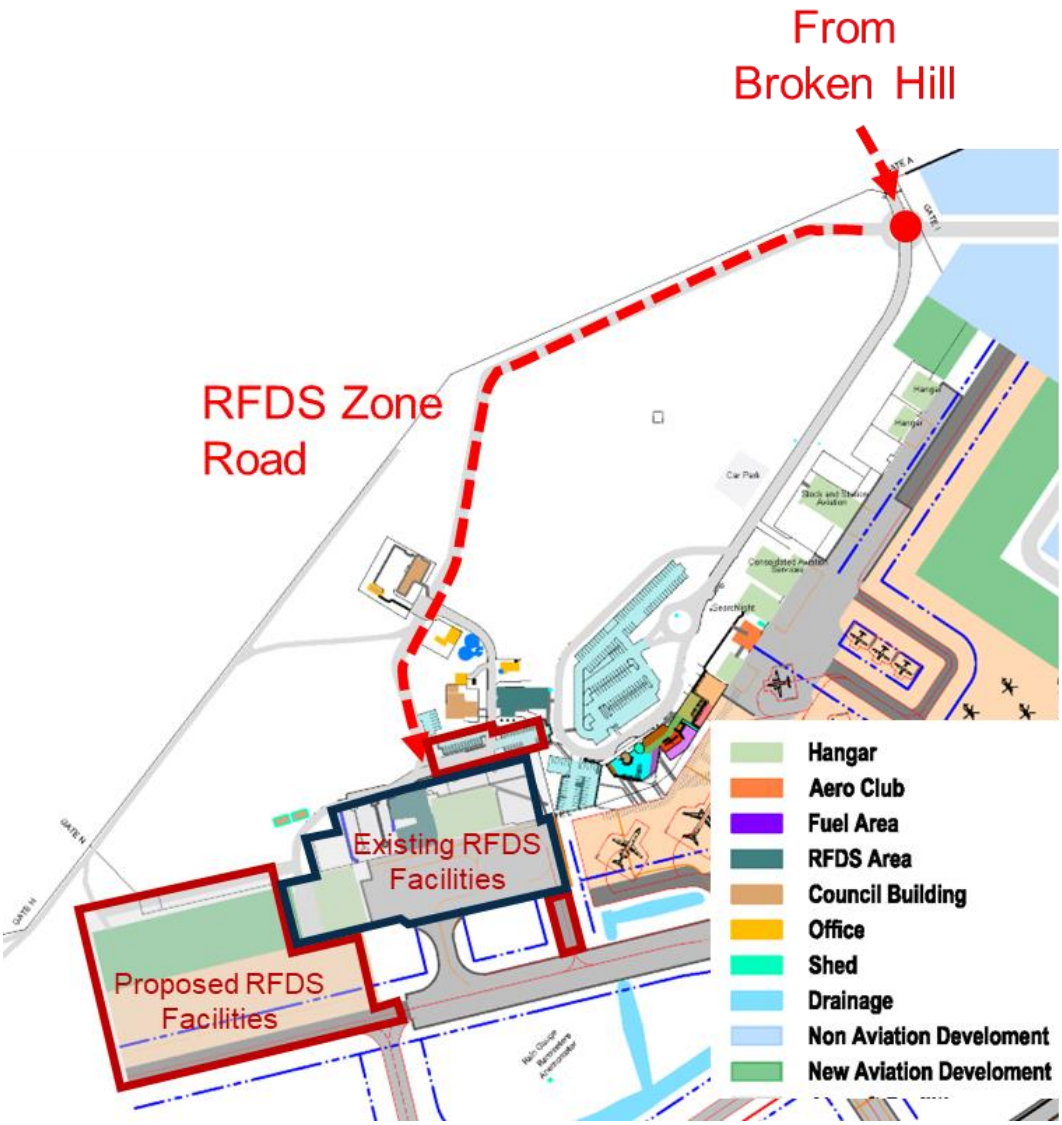
The RFDS indicated through the consultation process that they foresaw further expansion of their facility at the western end of the airport.

It was indicated that:

- The medical facility and GP clinic would be expanded.
- Visitor Centre patronage is expected to increase following the expansion of the Visitor Centre in 2023.
- Additional aircraft parking apron and aircraft housing. This may include additional maintenance hangars.
- Continued 24 hour ambulance access will be required to enter the airfield apron via the ambulance clearway adjacent to the RFDS visitor centre car park.

These additional facilities will require additional car parking facilities. The proposed planning identifies a distinctive RFDS zone on the airport where all activities would be focused. This zone would be accessed by a separate road with the choice made at the airport entry. The RFDS zone is shown in Figure 103 below.

Figure 103: RFDS Zone Location



Developments proposed in the RFDS zone are:

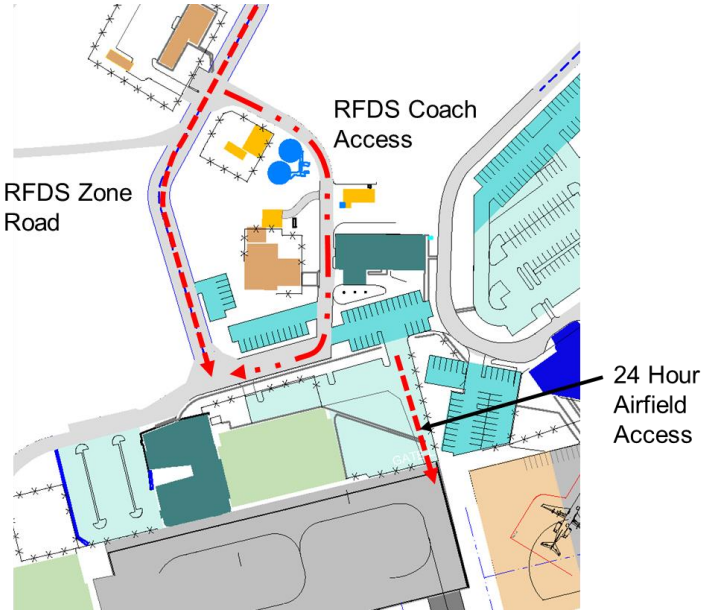
- Additional car parking (35 spaces) for RFDS facilities users. This will be enabled by the closure of the road linking the terminal and current RFDS area. The area currently occupied by the Council Animal Shelter car park will also be allocated to RFDS use. It is proposed that a new Animal Shelter car park and entry be constructed.
- Second taxiway link to RFDS apron. This will provide redundancy should the current single entry be unavailable.
- RFDS / Commercial Zone Development. This area is to be located to the west of current RFDS facilities and in proposed to include:
    - Access road.
    - Hangar space – 8, 375m^2.
    - Aircraft parking apron – 14,000m^2.
    - Code B taxiway.

  This commercial zone would facilitate RFDS plans for possible additional maintenance facilities and/ or an aircraft paint shop. Should the RFDS not require the land, it could be made available to other airport commercial operators.

Additional aviation development in the RFDS zone will act as the incentive to construct that part of the Runway 05/23 parallel taxiway west of Taxiway Alpha to Runway 14/ 32. It is also proposed that a taxiway link be constructed between the Parallel Taxiway and the enlarged RFDS apron.

RFDS road operations are shown in Figure 104 below. These include the new road for vehicle access, route for coaches to access coach parking at the Visitors Centre and the 24 hour clearway required to maintain 24 hour ambulance access to the airfield.

Figure 104: RFDS Road Operations



Beyond the Animal Shelter car park relocation mentioned above, there are no changes proposed to the Council facilities located north of the existing RFDS facilities.

7.4 Implementation Plans

The implementation of the Broken Hill Master Plan will be a staged process. Development Stages have been identified for five year periods through to 2042. These staging plans form the basis of the costing plans prepared.

The staging plans are based on the airport requirements that respond to the various forecasts that have been formulated.

If growth and/ or traffic patterns are either greater or less than the forecasts then the implementation plans will either be accelerated or delayed so that airport capacity and capital expenditure are balanced with demand.

7.4.1 Stage 1 – Committed Works

The Stage 1 – Committed Works is the Apron expansion project that was funded by the NSW Government is 2022. The expansion of the apron will allow an additional two aircraft to be parked. Aircraft up to Code C jet will be accommodated, however, this is future proofing as additional works such as taxiway and runway upgrades will be required for larger aircraft operation.

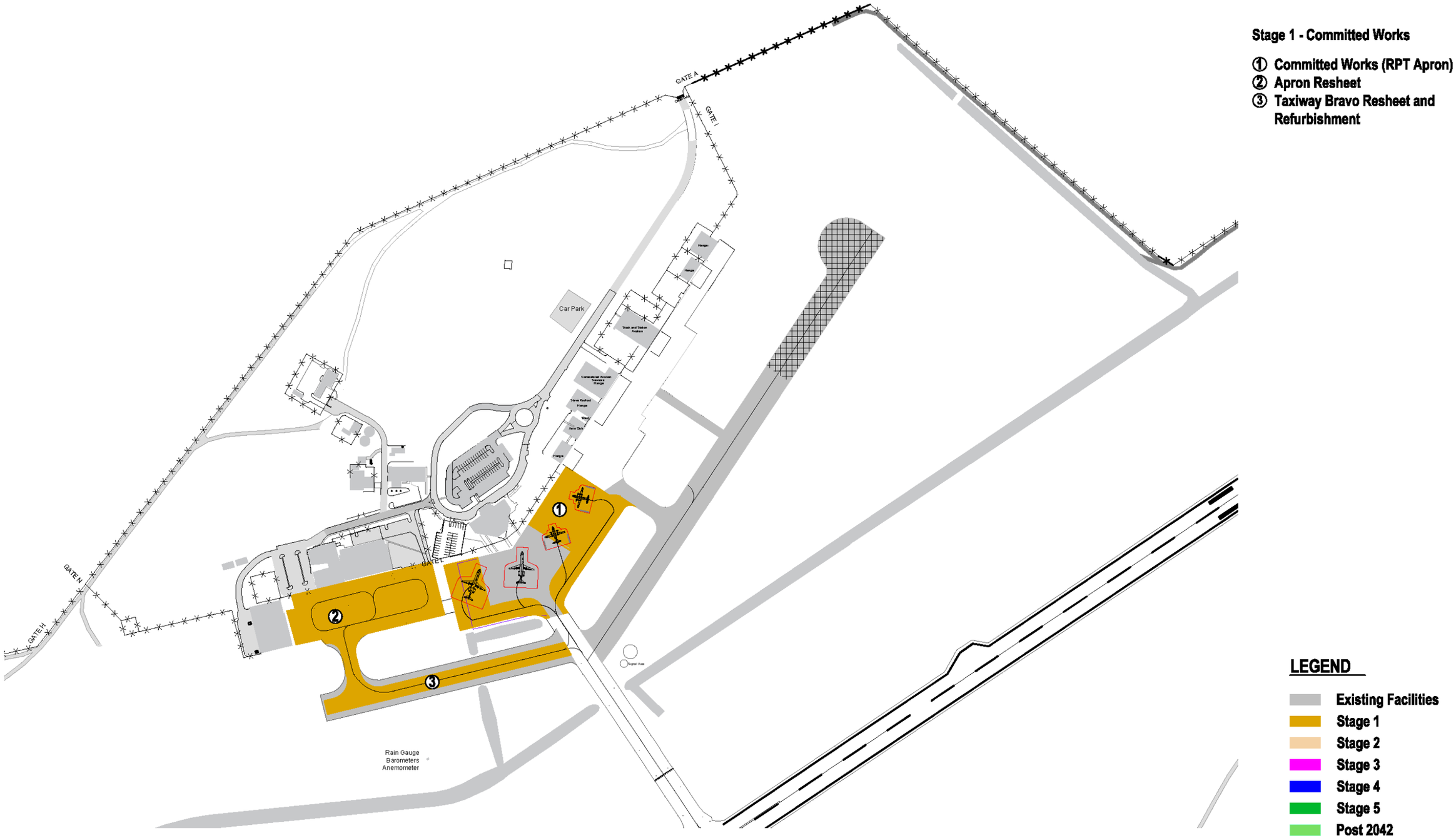
Works to refurbish an upgrade the RFDS Apron and Taxiway Bravo have been included in this package.

Table 19: Proposed Stage 1 Works

Stage 1 Item Number	Development Item	Extent of Works	Notes
1	RPT Apron Expansion to accommodate additional and larger aircraft	10,400m^2	Not included in Master Plan costing as works are already funded by NSW Government Grant.
2	RFDS Apron resheet	9,700m^2	Not included in Master Plan costing as works are already funded by NSW Government Grant.
3	Taxiway Bravo resheet and refurbishment	3,580m^2	Not included in Master Plan costing as works are already funded by NSW Government Grant.

The extent of Stage 1 is shown in Figure 105 below.

Figure 105: Stage 1 - Committed Works



7.4.2 Stage 2 – to 2027

Stage 2 works are proposed to cover the first five years of the Master Plan period.

The works are extensive and cover both direct aviation related works as well as non – aviation commercial works.

Table 20: Proposed Stage 2 Works

Stage 2 Item Number	Development Item	Extent of Works	Notes
1	Runway Strengthening – strengthening of runway to PCN of 44 for Code C jet use.	92,830m^2	
2	Taxiway Alpha refurbishment and strengthening.	5,700m^2	Will include signage and lighting
3	Partial Taxiway Charlie Decommissioning	6,000m^2	Part of the new road serving the commercial zone follows the taxiway alignment.
4	Aircraft Parking Apron	6,800m^2	New aircraft parking apron and strengthening and refurbishment of existing apron.
5	Terminal expansion and refurbishment – primary purpose is to provide security screening and additional capacity	2,680m^2	Refurbishment of existing terminal building and extension to provide additional terminal facilities.
6	Rental car parking improvement	1,100m^2	Partial extension and asphalt sealing of existing rental car parking area.
7	Terminal car park extension	1,240m^2	Asphalt sealing, line marking and lighting
8	New airport entry roundabout	560m^2	Will include signage and lighting
9	Non aviation commercial zone – land development	9.93 hectares	Enabling of commercial land development. Development of buildings etc. to be undertaken by others. Land will be developed on an ‘as required’ basis as market conditions dictate.

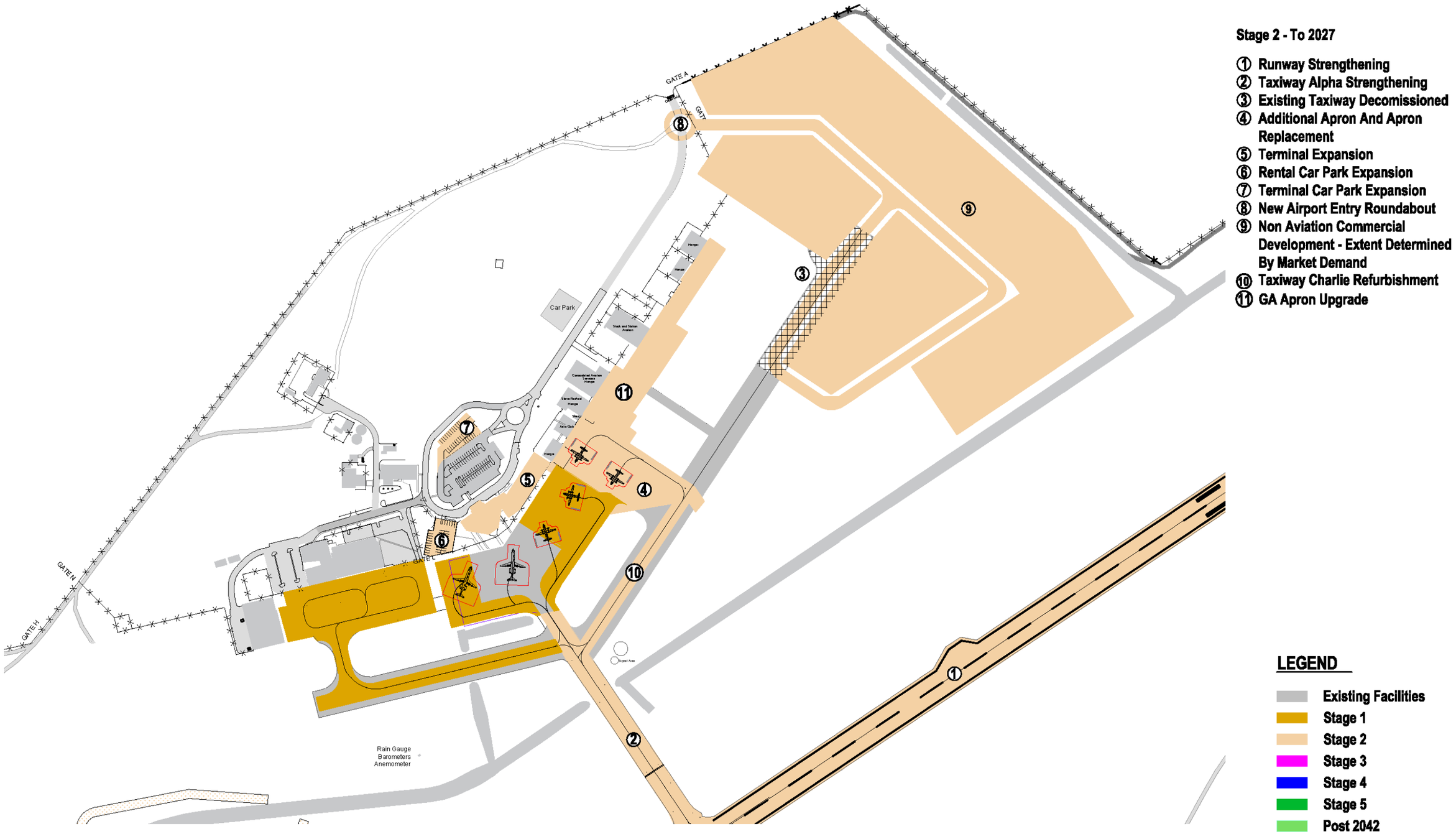
Stage 2 Item Number	Development Item	Extent of Works	Notes
	Non aviation commercial zone – roads	970 linear metres of roads	Roads to 8 metres wide, sealed. Water, sewage, stormwater and power are associated with road construction.
10	Taxiway Charlie Resheet	2,670m^2	Repairs to apron surface. Taxiways to be 15.0 metres wide only. Taxiway Charlie to have short asset life only.
11	GA Apron Resheet	8,940m^2	Resheet and repairs to GA Apron.
12	Enlarged Runway 05/23 turn pads	524m^2 x 2	Turn pads for large aircraft to be constructed at each of runway as part of runway strengthening works.
13	Runway 14/ 32 Weather Sealing	29,700m^2	Works to enable runway to be used in all weather conditions
14	Stormwater Detention Pond	3,000m^2	Stormwater detention required to handle additional run off from commercial and aviation developments on the east side of the airport.

The extent of Stage 2 is shown in Figure 106 below. Stage 2 airfield developments are shown in Figure 110 below.

Parts of the Stage 2 works are enabling works that are necessary for Stage 3 and 4 works to occur. These enabling works include:

- Non Aviation Commercial zone development is partly necessary to access and open up aviation commercial land for development.
- The weather sealing of Runway 14/ 32 justifies the westward extension of the proposed parallel taxiway in Stage 4.

Figure 106: Stage 2 Development



7.4.3 Stage 3 – to 2032

Stage 3 works are proposed to cover the second five years of the Master Plan period.

The works are extensive and cover both direct aviation related works as well as non – aviation commercial works.

Table 21: Proposed Stage 3 Works

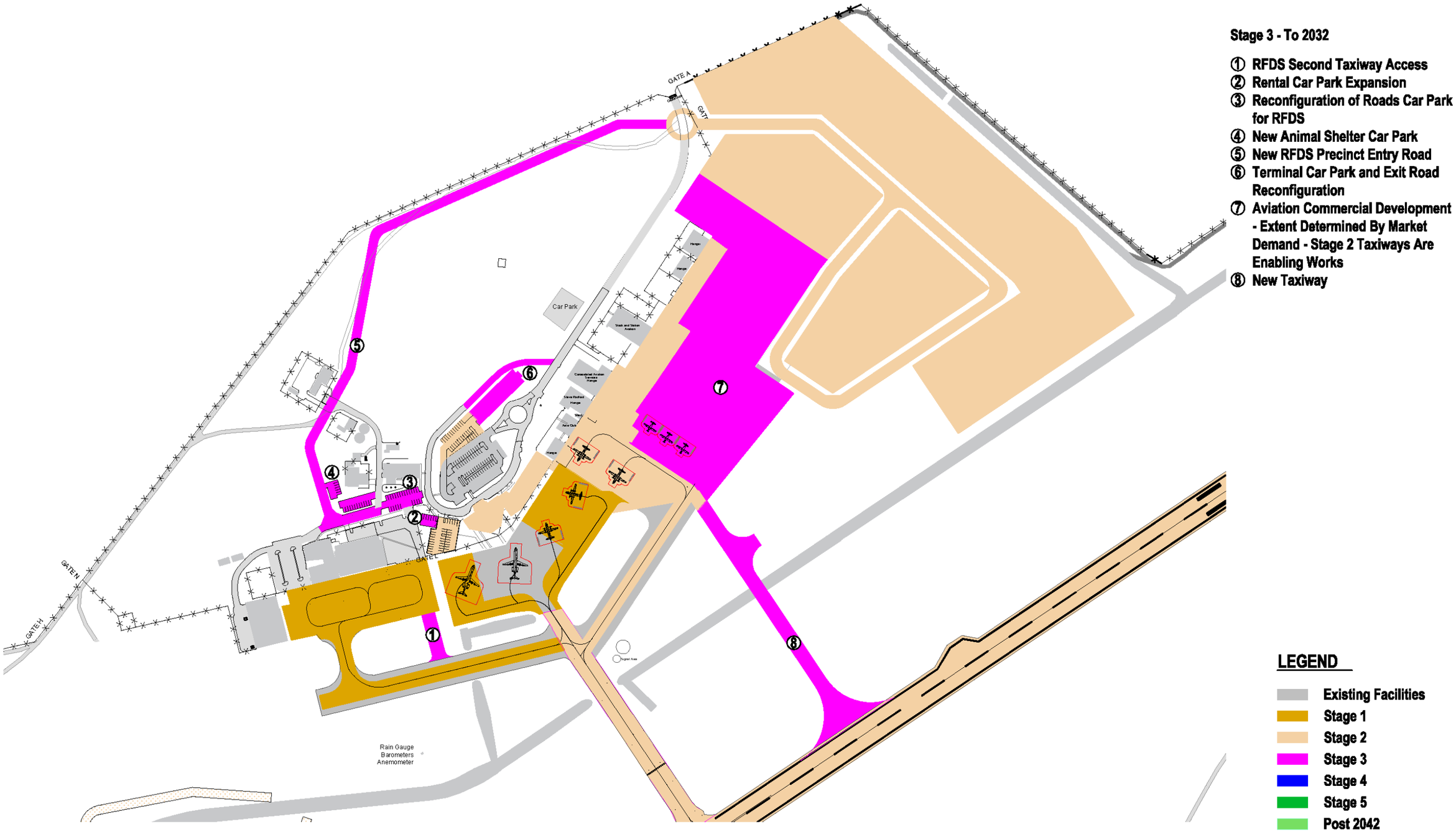
Stage 3 Item Number	Development Item	Extent of Works	Notes
1	RFDS second taxiway access – this provides an alternative entry to the RFDS apron	580m^2	Works may be undertaken separately by the RFDS and not be included in the overall airport development plan
2	Further rental car park expansion	240m^2	Additional sealed car parking for rental cars. These works will require relocation of the RFDS Nomad aircraft.
3	Reconfiguration of existing roads and car parks to provide additional car parking for RFDS.	6,000m^2	Conversion of existing roads and RFDS office car parking for public car parking. Item 6 is the enabling work for this task.
4	New animal shelter car park	250m^2	New car park and entry for Council animal shelter. This enables additional RFDS parking.
5	RFDS Precinct entry road. Road to be constructed from entry roundabout across northern boundary to RFDS precinct.	700 linear metres	Road to be sealed.
6	Terminal car park expansion and exit road reconfiguration.	1,290m^2 car park area	
		Road: 120 linear metres	Road reconfiguration required to accommodate forecast car parking numbers
7	Aviation Commercial Development	Taxilane: 5,730m^2	Including line marking
		Apron: 12,130m^2	Apron to be constructed in response to market demand.
		Land development: 14,300m^2	Enabling of aviation related commercial land development (hangars, etc.). Development of

Stage 3 Item Number	Development Item	Extent of Works	Notes
			buildings etc. to be undertaken by others. Land will be developed on an 'as required' basis as market conditions dictate.
8	New Taxiway – parallel to existing Taxiway Alpha.	9,440m^2	Construction will include lighting and line marking.

The extent of Stage 3 works is shown in Figure 107 below.

Construction of the new taxiway parallel to Taxiway Alpha will act as the enabling works for the second stage of aviation related commercial development to be constructed in Stage 4..

Figure 107: Stage 3 Development



7.4.4 Stage 4 – to 2037

Stage 4 works are proposed to cover the period from 2032 to 2037.

The works cover direct aviation related works only.

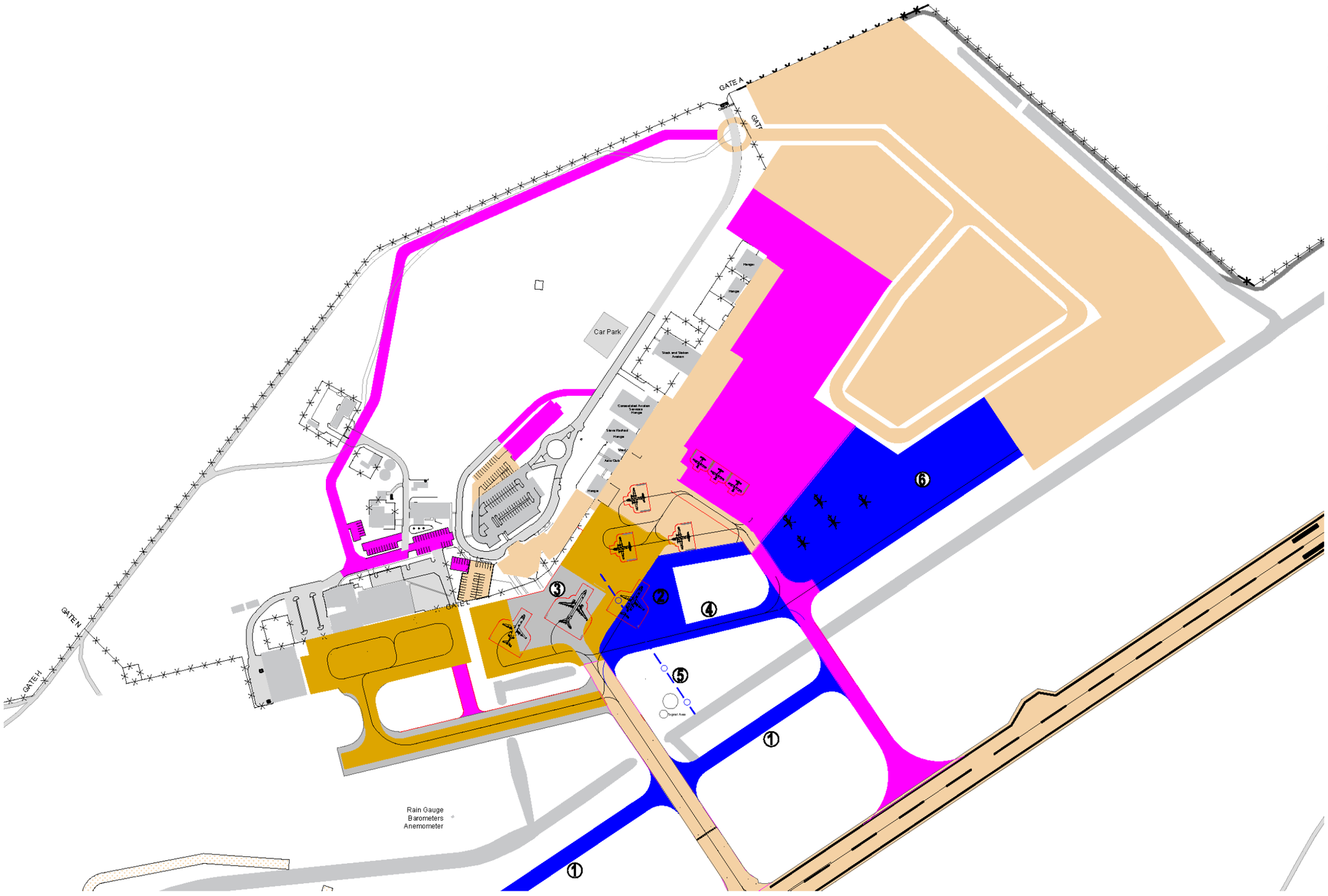
Table 22: Proposed Stage 4 Works

Stage 4 Item Number	Development Item	Extent of Works	Notes
1	Partial parallel taxiway	11,765m^2	The weather sealing of Runway 14/ 32 and large scale development of the aviation commercial zone justifies the construction of the parallel taxiway.
2	Additional RPT apron	4,810m^2	Additional apron to provide additional aircraft parking capacity. These works include in ground power, high bay lighting, and walkways to outer stands
3	Aircraft parking reconfiguration.		Expansion of the RPT apron requires aircraft parking reconfiguration. New line marking will be the major works.
4	Partial Taxiway	3,135m^2	This taxiway provides access to the expanded RPT apron. Works include provision of taxiway lighting and decommissioning of what remains of Taxiway Charlie..
5	Enclosed stormwater drainage.	130 linear metres	Open stormwater drains to be replaced by pipework and culverts as taxiway and apron to be built over.
6	Aviation Commercial Development	Taxilane: 3,775m^2	Including line marking
		Apron: 12,715m^2	Apron to be constructed in response to market demand.
		Land development: 6,610m^2	Enabling of aviation related commercial land development (hangars, etc.). Development of buildings etc. to be undertaken by others. Land will be developed on an ‘as required’ basis as market conditions dictate.

The extent of Stage 4 works is shown in Figure 108 below.

The construction of the partial parallel taxiway (Item 1) are required if the taxiway connection to the expanded RFDS apron are constructed in Stage 5.

Figure 108: Stage 4 Development



Stage 4 - To 2037

① Partial Parallel Taxiway
② Additional Aircraft Parking Apron
③ Aircraft Parking Reconfiguration
④ Partial Taxiway
⑤ Enclose Stormwater Drainage
⑥ Aviation Commercial Development -Stage 4 Taxiway are Enabling Works

LEGEND

- Existing Facilities
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Post 2042

7.4.5 Stage 5 – to 2042

Stage 5 works are proposed to cover the period from 2037 through to the end of the twenty year master plan period in 2042.

The works cover direct aviation related works only.

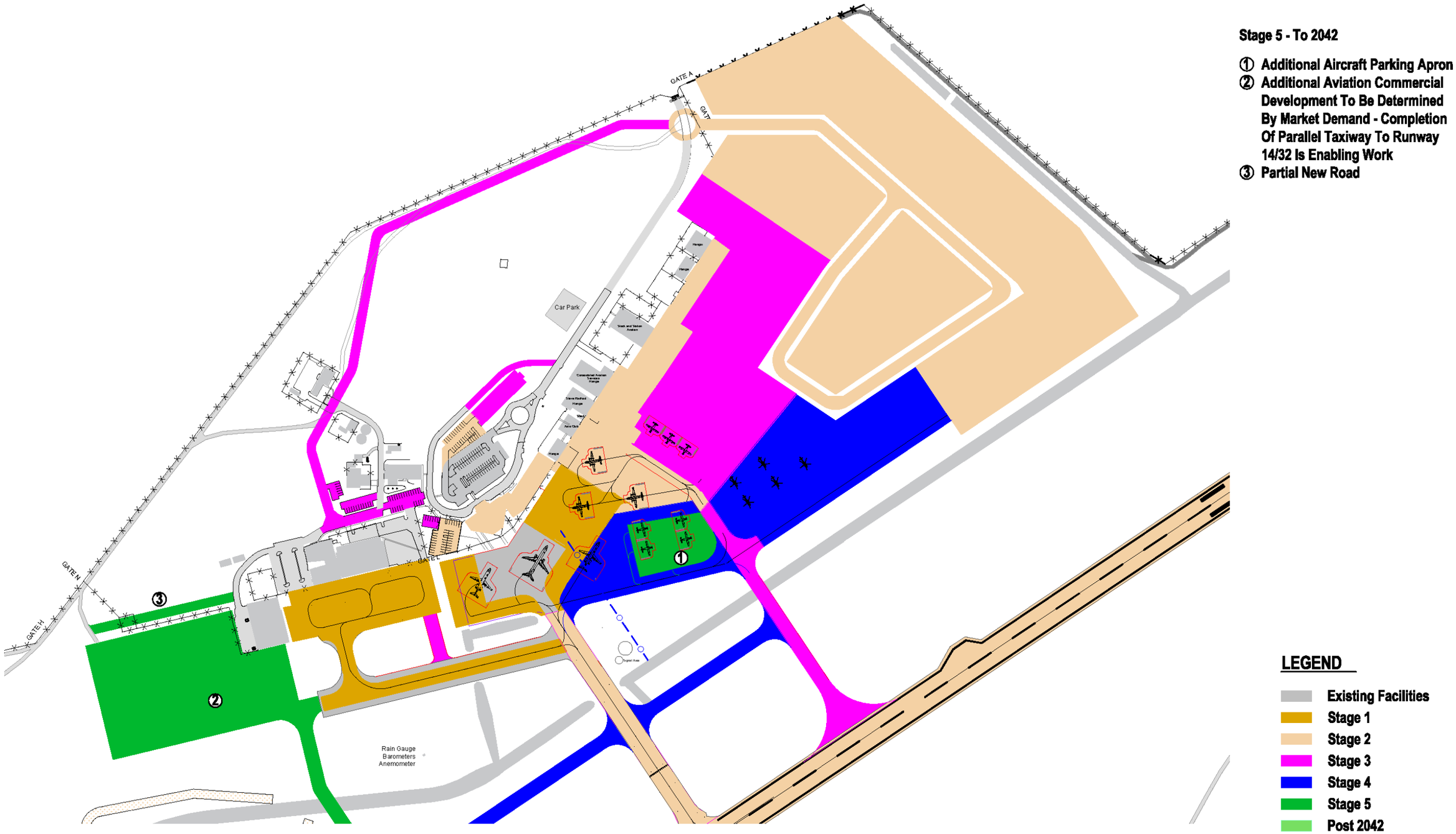
Table 23: Proposed Stage 5 Works

Stage 5 Item Number	Development Item	Extent of Works	Notes
1	Additional RPT apron	5,070m^2	Completion of the RPT apron to the forecast levels.
2	Aviation Commercial Development - Additional development at the western (RFDS) end of the development precinct.	Taxiways: 2,505m^2	Including lighting
		GA Apron: 14,000m^2	This may be developed by the RFDS separate to airport development.
		Land development: 8,375m^2	Enabling of aviation related commercial land development (hangars, etc.). Development of buildings etc. to be undertaken by others. Land will be developed on an 'as required' basis as market conditions dictate.
3	Access Road	Access Road: 160 linear metres	To be developed in conjunction with development of Item 2

Stage 5 item numbers 2 and 3 are intended primarily for future RFDS use. Should the RFDS wish or have access to funding for these works, they could be brought forward to an earlier stage.

The extent of Stage 5 works is shown in Figure 110 below.

Figure 109: Stage 5 Development



7.4.6 Post 2042 Development

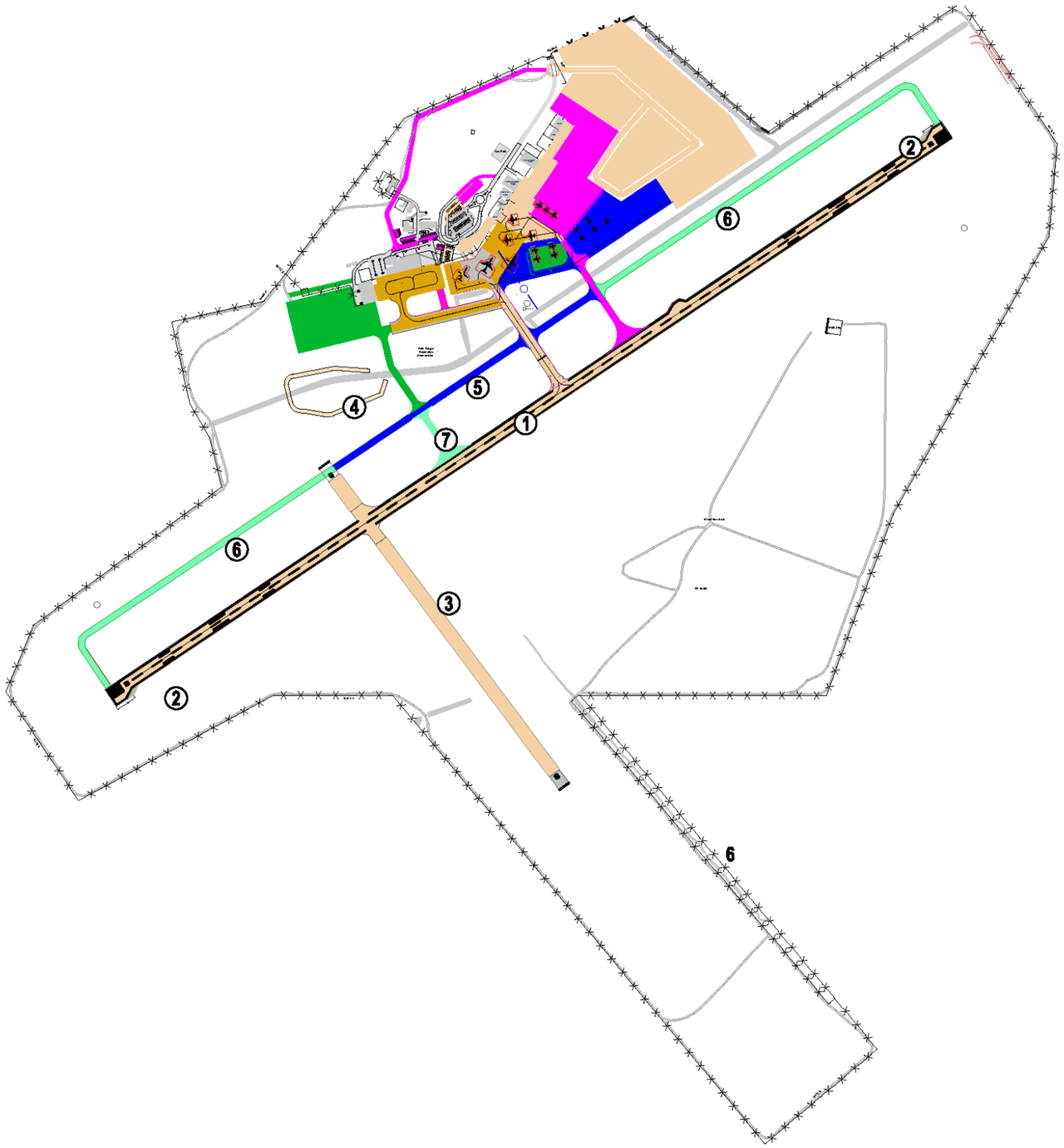
Development items have been identified for the timescale beyond 2042. These are items that should be considered in any future planning and safeguarded for. Timescales for when these items may be required have not been determined.

Table 24: Beyond 2042 Works

Beyond 2042 Item Number	Development Item	Notes
1	Completion of full length taxiway	Remainder of full length taxiway at Code C clearance (158 metres from runway).
2	Connector taxiway	Connector taxiway between Runway 05/23 and the proposed parallel taxiway. To be provided for additional RFDS apron access.

Post 2042 and overall staging development works are shown in Figure 110 below.

Figure 110: Post 2042 and Overall Airport Development



Stage 2
① Runway Strengthening
② Runway Turn Pads For Code C Jets
③ Runway Sealing
④ Stormwater Detention Basin

Stage 4
⑤ Partial Parallel Taxiway

Post 2042
⑥ Full Length Parallel Taxiway
⑦ Connection Taxiway

LEGEND
- Existing Facilities
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Post 2042

8 Engineering Plans

Preliminary engineering plans for landside areas – roads, car parks and the commercial development lands have been developed by Price Merrett Consulting.

The aims of the engineering plans was to develop high level preliminary design guidelines for the proposed industrial subdivision complete with appropriate road design and identifying and sizing a typical road reserve layout. Other work included access roads, carpark design and retardation basin design.

All CAD base information was provided by Landrum & Brown and based on datums provided.

The tasks included and outlined in the drawings to be found in Appendix E include:

- Confirmation of road widths and road reservations.
- Turning circles / court bowl sizing.
- High level specification for road design.
- Confirmation on water supply and sewage connections.
- Stormwater.
- Carpark Design.

The planning of the proposed industrial subdivision was based on successful past projects and the IDM (infra–Structure Design Manual)[68] which sets standards for local government development. Allotment sizing was not part of the brief and will be investigated further when market conditions are more defined.

Road design has been developed based on Austroads standards[69]. The location of Broken Hill was taken into account and has included turning path checking of B-Double semi-trailers and slow-moving road trains.

Typical road cross-sections indicate standard locations of services and road furniture.

At this early preliminary design stage, water supply and sewage are indicative only in the standard cross-sections. Later detail design will highlight existing system tie in and relevance to each allotment.

Stormwater calculations are also very preliminary as the nature and components of the industrial development are not known at this stage. The addition of multiple allotments in the industrial subdivision and additional areas of aircraft parking apron would require balanced outflows therefore a retardation basin is recommended to delay water entering the local system too quickly. This is proposed to be located to the west of the terminal precinct.

For the expansion of the existing terminal carpark and additional RFDS car park, a typical car park design has been suggested with edge strip and guttering. A typical cross-section has also been provided indicating pavement layers.

[68] https://www.designmanual.com.au/
[69] https://austroads.com.au/safety-and-design/road-design/guide-to-road-design

9 Geotechnical Testing

Geotechnical and soil tests were commissioned by Broken Hill City Council independently of the Airport master planning process. These were undertaken by Civil Test Pty Ltd. The soil tests were undertaken in the areas on the northern part of the airport identified for development by the master plan. The purpose of the soil testing was to provide a feasibility background to the next stage of development post the master plan.

The geotechnical and soil tests can be found in Appendix F to this report.

10 Costing Plan

A costing plan for the master plan development has been prepared by WT Partnership. The costing considers the development areas identified as well the development stages outlined in Section 7 of this report.

The costing plan is confidential to Council.

11 Appendix A: CASA 'Grandfathering' Provisions[70]

8 Grandfathering provision

8.1 What is grandfathering?

8.1.1 Grandfathering allows the operator of an existing certified, or an existing registered aerodrome, to maintain their aerodrome facility and the OLS of an existing runway, to the standard that applied:

- at the time the facility was constructed, or
- if the facility had been replaced or upgraded since it was constructed, to the standard that applied to the facility at the time it was replaced or upgraded.

8.1.2 Grandfathering may be against any previous aerodrome standard such as:

- previous revisions of the Manual of Standards Part 139 - Aerodromes (MOS Part 139)
- Rules and Practices for Aerodromes (RPA)
- Airways Engineering Instructions (AEI)
- Airport Instructions (API)
- Airport Engineering Instructions (APEI)

8.1.3 Provided the grandfathering provision has been correctly applied and the required information is documented in the aerodrome manual, CASA will continue to recognise the standard that was in place at the time the facility was first built, or the standard which otherwise applied at the time it was last replaced or upgraded.

8.1.4 Grandfathered facilities will continue to have grandfathered status until they are next upgraded or replaced by the aerodrome operator.

8.2 Applying the grandfathering provision

8.2.1 To apply the grandfathering provision an aerodrome operator must be able to demonstrate that at the time the facility was constructed, replaced, or upgraded, the facility complied with, and continues to comply with, the standards that were in effect at that time.

8.2.2 A facility that has been replaced or upgraded after it was originally built, cannot be retrospectively grandfathered to the initial standard that applied when the facility was first built.

8.2.3 For a facility to be recognised as being grandfathered, the operator's aerodrome manual must:

- identify the facility/OLS, and
- detail how the facility/OLS does not comply.

8.2.4 In addition to, and for evidentiary purposes, the following information should also be recorded in the aerodrome manual:

- the date the facility was constructed, last replaced or upgraded, and
- the previous standard to which the facility complied with and continues to comply with.

8.2.5 Subject to appropriate documentation in the aerodrome manual, grandfathering does not require a safety case.

8.2.6 Facilities that are not accurately documented cannot be grandfathered retrospectively.

8.2.7 A flow chart summarising the grandfathering provision is provided in Appendix B to this advisory circular.

8.3 Circumstances in which grandfathering does not apply

8.3.1 The grandfathering provision can only be applied to actual physical facilities and the OLS applicable to an existing runway, and therefore does not extend to include:

- systems and processes, or
- matters of non-compliance.

8.3.2 Subject to transitional provisions, on the commencement of the revised Part 139 MOS, an aerodrome operator is expected to comply with all applicable systems and processes.

8.3.3 Whilst maintaining ground markings is considered maintenance, the grandfathering provision will no longer apply from the nominated date in which a marking (i.e. runway holding position markings) is required to be updated. As the enhancement of these markings provides a superior safety outcome, CASA recommends that the aerodrome operator establishes a program to ensure existing markings are bought into compliance with the revised standard as soon as practicable.

8.3.4 CASA may direct an aerodrome operator to upgrade their facility to comply with the standards in the revised Part 139 MOS.

8.3.5 Grandfathering provisions will not apply to new aerodromes.

8.3.6 If an existing regulated aerodrome does not transition upon commencement of the new rules, or if the aerodrome ceases to be certified at any point after the commencement of the new rules, they will be considered a new aerodrome and grandfathering provisions will not apply.

8.3.7 Facilities that don't comply with the revised Part 139 MOS, and are not able to be grandfathered, are non-compliances against the Part 139 MOS.

[70] CASA Advisory Circular AC 139.A-03 v1.0: Application of Aerodrome Standards, November 2019

12 Appendix B: Preliminary Planning Options Developed

12.1 Option 1

Table 25: Option 1 Features / Pros / Cons

Option 1 Key Features	Option 1 Pros	Option 1 Cons
• Safeguards for full length parallel taxiway • Builds part of parallel taxiway • Additional taxiway access to aprons • Aviation commercial development and apron • New road link to RFDS precinct – separate from terminal access road • Terminal road realignment and car park expansion • Terminal Expansion • Enlarged RPT apron • Non aviation commercial development	• Flexible development pathways for RPT apron and commercial development. • Multiple runway entry / exit points • Largely maintains separation of RPT / RFDS / GA aprons and operations. • Further aircraft parking potential	• Some duplication of taxiways to maintain operations • Loss of TWY Charlie – though at end of life and used as commercial area road alignment. • Doesn't maximise use of land resource • Some aviation land at eastern end will be expensive to develop – long lengths of single loaded taxilane length – depending on demand may be better suited to non aviation • No distinct GA parking apron .

Figure 111: Option 1 – Overall Airport Layout

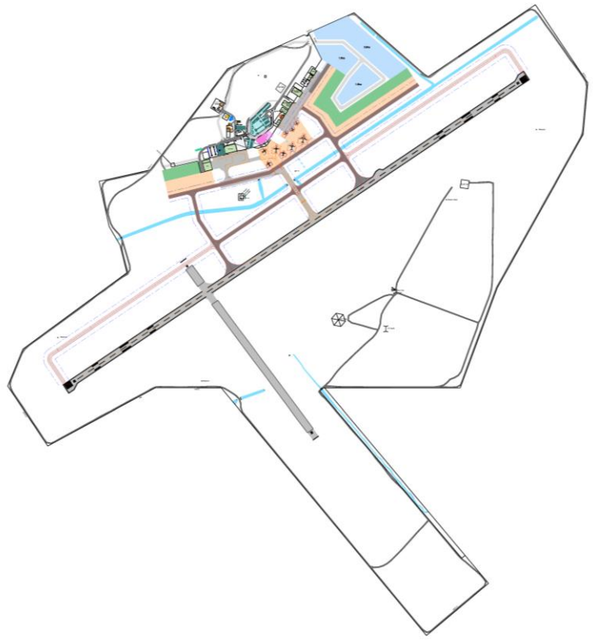
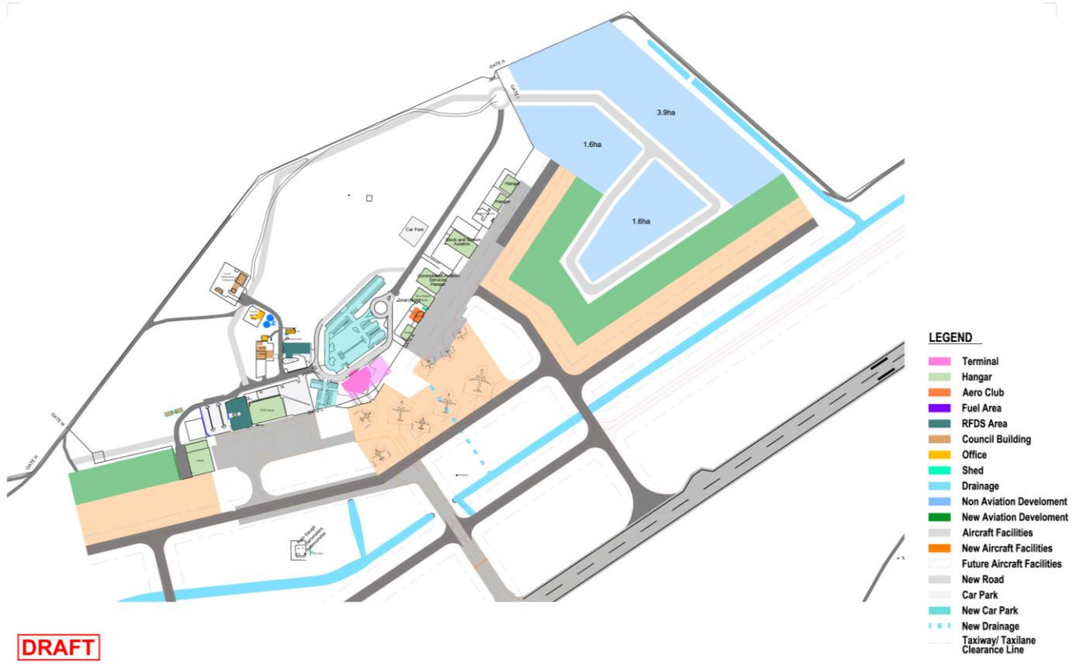


Figure 112: Option 1 – Northern Airport Development

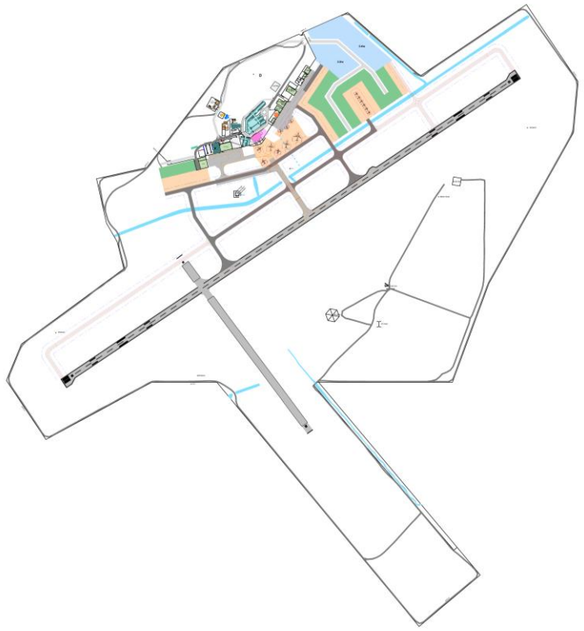


12.2 Option 2

Table 26: Option 2 Features / Pros / Cons

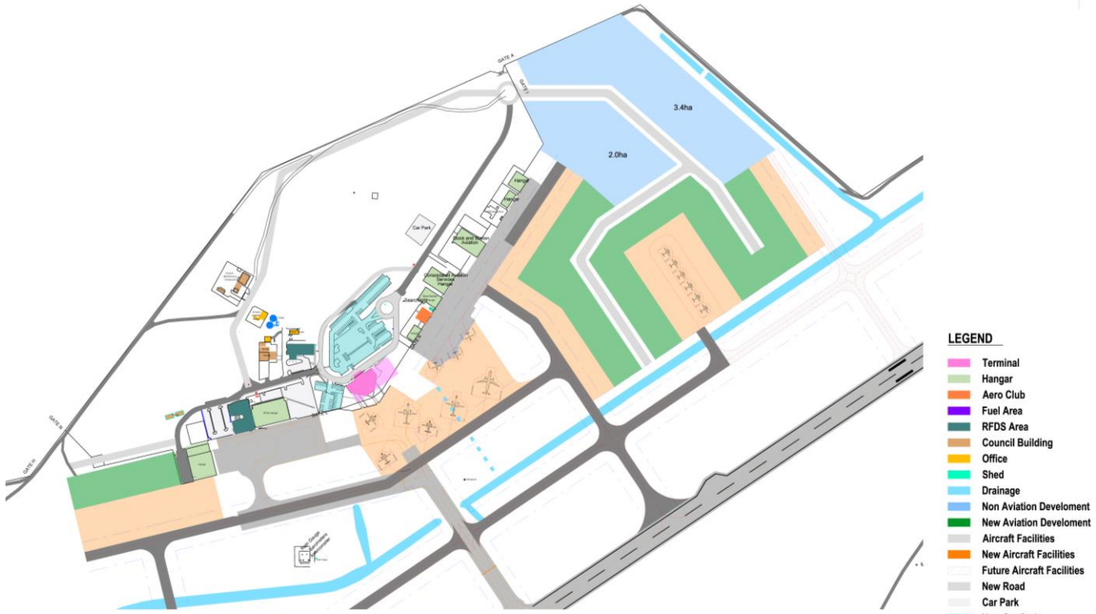
Option 2 Key Features	Option 2 Pros	Option 2 Cons
• Safeguard for full length parallel taxiway • Build part of parallel taxiway • Additional taxiway access to aprons • Aviation commercial development and apron • New road link to RFDS precinct – separate from terminal access road • Terminal road realignment and car park expansion • Terminal Expansion • Enlarged RPT apron • Non aviation commercial development • Flexible land use – aviation or non aviation	• Flexible development pathways for RPT apron and commercial development. • Multiple runway entry / exit points • Largely maintains separation of RPT / RFDS / GA aprons and operations. • Provides distinct GA parking apron • Addition aircraft parking potential	• Some duplication of taxiways to maintain operations • Loss of TWY Charlie – though at end of life and used partly as commercial area road alignment. • Doesn't maximise use of land resource • Some aviation land will be expensive to develop – long lengths of single loaded taxilane length .

Figure 113: Option 2 – Overall Airport Layout



DRAFT

Figure 114: Option 2 – Northern Airport Development



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12.3 Option 3

Table 27: Option 3 Features / Pros / Cons

Option 3 Key Features	Option 3 Pros	Option 3 Cons
• Safeguards for full length parallel taxiway • Builds part of parallel taxiway • Additional taxiway access to aprons • Aviation commercial development and apron • New road link to RFDS precinct – separate from terminal access road • Terminal road realignment and car park expansion • Terminal Expansion • Enlarged RPT apron • Non aviation commercial development • GA parking apron	• Flexible development pathways for RPT apron and commercial development. • Multiple runway entry / exit points • Provides distinct GA parking apron • Shorter lengths of taxiway and higher utilization compared to Options 1 and 2 • Makes greater use of easily accessible land resource • Larger non aviation commercial land resource • TWY Charlie maintained	• Greater degree of mixing GA and RPT operations • Terminal expansion space more constrained • More expensive RPT apron expansion.

Figure 115: Option 3 – Overall Airport Layout

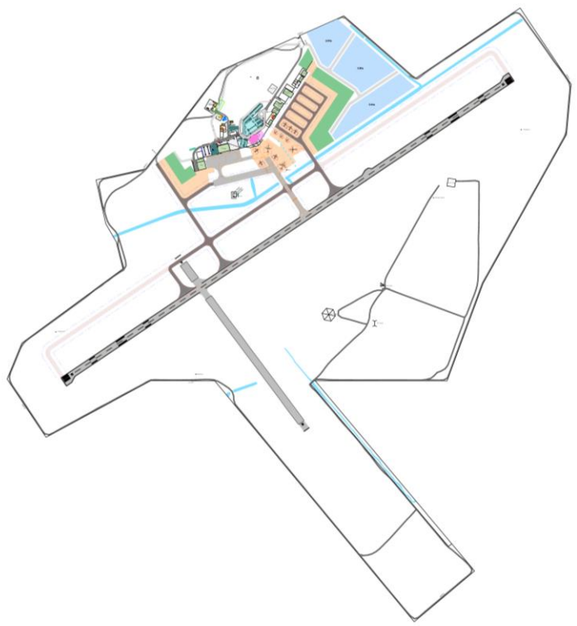
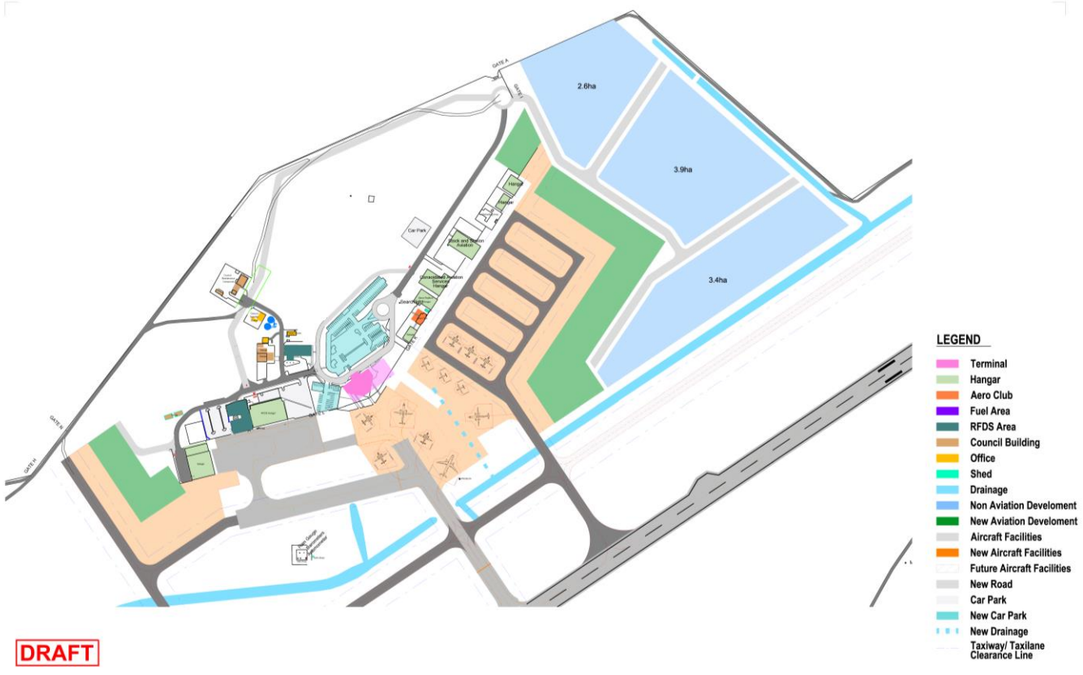


Figure 116: Option 3 – Northern Airport Development



12.4 Option 4

Table 28: Option 4 Features / Pros / Cons

Option 4 Key Features	Option 4 Pros	Option 4 Cons
• Safeguards for full length parallel taxiway • Build part of parallel taxiway • Additional taxiway access to aprons • Aviation commercial development and apron • New road link to RFDS precinct – separate from terminal access road • Terminal road realignment and car park expansion • Terminal Expansion • Enlarged RPT apron • Non aviation commercial development • GA parking apron	• Flexible development pathways for RPT apron and commercial development. • Multiple runway entry / exit points • Provides distinct GA parking apron • Dual access to RFDS Apron • Makes greater use of easily accessible land resource • Larger non aviation commercial land resource	• Lack of further development pathways for RPT apron expansion •

Of the first round of options – Options 1 through 4 – the concept Option 4 was preferred. It formed the basis of subsequent option development.

Figure 117: Option 4 – Overall Airport Layout

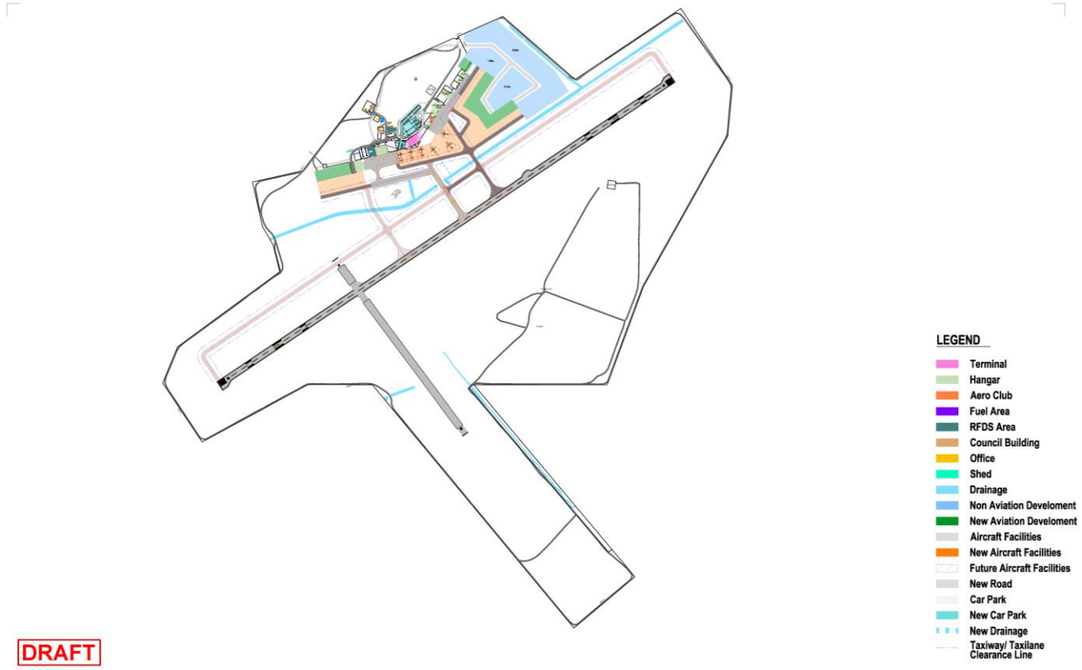
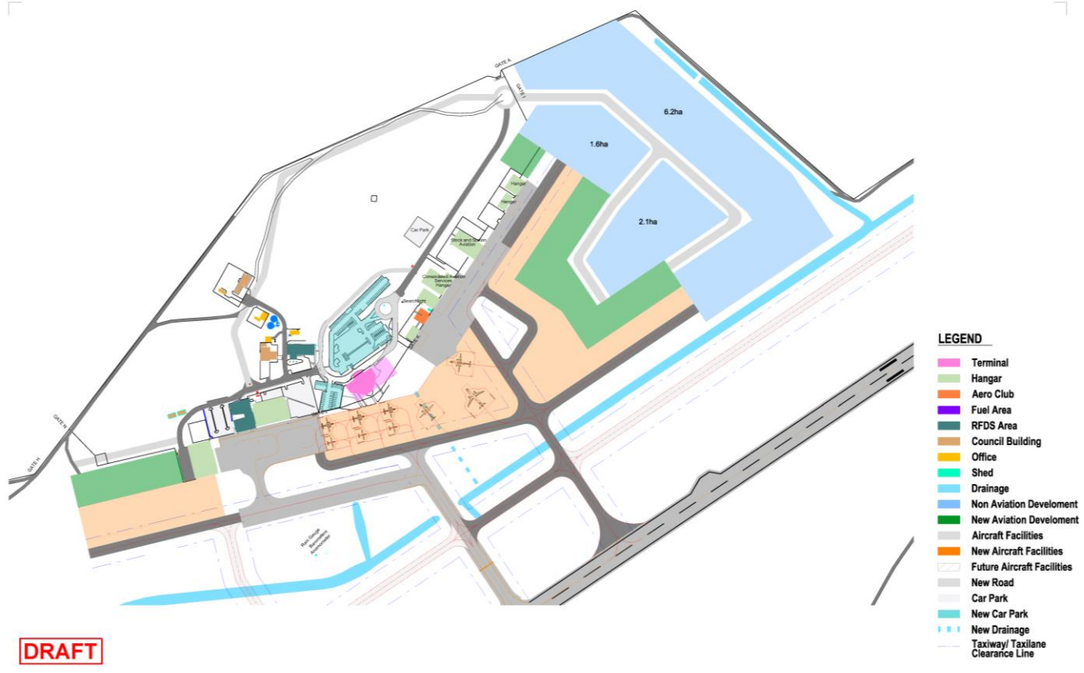


Figure 118: Option 4 – Northern Airport Development

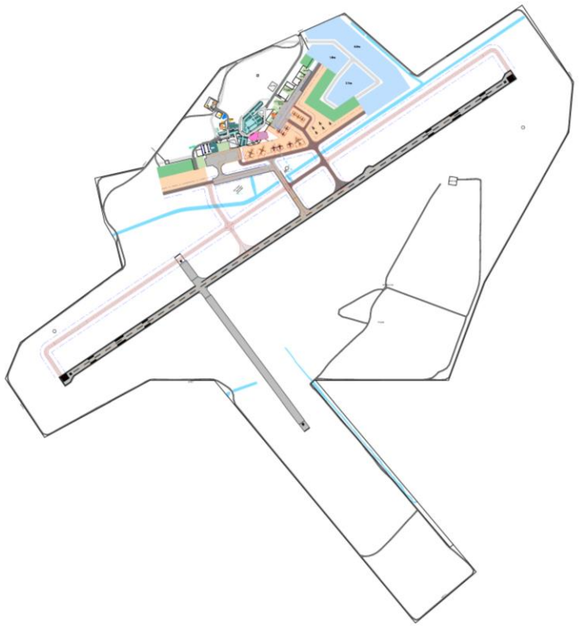


12.5 Option 5

Table 29: Option 5 Features / Pros / Cons

Option 5 Key Features	Option 5 Pros	Option 5 Cons
• Safeguards for full length parallel taxiway • Build part of parallel taxiway • Additional taxiway access to aprons • Aviation commercial development and apron • New road link to RFDS precinct – separate from terminal access road • Terminal road realignment and car park expansion • Terminal Expansion • Enlarged RPT apron • Non aviation commercial development • GA parking apron	• Flexible development pathways for RPT apron and commercial development. • Multiple runway entry / exit points • Provides distinct GA parking apron • Dual access to RFDS Apron • Makes greater use of easily accessible land resource • Larger non aviation commercial land resource	• Development of terminal toward airside over foreshadowed apron works.

Figure 119: Option 5 – Overall Airport Layout



DRAFT

Figure 120: Option 5 – Northern Airport Development

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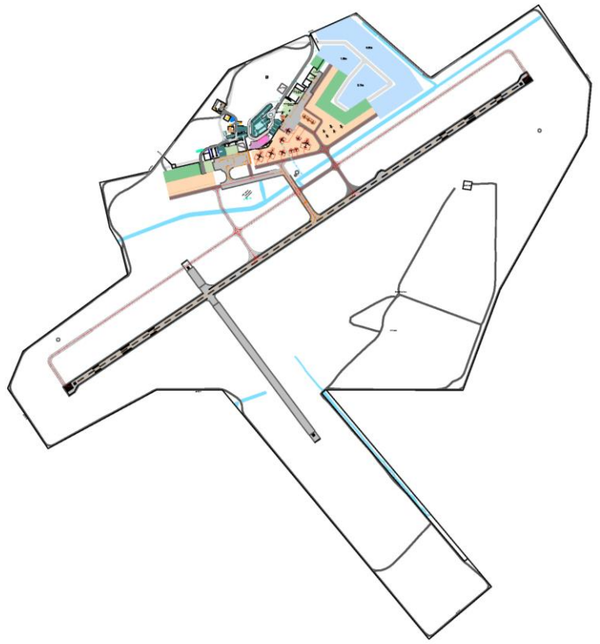
12.6 Option 6

Table 30: Option 6 Features / Pros / Cons

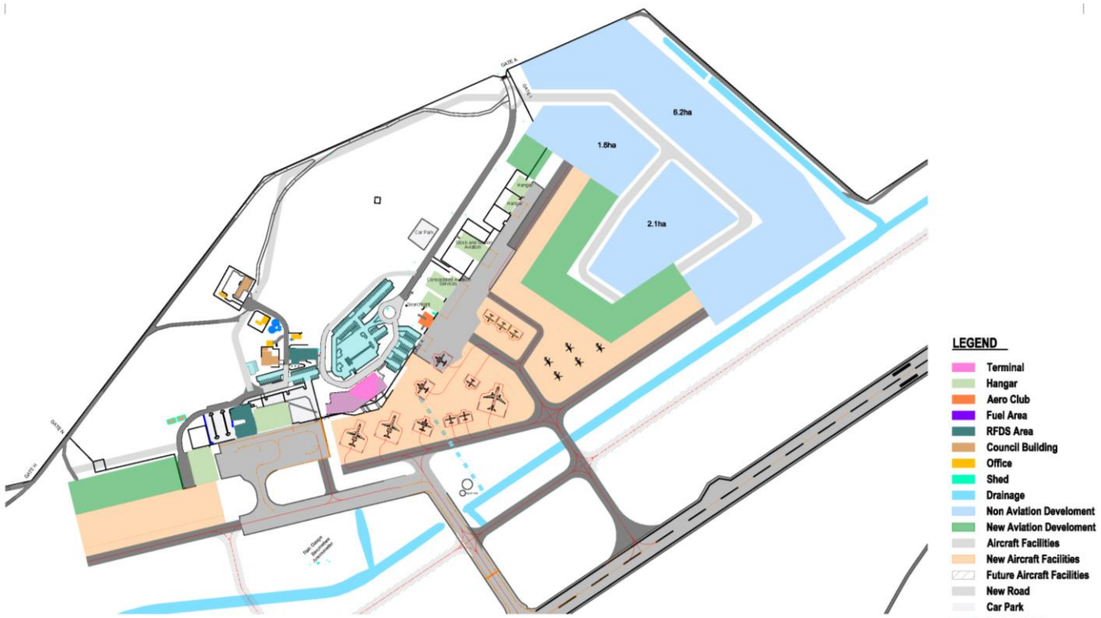
Option 6 Key Features	Option 6 Pros	Option 6 Cons
• Safeguards for full length parallel taxiway • Build part of parallel taxiway • Additional taxiway access to aprons • Aviation commercial development and apron • New road link to RFDS precinct – separate from terminal access road • Terminal road realignment and car park expansion • Terminal Expansion • Enlarged RPT apron • Non aviation commercial development • GA parking apron • All of the above similar to Option 5	• Flexible development pathways for RPT apron and commercial development. • Multiple runway entry / exit points • Provides distinct GA parking apron • Dual access to RFDS Apron • Makes greater use of easily accessible land resource • Larger non aviation commercial land resource • No terminal development over foreshadowed apron developments.	• Development of terminal to west and location of rental car parking to east of terminal seen as a potential staging issue..

Figure 121: Option 6 – Overall Airport Layout



DRAFT

Figure 122: Option 6 – Northern Airport Development



DRAFT

12.7 Option 7

Table 31: Option 7 Features / Pros / Cons

Option 7 Key Features	Option 7 Pros	Option 7 Cons
• Safeguards for full length parallel taxiway • Build part of parallel taxiway • Additional taxiway access to aprons • Aviation commercial development and apron • New road link to RFDS precinct – separate from terminal access road • Terminal road realignment and car park expansion • Terminal Expansion • Enlarged RPT apron • Non aviation commercial development • GA parking apron • All of the above similar to Option 5	• Flexible development pathways for RPT apron and commercial development. • Multiple runway entry / exit points • Provides distinct GA parking apron • Dual access to RFDS Apron • Makes greater use of easily accessible land resource • Larger non aviation commercial land resource • No terminal development over foreshadowed apron developments. • Terminal development to east of terminal and rental car park retained.	• None..

Option 7 was identified as the preferred option to be taken forward for final master plan development.

Figure 123: Option 7 – Overall Airport Layout

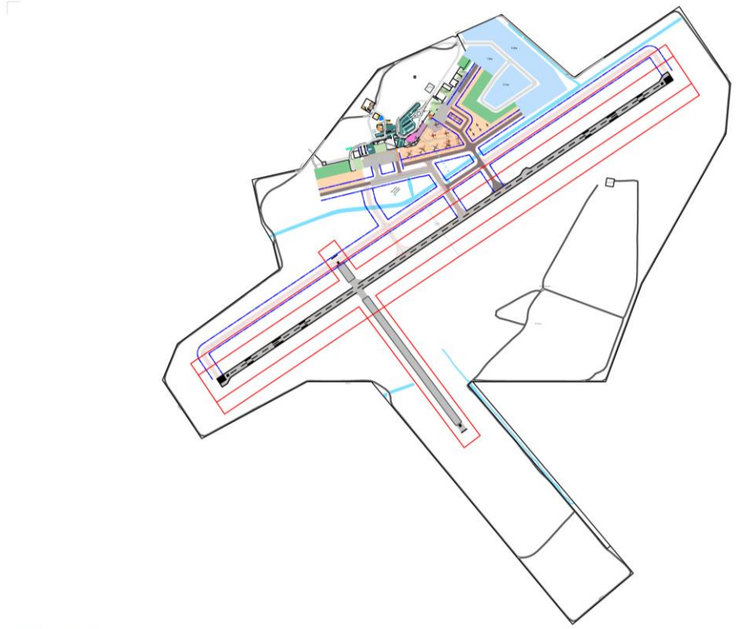
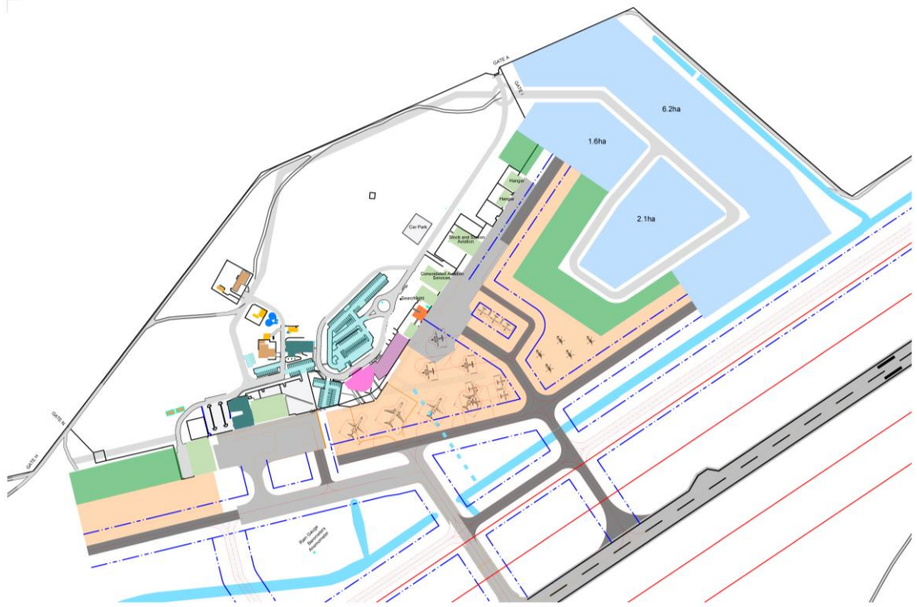
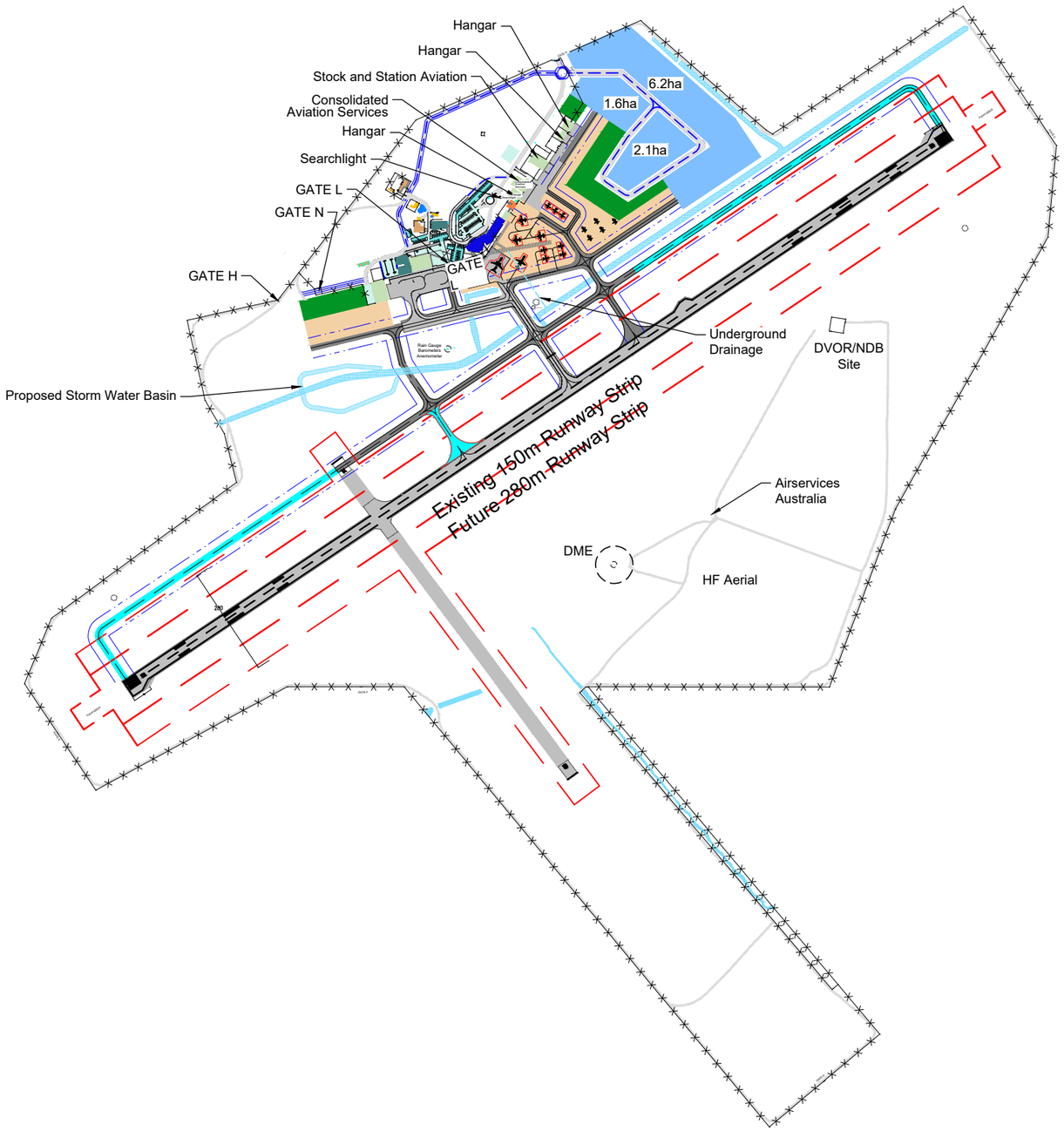


Figure 124: Option 7 – Northern Airport Development



13 Appendix C: 2042 Airport Plans



LEGEND

- Terminal
- Hangar
- Aero Club
- Fuel Area
- RFDS Area
- Council Building
- Services
- Shed
- Drainage
- Non Aviation Develoment
- New Aviation Develoment
- Existing Aircraft Facilities
- Aircraft Apron
- New Taxiway
- Post 2042 Taxiway
- Existing Road
- New Road
- Existing Car Park
- New Car Park
- New Drainage
- Taxiway/ Taxilane Clearance Line

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PROJECT Broken Hill Regional Airport
Master Planning Project

DRAWING 2042 Airport Plan

SHEET LB001

SCALE
0 1200 2400 3600 4800
Scale in metres: 1:12000 @A3

ISSUE 1

DATE 21/08/2023

DRAWN BY SY

PROJECT NO. LB00577

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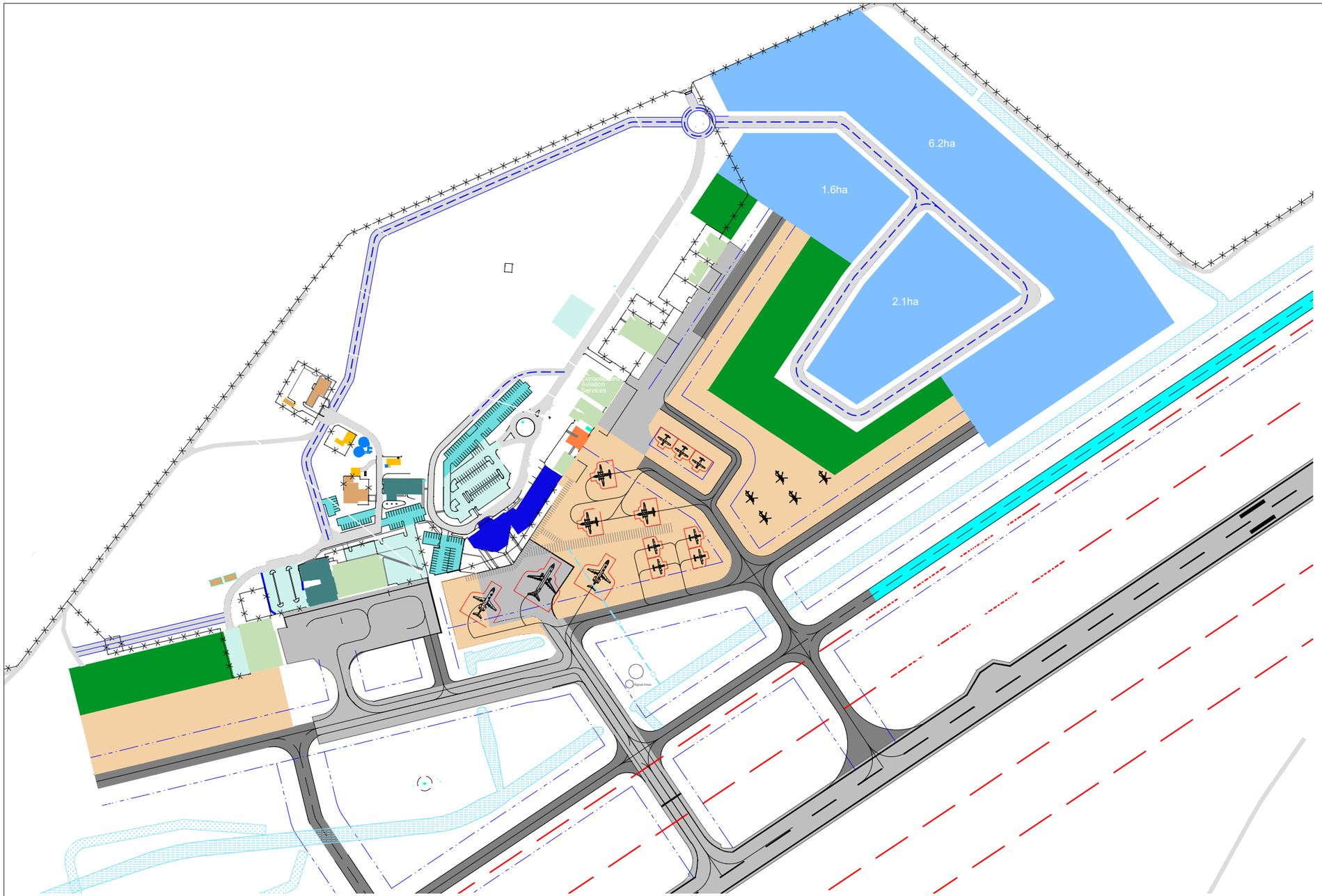

LEGEND

- Terminal
- Hangar
- Aero Club
- Fuel Area
- RFDS Area
- Council Building
- Services
- Shed
- Drainage
- Non Aviation Develoment
- New Aviation Develoment
- Existing Aircraft Facilities
- Aircraft Apron
- New Taxiway
- Post 2042 Taxiway
- Existing Road
- New Road
- Existing Car Park
- New Car Park
- New Drainage
- Taxiway/ Taxilane Clearance Line

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PROJECT	Broken Hill Reginal Airport Master Planning Project	**SHEET**	**SCALE**		**ISSUE**	**DATE**
DRAWING	2042 Airport Plan	LB002	0 400 800 1200 1600 Scale in metres: 1:4000 @A3		1	21/08/2023
					DRAWN BY SY	**PROJECT NO.** LB00577

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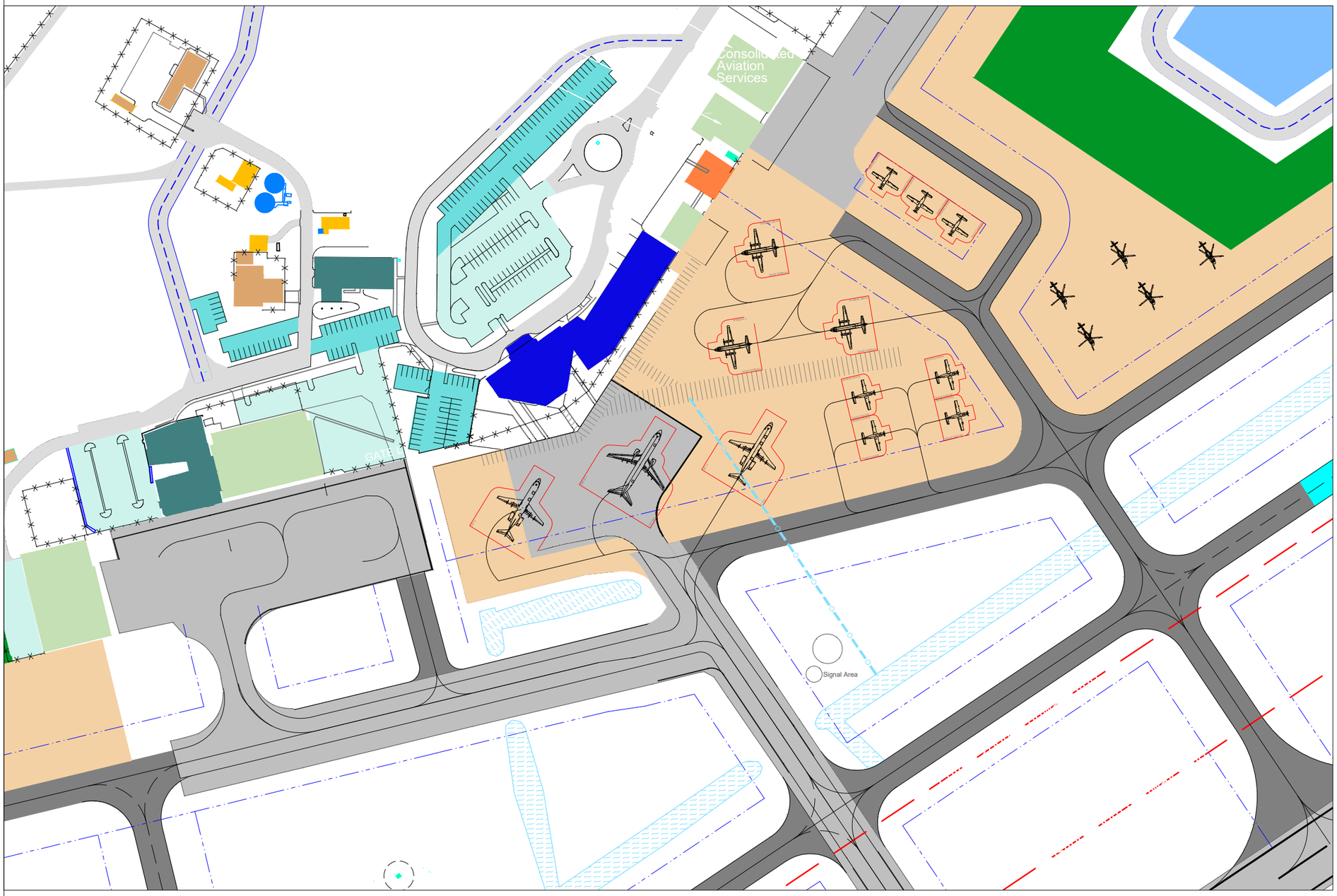

LEGEND

- Terminal
- Hangar
- Aero Club
- Fuel Area
- RFDS Area
- Council Building
- Services
- Shed
- Drainage
- Non Aviation Develoment
- New Aviation Develoment
- Existing Aircraft Facilities
- Aircraft Apron
- New Taxiway
- Post 2042 Taxiway
- Existing Road
- New Road
- Existing Car Park
- New Car Park
- New Drainage
- Taxiway/ Taxilane Clearance Line

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PROJECT Broken Hill Regional Airport
Master Planning Project

DRAWING 2042 Airport Plan

SHEET LB003

SCALE
0 200 400 600 800
Scale in metres: 1:2000 @A3

ISSUE 1

DATE 21/08/2023

DRAWN BY SY

PROJECT NO. LB00577

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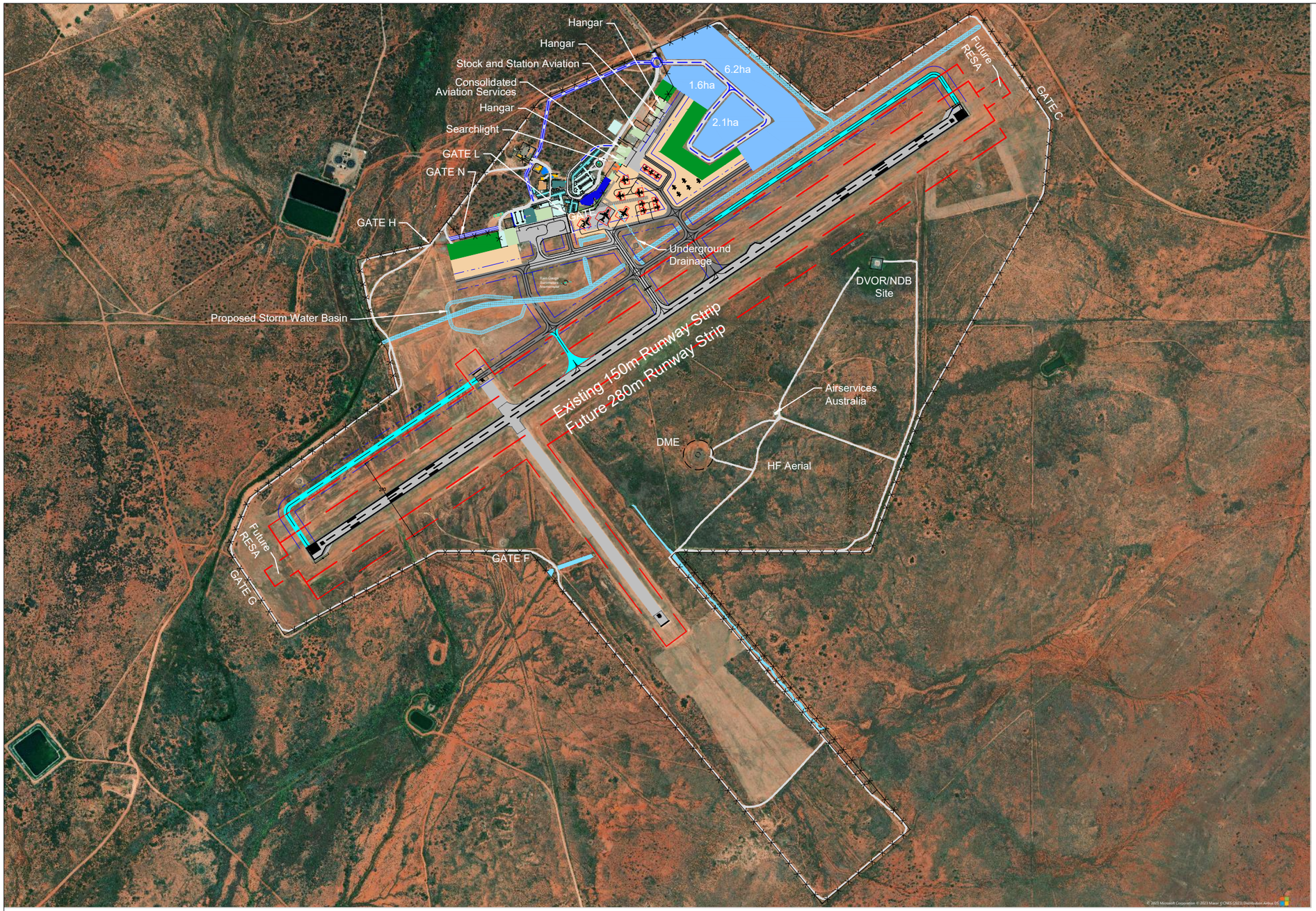

LEGEND

- Terminal
- Hangar
- Aero Club
- Fuel Area
- RFDS Area
- Council Building
- Services
- Shed
- Drainage
- Non Aviation Develoment
- New Aviation Develoment
- Existing Aircraft Facilities
- Aircraft Apron
- New Taxiway
- Post 2042 Taxiway
- Existing Road
- New Road
- Existing Car Park
- New Car Park
- New Drainage
- Taxiway/ Taxilane Clearance Line

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PROJECT Broken Hill Regional Airport
Master Planning Project

DRAWING 2042 Airport Plan

SHEET LB001

SCALE 0 1200 2400 3600 4800
Scale in metres: 1:12000 @A3

ISSUE 1

DATE 21/08/2023

DRAWN BY SY

PROJECT NO. LB00577

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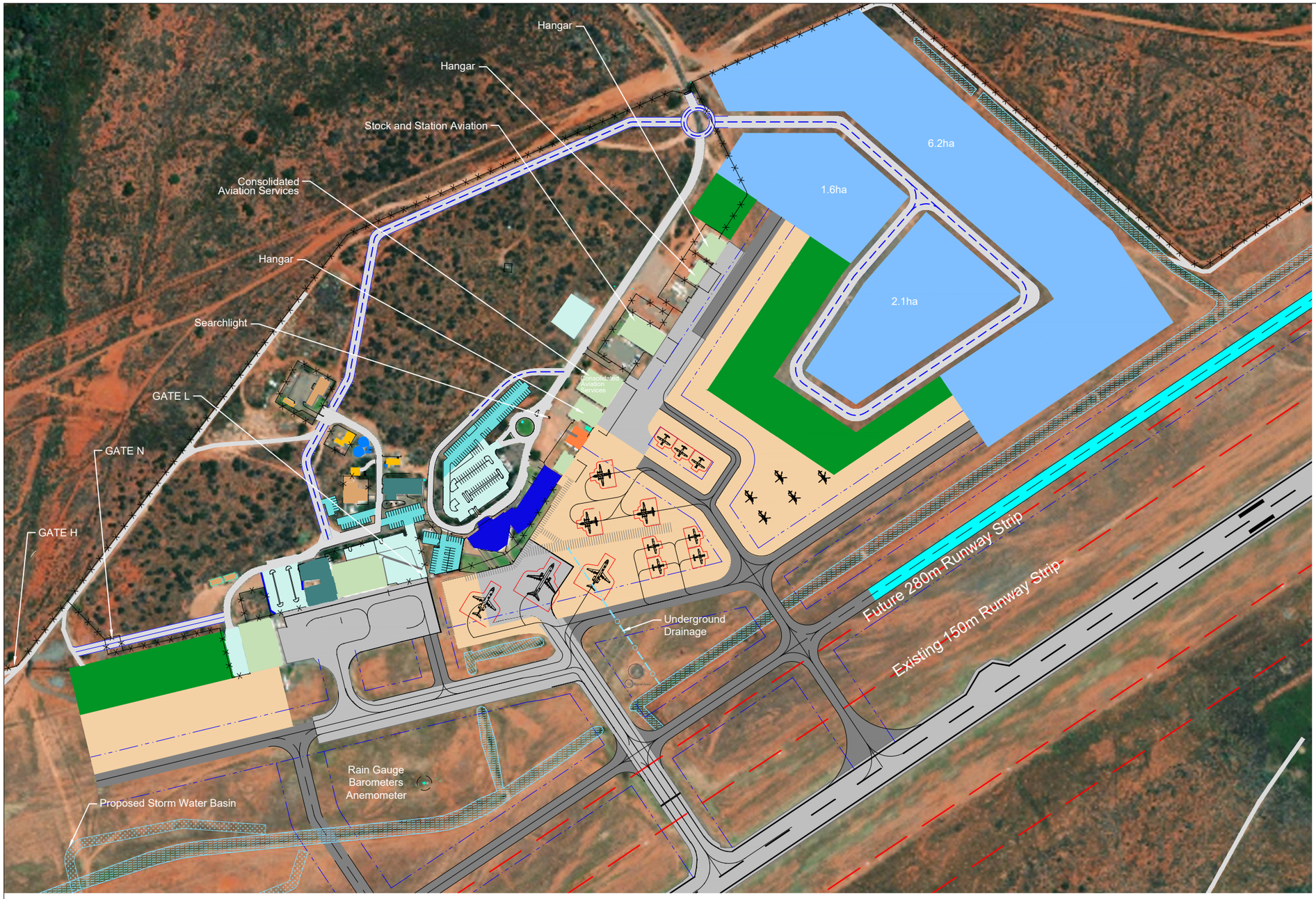

LEGEND

- Terminal
- Hangar
- Aero Club
- Fuel Area
- RFDS Area
- Council Building
- Services
- Shed
- Drainage
- Non Aviation Develoment
- New Aviation Develoment
- Existing Aircraft Facilities
- Aircraft Apron
- New Taxiway
- Post 2042 Taxiway
- Existing Road
- New Road
- Existing Car Park
- New Car Park
- New Drainage
- Taxiway/ Taxilane Clearance Line

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PROJECT Broken Hill Reginal Airport
Master Planning Project

DRAWING 2042 Airport Plan

SHEET LB002

SCALE
0 400 800 1200 1600
Scale in metres: 1:4000 @A3

ISSUE 1

DATE 21/08/2023

DRAWN BY SY

PROJECT NO. LB00577

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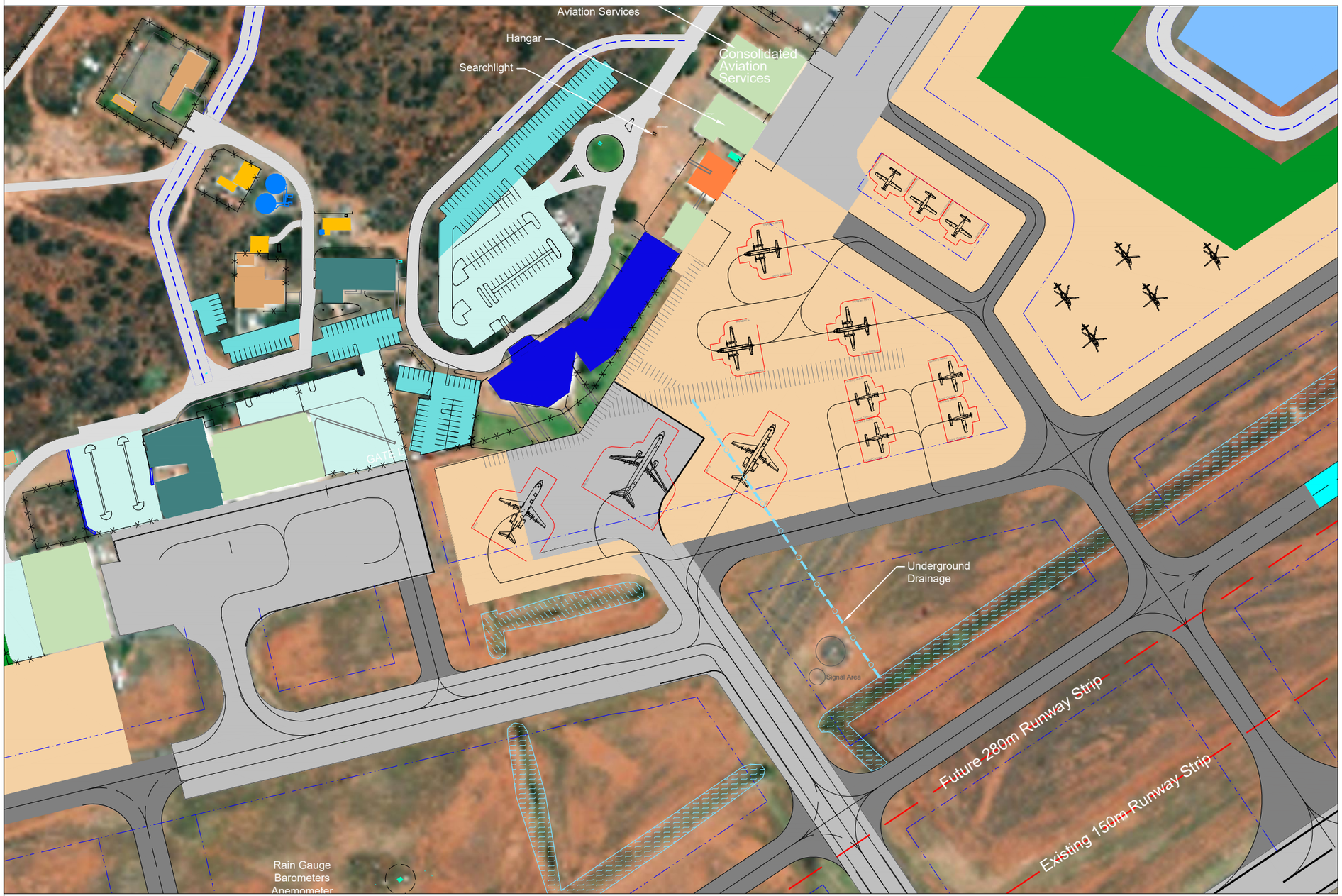

LEGEND

- Terminal
- Hangar
- Aero Club
- Fuel Area
- RFDS Area
- Council Building
- Services
- Shed
- Drainage
- Non Aviation Develoment
- New Aviation Develoment
- Existing Aircraft Facilities
- Aircraft Apron
- New Taxiway
- Post 2042 Taxiway
- Existing Road
- New Road
- Existing Car Park
- New Car Park
- New Drainage
- Taxiway/ Taxilane Clearance Line

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PROJECT Broken Hill Regional Airport
Master Planning Project

DRAWING 2042 Airport Plan

SHEET LB003

SCALE
0 200 400 600 800
Scale in metres: 1:2000 @A3

ISSUE 1

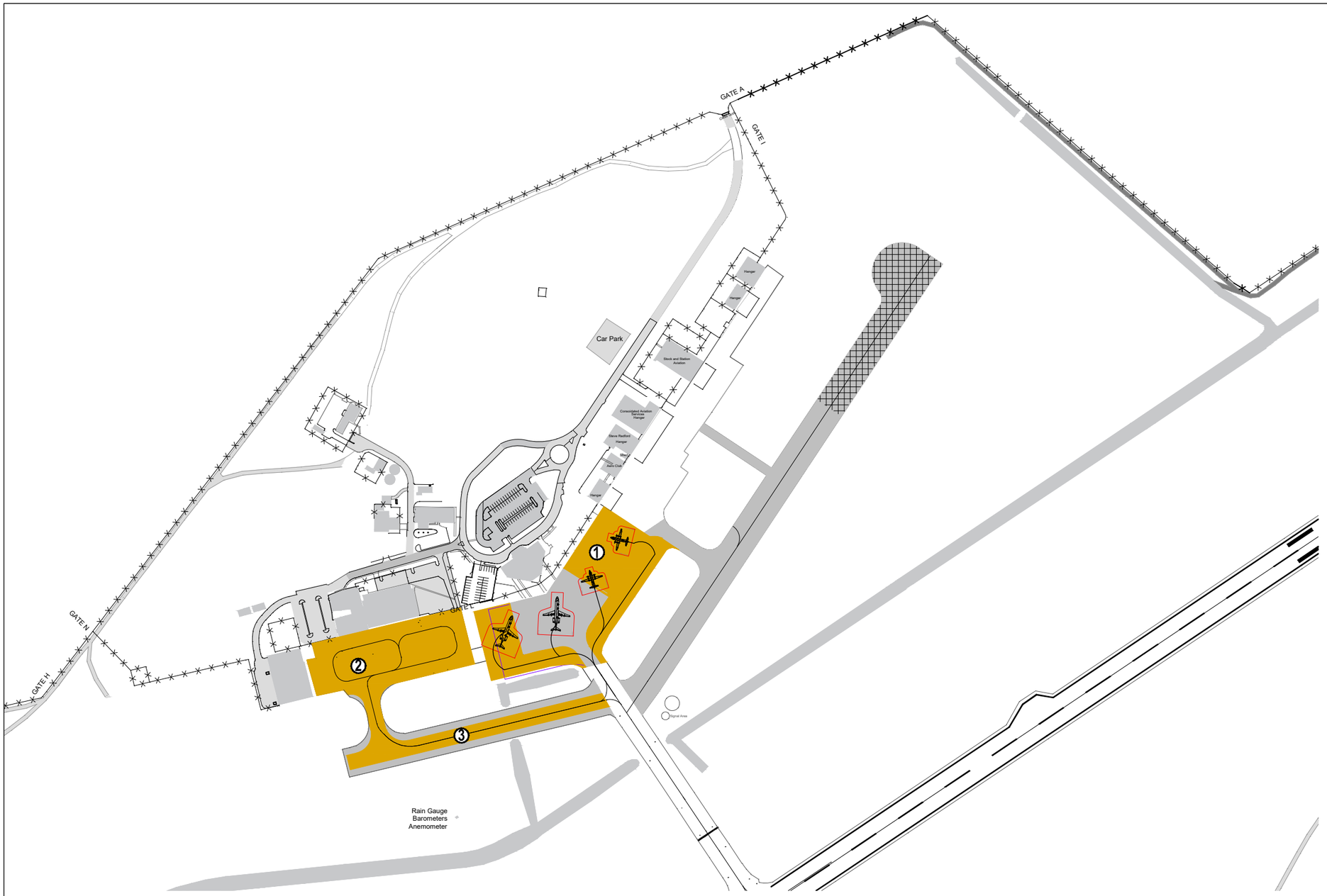
DATE 21/08/2023

DRAWN BY SY

PROJECT NO. LB00577

File:Preferred Option 2042.08-15.V1.dwg Layout:2042 Apron Area Plan Last Saved:8/22/2023 11:25 AM Plotted On:8/22/2023 11:36 AM Colortable:----- LTScale:1.00 LwDefault:.004

14 Appendix D: Staging Plans



Stage 1 - Committed Works

① Committed Works (RPT Apron)
② Apron Resheet
③ Taxiway Bravo Resheet and Refurbishment

LEGEND

- Existing Facilities
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Post 2042

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PROJECT Broken Hill Regional Airport Master Planning Project

DRAWING Stage 1 - Committed Works

SHEET LB002

SCALE 0 400 800 1200 1600
Scale in metres: 1:4000 @A3

ISSUE 1

DATE 21/08/2023

DRAWN BY SY

PROJECT NO. LB00577

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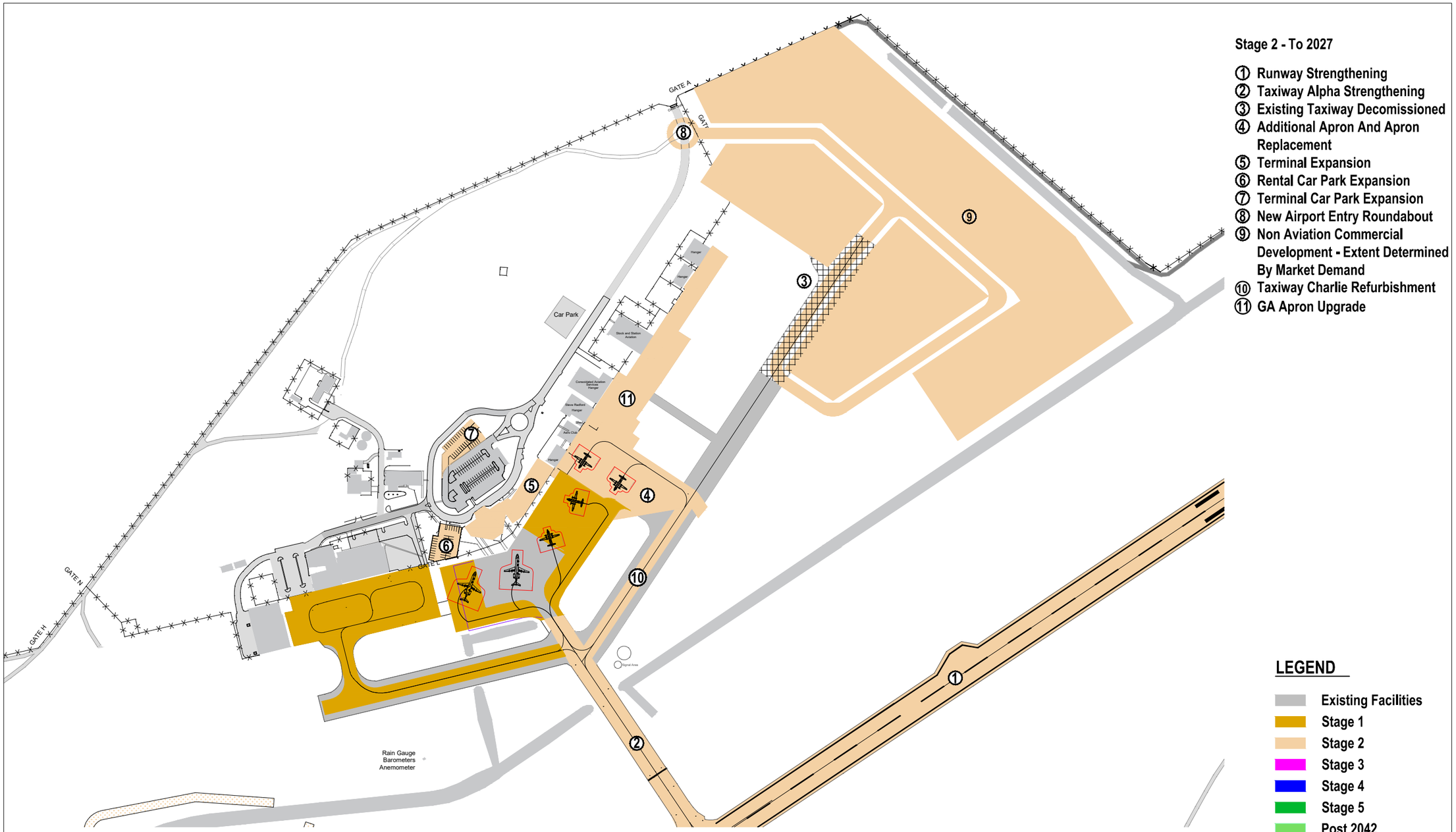

Stage 2 - To 2027

① Runway Strengthening
② Taxiway Alpha Strengthening
③ Existing Taxiway Decomissioned
④ Additional Apron And Apron Replacement
⑤ Terminal Expansion
⑥ Rental Car Park Expansion
⑦ Terminal Car Park Expansion
⑧ New Airport Entry Roundabout
⑨ Non Aviation Commercial Development - Extent Determined By Market Demand
⑩ Taxiway Charlie Refurbishment
⑪ GA Apron Upgrade

LEGEND

- Existing Facilities
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Post 2042

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PROJECT	Broken Hill Regional Airport Master Planning Project
DRAWING	Stage 2 - To 2027
SHEET	LB003
SCALE	0 400 800 1200 1600 Scale in metres: 1:4000 @A3
ISSUE	1
DRAWN BY	SY
DATE	21/08/2023
PROJECT NO.	LB00577

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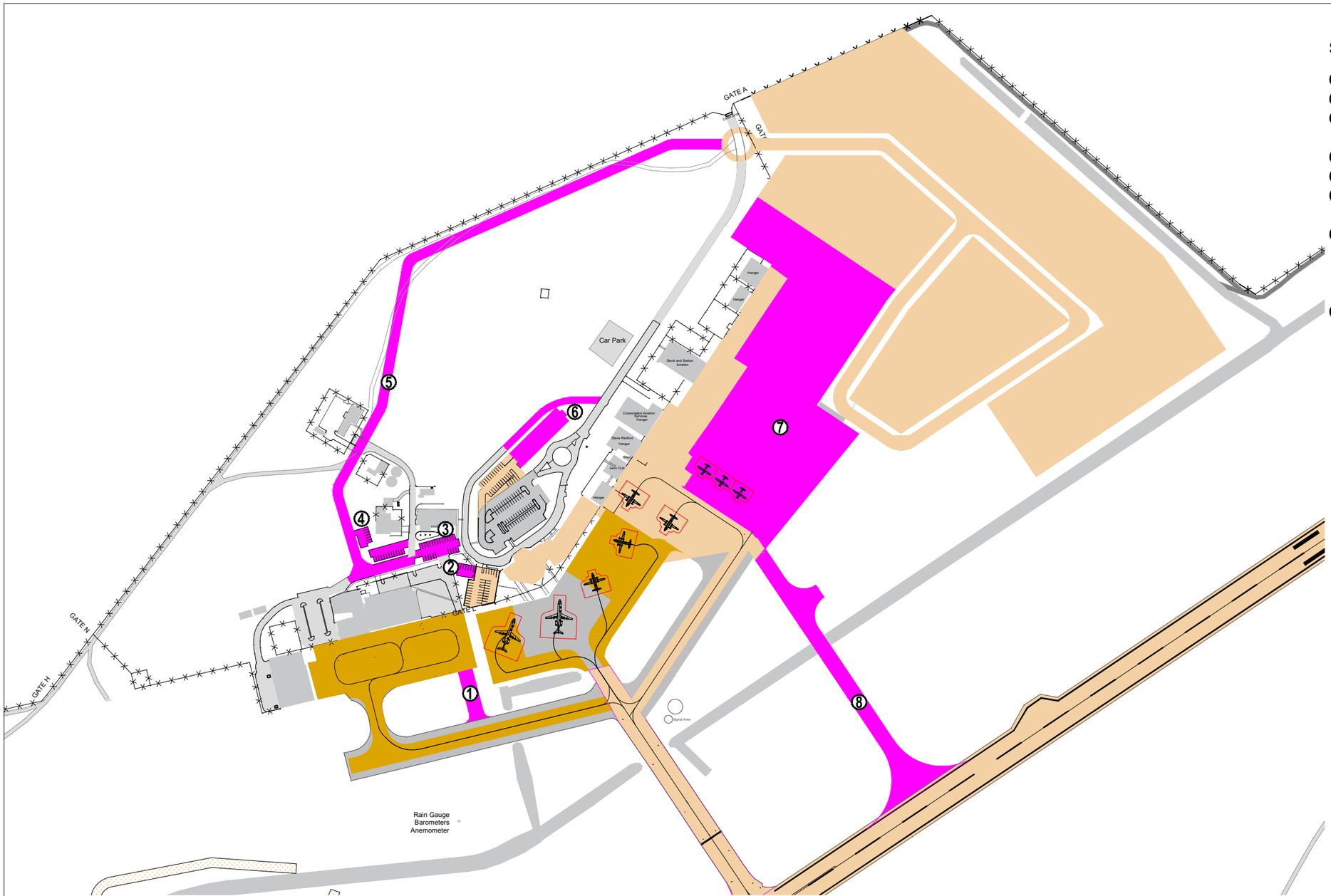

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PROJECT Broken Hill Regional Airport
Master Planning Project

DRAWING Stage 3 - To 2032

SHEET LB006

SCALE 0 400 800 1200 1600
Scale in metres: 1:4000 @A3

ISSUE 1

DATE 21/08/2023

DRAWN BY SY

PROJECT NO. LB00577

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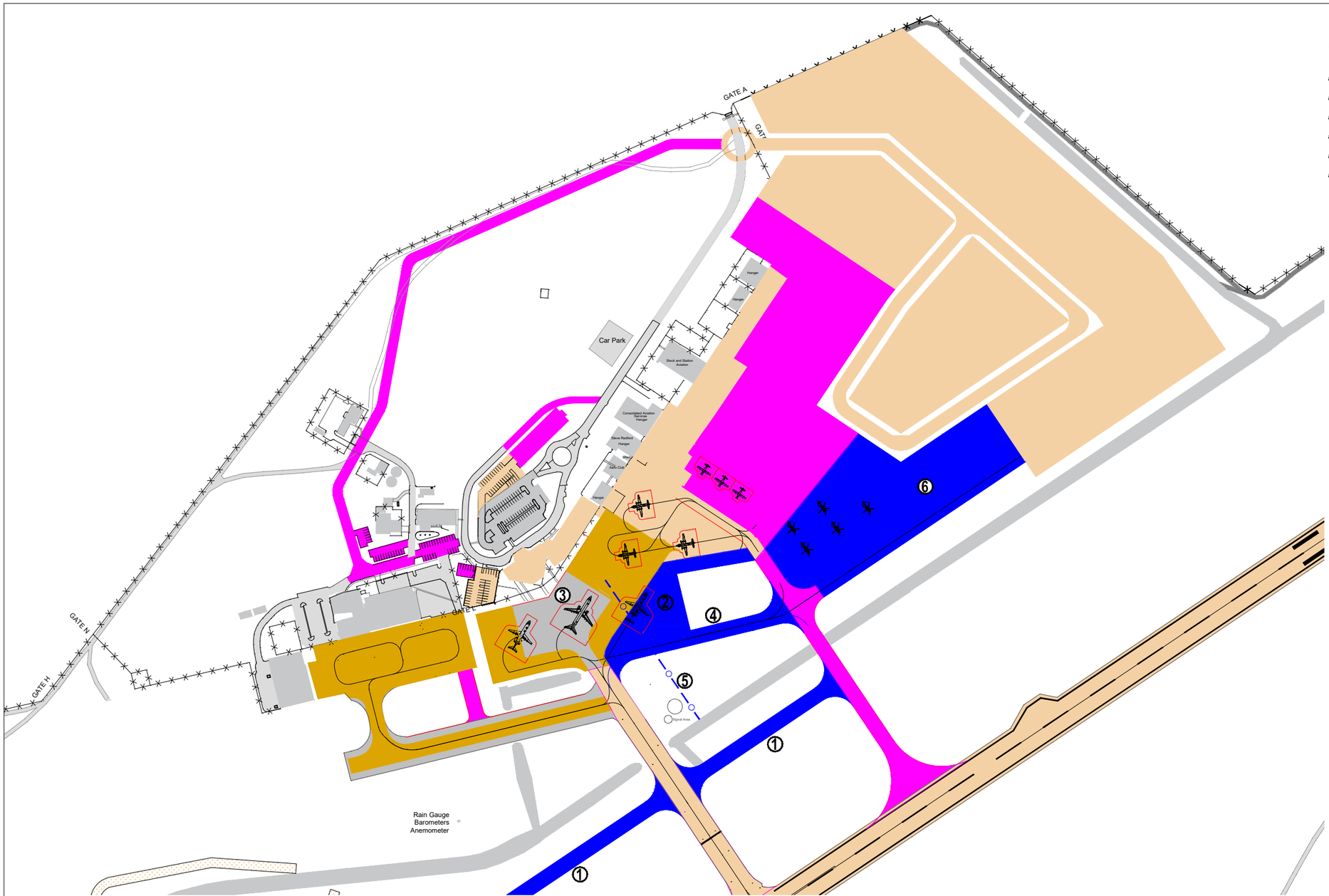

Stage 4 - To 2037

① Partial Parallel Taxiway
② Additional Aircraft Parking Apron
③ Aircraft Parking Reconfiguration
④ Partial Taxiway
⑤ Enclose Stormwater Drainage
⑥ Aviation Commercial Development
-Stage 4 Taxiway are Enabling Works

LEGEND

- Existing Facilities
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Post 2042

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PROJECT Broken Hill Regional Airport
Master Planning Project

DRAWING Stage 4 - To 2037

SHEET LB005

SCALE 0 400 800 1200 1600
Scale in metres: 1:4000 @A3

ISSUE 1

DATE 21/08/2023

DRAWN BY SY

PROJECT NO. LB00577

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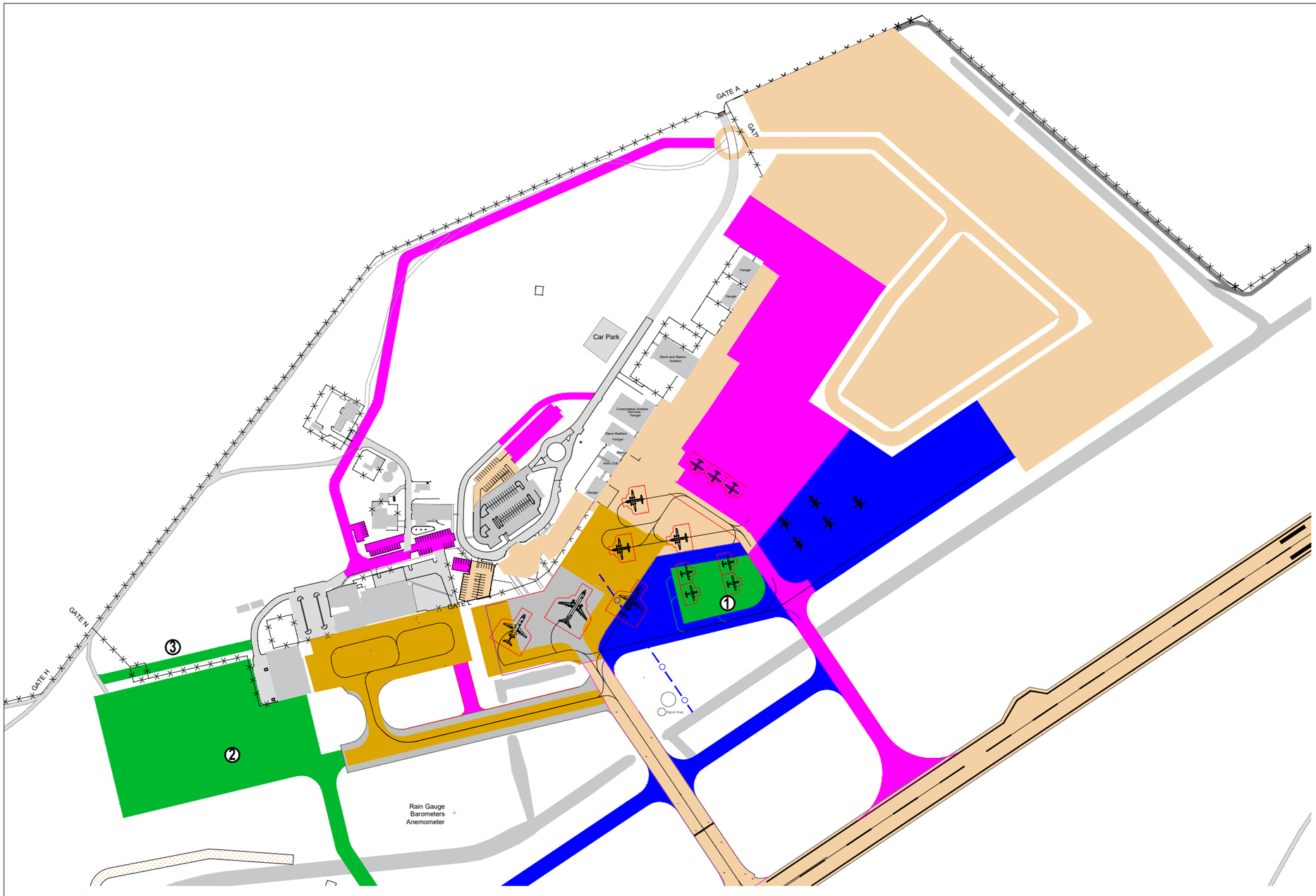

Stage 5 - To 2042

① Additional Aircraft Parking Apron
② Additional Aviation Commercial Development To Be Determined By Market Demand - Completion Of Parallel Taxiway To Runway 14/32 Is Enabling Work
③ Partial New Road

LEGEND

- Existing Facilities
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Post 2042

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PROJECT	Broken Hill Regional Airport Master Planning Project
DRAWING	Stage 5 - To 2042
SHEET	LB006
SCALE	0 400 800 1200 1600 Scale in metres: 1:4000 @A3
ISSUE	1
DATE	21/08/2023
DRAWN BY	SY
PROJECT NO.	LB00577

File:Stages-1 Thru 5 01-09-2023.dwg Layout:Stage-5 Dev Last Saved:9/11/2023 11:10 AM Plotted On:9/11/2023 11:31 AM Colortable:---- LTScale:1.00 LwDefault:.004

Stage 2

① Runway Strengthening
② Runway Turn Pads For Code C Jets
③ Runway Sealing
④ Stormwater Detention Basin

Stage 4

⑤ Partial Parallel Taxiway

Post 2042

⑥ Full Length Parallel Taxiway
⑦ Connection Taxiway

LEGEND

- Existing Facilities
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Post 2042

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PROJECT Broken Hill Regional Airport
Master Planning Project

DRAWING All Airport Staging

SHEET LB006

SCALE 0 400 800 1200 1600
Scale in metres: 1:4000 @A3

ISSUE 1

DATE 21/08/2023

DRAWN BY SY

PROJECT NO. LB00577

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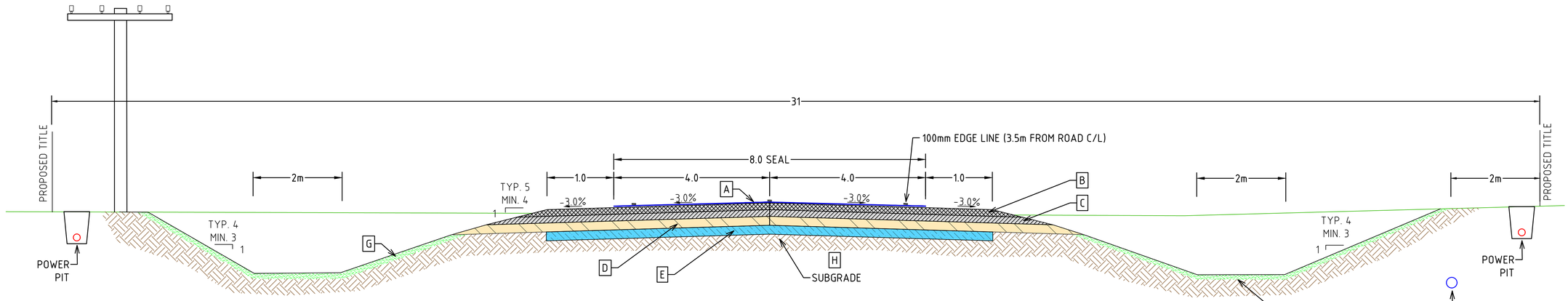
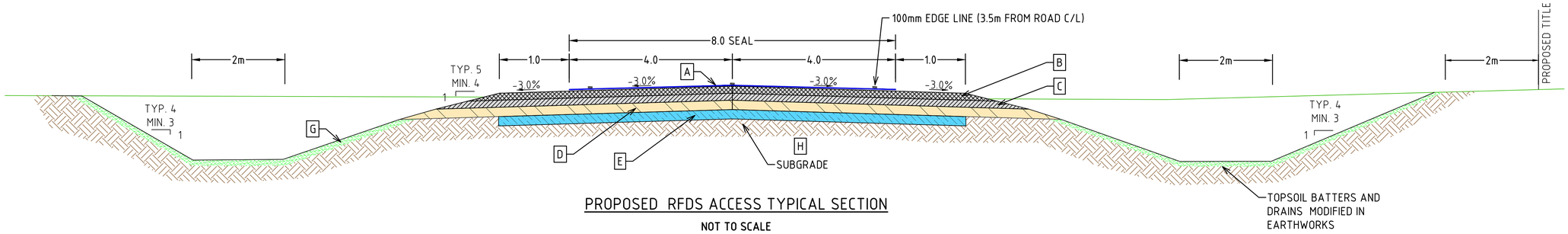
15 Appendix E: Engineering Plans



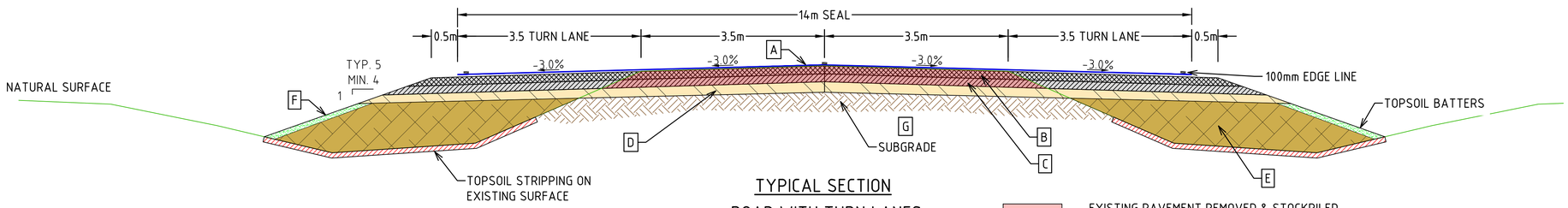
PROPOSED INDUSTRIAL ESTATE TYPICAL SECTION

NOT TO SCALE



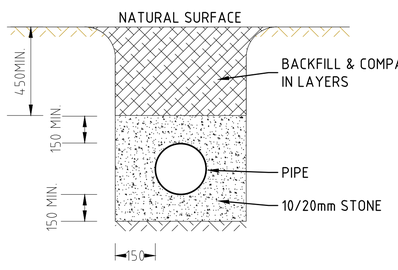
PROPOSED RFDS ACCESS TYPICAL SECTION

NOT TO SCALE



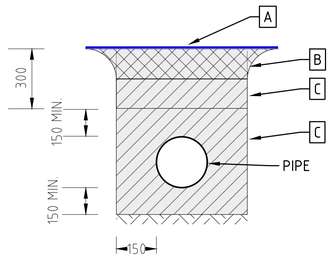
TYPICAL SECTION
ROAD WITH TURN LANES

EXISTING PAVEMENT REMOVED & STOCKPILED FOR REUSE IN SUB-BASE LAYERS



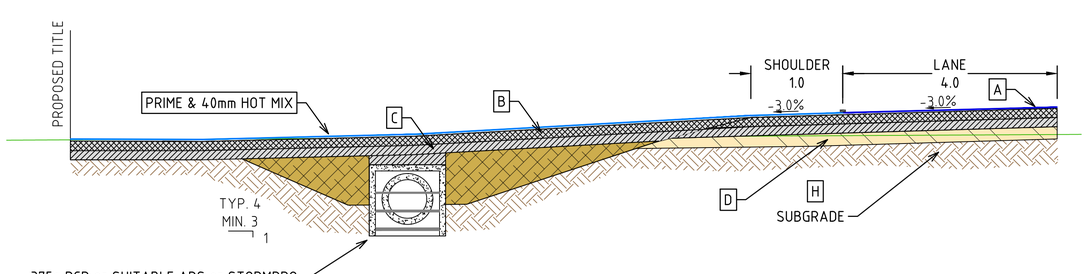
TRENCH DETAILS
DRAINAGE NON-TRAFFICABLE

SCALE - N.T.S



TRENCH DETAILS
DRAINAGE TRAFFICABLE

SCALE - N.T.S



TYPICAL SECTION
FUTURE CROSSOVER

PAVEMENT LAYERS

- A – DOUBLE DOUBLE 14/10 SEAL ASPHALT AREAS TO BE PRIMED AND TYPE H, 40mm THICK SIZE 10 STONE
- B – BASE 150mm THICK 20mm CL1 CRUSHED ROCK 100% MODIFIED
- C – SUB-BASE 150mm THICK 20mm CL3 CRUSHED ROCK 98% MODIFIED
- D – LOWER SUB BASE 150mm THICK MIN CBR 30, AND GRADING MATCHING CL 3 – 98% MODIFIED
  or – 50% CRUSHED CONCRETE + 50% SANDSTONE MIX
- E – 3% LIME STABILISED SUBGRADE 200mm THICK
- F – TYPE A SELECT FILL MAX 200mm LAYERS TO 98% MODIFIED
- G – TOPSOIL BATTERS, DRAINS AND OTHER EARTH AREAS DISTURBED THROUGH CONSTRUCTION
- H – SUBGRADE 98% STANDARD

DRAWING LOCATION: P:\K1027\Drawings\Autocad\K1027.dwg

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D	15/08/23	AMENDMENTS AS REQUESTED BY CLIENT	NSW	NSW	PJM	----
C	01/08/23	AMENDMENTS AS REQUESTED BY CLIENT	NSW	NSW	PJM	----
B	05/07/23	CAR PARK & RFDS ACCESS ROAD INFO ADDED	NSW	NSW	PJM	----
A	28/06/23	POWER, WATER, COMMUNINICATION LINES ADDED	NSW	NSW	PJM	----
0	29/05/23	ORIGINAL CREATED	NSW	--	PJM	--

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SCALE OF METRES
0
ORIGINAL DRAWING SCALE 1 :

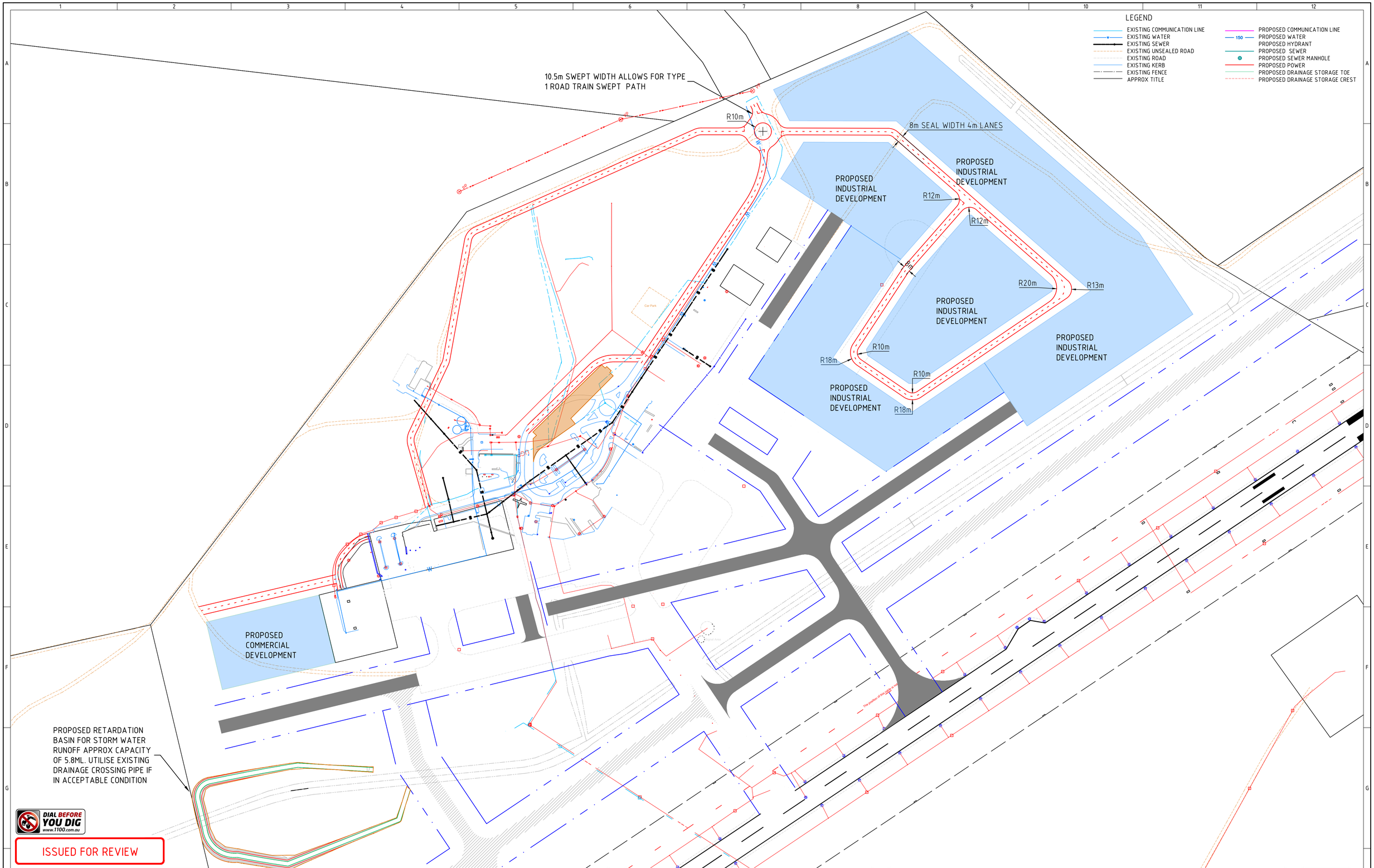
DATUM HORIZONTAL: APPROX. MGA/20CD-54
DATUM VERTICAL: AHD
LEVEL DATUM ORIGIN: -
SURVEY DATE: -
AREA: -- Ha

CLIENT: LANDRUM & BROWN

PROJECT: BROKEN HILL AIRPORT
LOCATION: BROKEN HILL - NSW
SHEET TITLE: TYPICAL SECTION

DRAWING CREATED: 15 August 2023
LAST PLOTTED: 21 August 2023
LOT DESCRIPTION: -

FILE NUMBER: K1027
DRAWING NUMBER: 6542
SHEET NUMBER: 1
REVISION: E
ORIGINAL SHEET SIZE: A1



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D	15/08/23	AMENDMENTS AS REQUESTED BY CLIENT	NSW	NSW	PJM	----
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A	28/06/23	POWER, WATER, COMMUNINICATION LINES ADDED	NSW	NSW	PJM	----
0	29/05/23	ORIGINAL CREATED	NSW	--	PJM	--

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SCALE OF METRES
20.0 0 40 80
ORIGINAL DRAWING SCALE 1 : 2000

DATUM HORIZONTAL: APPROX. MGA/20CD-54
DATUM VERTICAL: AHD
LEVEL DATUM ORIGIN: -
SURVEY DATE: -
AREA: -- Ha

CLIENT: LANDRUM & BROWN

PROJECT: BROKEN HILL AIRPORT
LOCATION: BROKEN HILL - NSW
SHEET TITLE: PROPOSED LANDSIDE DEVELOPMENT

DRAWING CREATED: 15 August 2023
LAST PLOTTED: 21 August 2023
LOT DESCRIPTION: -

FILE NUMBER: K1027
DRAWING NUMBER: 6542
SHEET NUMBER: 2
REVISION: E
ORIGINAL SHEET SIZE: A1

LEGEND

- EXISTING COMMUNICATION LINE
- EXISTING WATER
- EXISTING SEWER
- EXISTING UNSEALED ROAD
- EXISTING ROAD
- EXISTING KERB
- EXISTING FENCE
- APPROX TITLE
- PROPOSED COMMUNICATION LINE
- PROPOSED WATER
- PROPOSED HYDRANT
- PROPOSED SEWER
- PROPOSED SEWER MANHOLE
- PROPOSED POWER
- PROPOSED DRAINAGE STORAGE TOE
- PROPOSED DRAINAGE STORAGE CREST

R10m

10.5m SWEPT WIDTH ALLOWS FOR TYPE 1 ROAD TRAIN SWEPT PATH

8m SEAL WIDTH
4m LANES

PROPOSED INDUSTRIAL DEVELOPMENT

PROPOSED INDUSTRIAL DEVELOPMENT

PROPOSED INDUSTRIAL DEVELOPMENT

PROPOSED INDUSTRIAL DEVELOPMENT

R12m

R12m

R20m

R45m

R10m

R18m

R10m

R18m

Car Park

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DRAWING LOCATION: P:\K1027\Drawings\Autocad\K1027.dwg

REV	DATE	AMENDMENT	DRAWN	DESIGNED	CHECKED	APP'D
E	21/08/23	HATCHING CHANGED AS REQUESTED	NSW	NSW	PJM	----
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C	01/08/23	AMENDMENTS AS REQUESTED BY CLIENT	NSW	NSW	PJM	----
B	05/07/23	CAR PARK & RFDS ACCESS ROAD INFO ADDED	NSW	NSW	PJM	----
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0	29/05/23	ORIGINAL CREATED	NSW	--	PJM	--

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SCALE OF METRES
10.0 0 20 40
ORIGINAL DRAWING SCALE 1 : 1000

DATUM HORIZONTAL: APPROX. MGA/20CD-54
DATUM VERTICAL: AHD
LEVEL DATUM ORIGIN: -
SURVEY DATE: -
AREA: -- Ha

CLIENT: LANDRUM & BROWN

DRAWING CREATED: 15 August 2023
LAST PLOTTED: 21 August 2023

PROJECT: BROKEN HILL AIRPORT
LOCATION: BROKEN HILL - NSW
SHEET TITLE: PROPOSED UNDERGROUND POWER LAYOUT
LOT DESCRIPTION: -

FILE NUMBER: K1027
DRAWING NUMBER: 6542
SHEET NUMBER: 3
REVISION: E
ORIGINAL SHEET SIZE: A1

LEGEND

- EXISTING COMMUNICATION LINE
- EXISTING WATER
- EXISTING SEWER
- EXISTING UNSEALED ROAD
- EXISTING ROAD
- EXISTING KERB
- EXISTING FENCE
- APPROX TITLE
- PROPOSED COMMUNICATION LINE
- 150 PROPOSED WATER
- PROPOSED HYDRANT
- PROPOSED SEWER
- PROPOSED SEWER MANHOLE
- PROPOSED POWER
- PROPOSED DRAINAGE STORAGE TOE
- PROPOSED DRAINAGE STORAGE CREST

R10m

10.5m SWEPT WIDTH ALLOWS FOR TYPE
1 ROAD TRAIN SWEPT PATH

8m SEAL WIDTH
4m LANES

PROPOSED
INDUSTRIAL
DEVELOPMENT

PROPOSED
INDUSTRIAL
DEVELOPMENT

R12m

R12m

8m

PROPOSED
INDUSTRIAL
DEVELOPMENT

R20m

R13m

PROPOSED
INDUSTRIAL
DEVELOPMENT

R10m

R18m

R10m

R18m

Car Park

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ISSUED FOR REVIEW

DRAWING LOCATION: P:\K1027\Drawings\Autocad\K1027.dwg

REV	DATE	AMENDMENT	DRAWN	DESIGNED	CHECKED	APP'D
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C	01/08/23	AMENDMENTS AS REQUESTED BY CLIENT	NSW	NSW	PJM	----
B	05/07/23	CAR PARK & RFDS ACCESS ROAD INFO ADDED	NSW	NSW	PJM	----
A	28/06/23	POWER, WATER, COMMUNINICATION LINES ADDED	NSW	NSW	PJM	----
0	29/05/23	ORIGINAL CREATED	NSW	--	PJM	--

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SCALE OF METRES
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DATUM HORIZONTAL: APPROX. MGA/20CD-54
DATUM VERTICAL: AHD
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SURVEY DATE: -
AREA: -- Ha

CLIENT:
LANDRUM
& BROWN

DRAWING CREATED: 15 August 2023
LAST PLOTTED: 21 August 2023

PROJECT: BROKEN HILL AIRPORT
LOCATION: BROKEN HILL - NSW
SHEET TITLE: PROPOSED TELECOMMUNICATION LAYOUT
LOT DESCRIPTION: -

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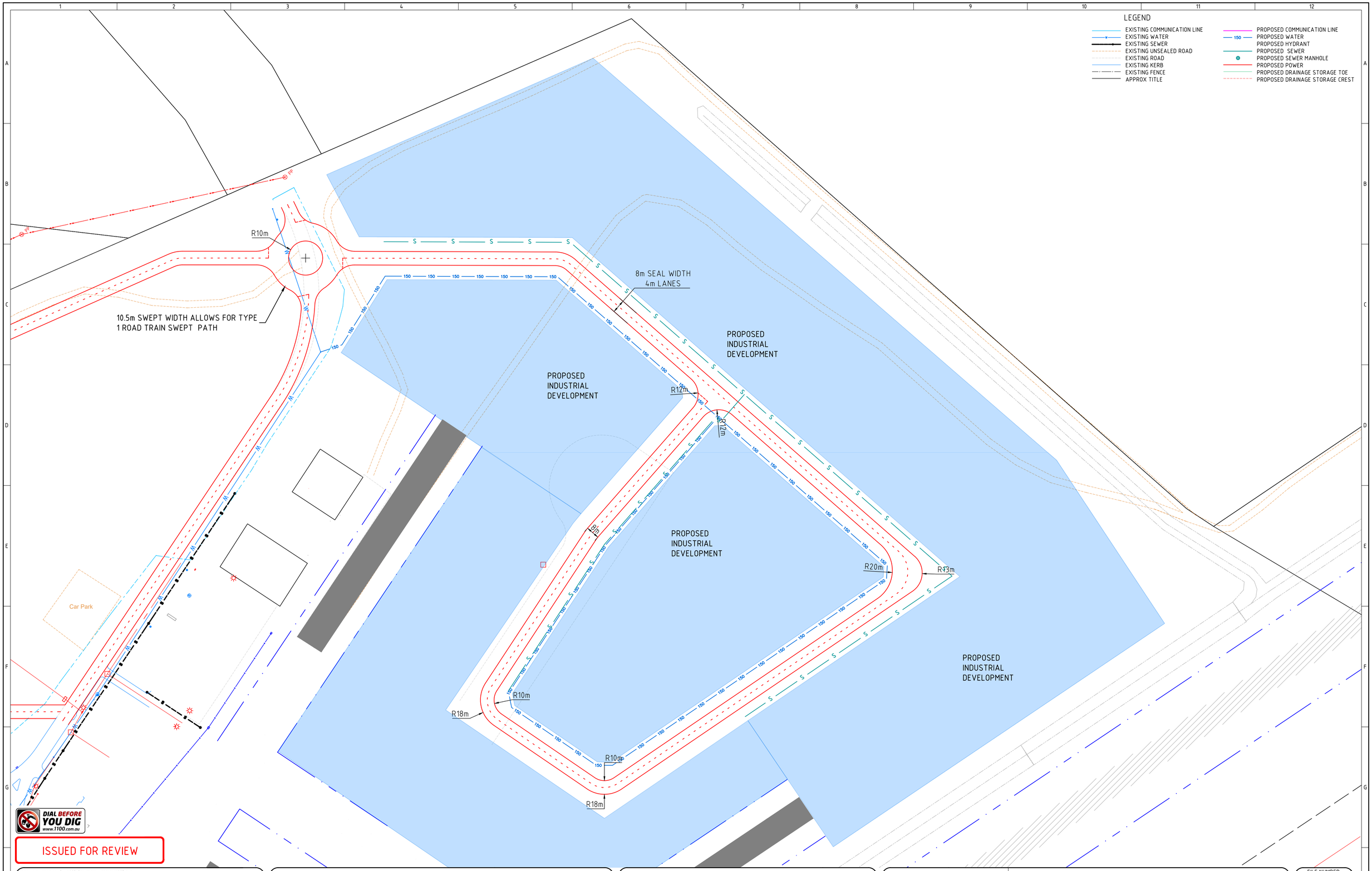

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DRAWING LOCATION: P:\K1027\Drawings\Autocad\K1027.dwg

REV	DATE	AMENDMENT	DRAWN	DESIGNED	CHECKED	APP'D
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0	29/05/23	ORIGINAL CREATED	NSW	--	PJM	--

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SCALE OF METRES
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ORIGINAL DRAWING SCALE 1 : 1000

DATUM HORIZONTAL: APPROX. MGA/20CD-54
DATUM VERTICAL: AHD
LEVEL DATUM ORIGIN: -
SURVEY DATE: -
AREA: -- Ha

CLIENT: LANDRUM & BROWN

PROJECT: BROKEN HILL AIRPORT
LOCATION: BROKEN HILL - NSW
SHEET TITLE: PROPOSED WATER & SEWER LAYOUT

DRAWING CREATED: 15 August 2023
LAST PLOTTED: 21 August 2023
LOT DESCRIPTION: -

FILE NUMBER: K1027
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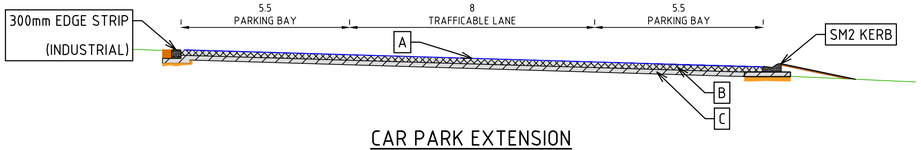
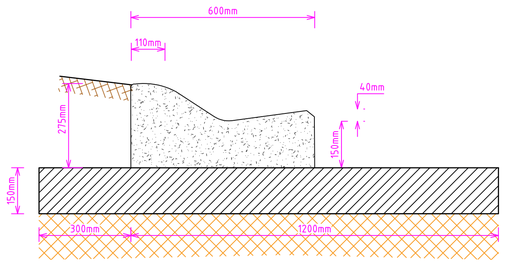


CAR PARK EXTENSION TYPICAL SECTION

NOT TO SCALE

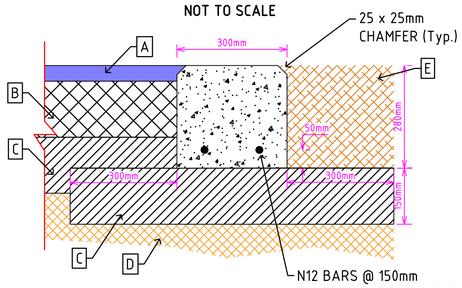
SM2 KERB

NOT TO SCALE

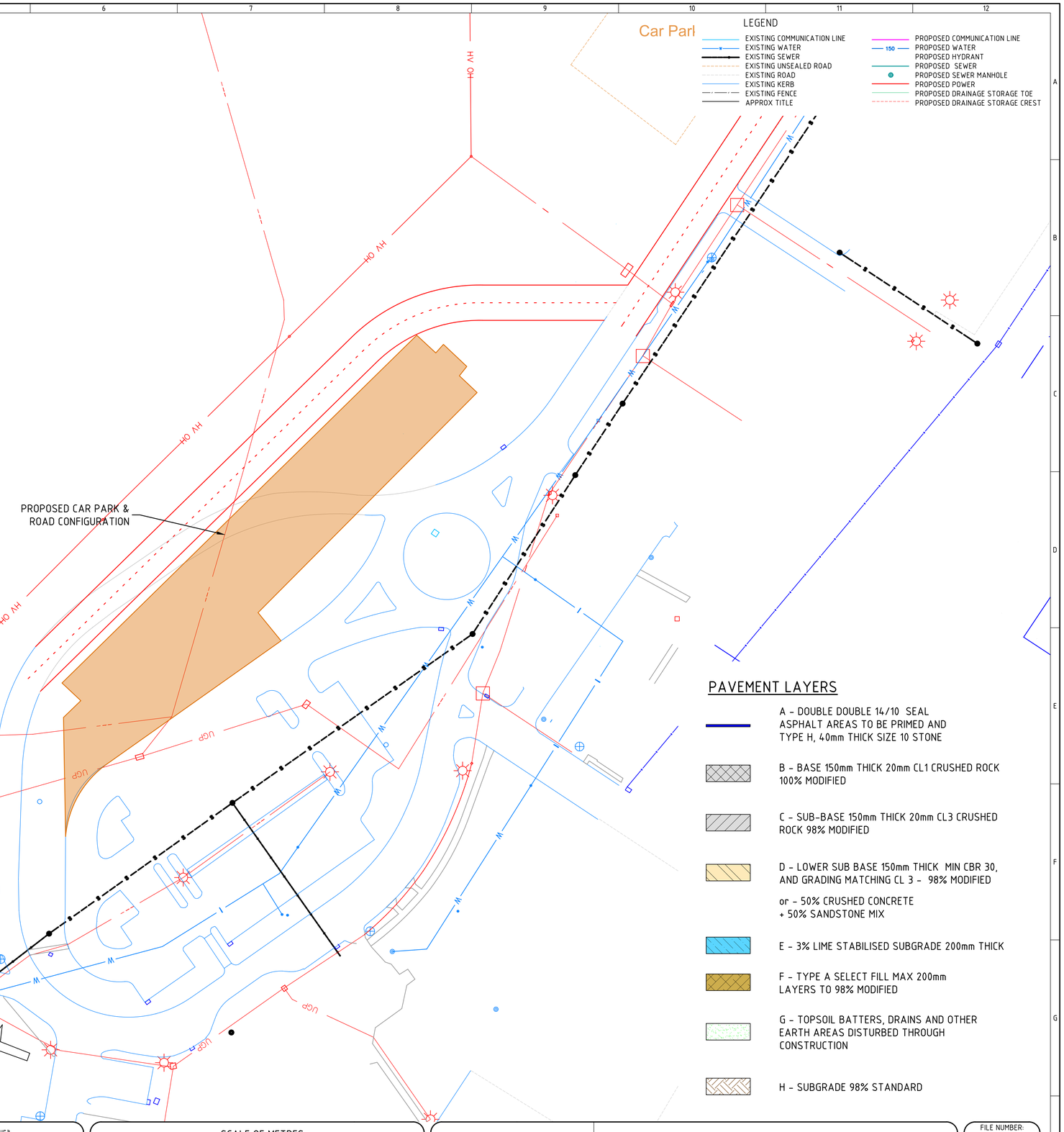


300mm EDGE STRIP (INDUSTRIAL)

NOT TO SCALE



REFER TO IDM STANDARD DRAWING 105 ON SHEET 4 FOR DETAILS



LEGEND

- EXISTING COMMUNICATION LINE
- EXISTING WATER
- EXISTING SEWER
- EXISTING UNSEALED ROAD
- EXISTING ROAD
- EXISTING KERB
- EXISTING FENCE
- APPROX TITLE
- PROPOSED COMMUNICATION LINE
- PROPOSED WATER (150)
- PROPOSED HYDRANT
- PROPOSED SEWER
- PROPOSED SEWER MANHOLE
- PROPOSED POWER
- PROPOSED DRAINAGE STORAGE TOE
- PROPOSED DRAINAGE STORAGE CREST

PAVEMENT LAYERS

A - DOUBLE DOUBLE 14/10 SEAL
ASPHALT AREAS TO BE PRIMED AND
TYPE H, 40mm THICK SIZE 10 STONE

B - BASE 150mm THICK 20mm CL1 CRUSHED ROCK
100% MODIFIED

C - SUB-BASE 150mm THICK 20mm CL3 CRUSHED
ROCK 98% MODIFIED

D - LOWER SUB BASE 150mm THICK MIN CBR 30,
AND GRADING MATCHING CL 3 - 98% MODIFIED

or - 50% CRUSHED CONCRETE
+ 50% SANDSTONE MIX

E - 3% LIME STABILISED SUBGRADE 200mm THICK

F - TYPE A SELECT FILL MAX 200mm
LAYERS TO 98% MODIFIED

G - TOPSOIL BATTERS, DRAINS AND OTHER
EARTH AREAS DISTURBED THROUGH
CONSTRUCTION

H - SUBGRADE 98% STANDARD

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REV	DATE	AMENDMENT	DRAWN	DESIGNED	CHECKED	APP'D
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C	01/08/23	AMENDMENTS AS REQUESTED BY CLIENT	NSW	NSW	PJM	----
B	05/07/23	CAR PARK & RFDS ACCESS ROAD INFO ADDED	NSW	NSW	PJM	----
A	28/06/23	POWER, WATER, COMMUNINICATION LINES ADDED	NSW	NSW	PJM	----
0	29/05/23	ORIGINAL CREATED	NSW	--	PJM	--

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SCALE OF METRES
5.0 0 10 20
ORIGINAL DRAWING SCALE 1 : 500

DATUM HORIZONTAL: APPROX. MGA/20CD-54
DATUM VERTICAL: AHD
LEVEL DATUM ORIGIN: -
SURVEY DATE: -
AREA: -- Ha

CLIENT: LANDRUM & BROWN

PROJECT: BROKEN HILL AIRPORT
LOCATION: BROKEN HILL - NSW
SHEET TITLE: PROPOSED CARPARK LAYOUT

DRAWING CREATED: 15 August 2023
LAST PLOTTED: 21 August 2023
LOT DESCRIPTION: -

FILE NUMBER: K1027
DRAWING NUMBER: 6542
SHEET NUMBER: 6
REVISION: E
ORIGINAL SHEET SIZE: A1

16 Appendix F: Geotechnical and Soil Testing

CIVILTEST PTY LTD
SOIL TESTING & GEOTECHNICAL CONSULTANTS
ABN 91 006 855 689 ACN 006 855 689

1 August 2023 **Our Ref:** 3230270-1

Broken Hill City Council
Attention: Mr Asad Nizamani
PO Box 448
BROKEN HILL NSW 2880

Dear Mr Nizamani,

RE: Broken Hill Airport Upgrade

At your request, Civiltest Pty Ltd attended the abovementioned site on 23 to 26 July 2023 to conduct investigation including drilling and observations at 48 locations as shown on the attached plan, to a depth of up to 3.0 metres.

Site Geology:

Geological maps of the area suggest that the site is in an area of Palaeoproterozoic Granite. The natural soils encountered during the site investigation confirmed this.

Site Topography:

The ground surface over the site is relatively level. The site is generally unoccupied, i.e., no existing structures. Groundcover comprised of natural grasses and native trees. Photograph 1 shows the site condition noted during the field investigation.

Photograph 1: *Noted site conditions during the field investigation.*

Fieldwork:

The fieldwork consisted of drilling total 48 boreholes (BHs) in four areas (Area 1 to Area 4) up to 3.0 metres depth with a mechanical auger. The approximate locations of the boreholes are shown on the attached plan. Subsurface materials penetrated were visually classified to AS1726: Geotechnical Site Investigation. The engineering logs of each borehole are attached showing the soil descriptions and depths, along with any cohesive strengths measured and observed densities of non-cohesive soils.

Field Data:

Area 1: 1581m^2 area – Boreholes 7 to 10

Borehole 7 revealed that the existing soil profile consisted of 200mm sandy CLAY FILL overlying the naturally occurring sandy CLAY, followed by gravelly SAND.

Boreholes 8 to 10 revealed that the existing soil profile consisted of 200mm of sandy CLAY FILL overlying the naturally occurring sandy CLAY.

Auger refusal was encountered in borehole 8 at 1.8 metres depth.

Area 2: 1919m^2 area – Boreholes 1 to 6

Boreholes 1, 2, 4 and 5 revealed that the existing soil profile consisted of 100mm of sandy CLAY FILL overlying the naturally occurring sandy CLAY.

Borehole 3 revealed that the existing soil profile consisted of 100mm of sandy CLAY FILL overlying the naturally occurring sandy CLAY, followed by clayey SAND.

Borehole 6 revealed that the natural soil profile consisted sandy CLAY.

Auger refusal was encountered in the boreholes at the following depths:

Borehole	Depth to auger refusal (m)
BH1	1.5
BH2	1.6
BH3	2.4
BH4	1.7
BH5	Not encountered
BH6	1.4

Area 3: 202,170m^2 area – Boreholes 11 to 38

Boreholes 11, 14, 18 to 21, 24, 26, 27, 30, 37 and 38 revealed that the natural soil profile consisted of clayey SAND overlying sandy CLAY.

Boreholes 12, 13, 15, 17, 22, 23, 25, 28, 29 and 31 to 36 revealed that the natural soil profile consisted of sandy CLAY.

Borehole 16 revealed that the natural soil profile consisted of sandy CLAY overlying clayey SAND.

Auger refusal was encountered in the boreholes at the following depths:

Borehole	Depth to auger refusal (m)
BH14	2.3
BH15	1.9
BH16	1.5
BH17	1.6
BH19	1.5
BH31	2.5
BH35	1.5

Area 4: 28,126m^2 area – Boreholes 39 to 48

Boreholes 39 to 48 revealed that the natural soil profile consisted of sandy CLAY.

Auger refusal was encountered in the boreholes at the following depths:

Borehole	Depth to auger refusal (m)
BH43	1.0
BH44	0.5
BH45	0.5
BH46	1.2
BH47	2.6
BH48	1.5

Groundwater was not encountered in the boreholes during the field investigation.

Substrata conditions encountered are such that infiltration and occurrence of perched water at the interface between different material layers and permeabilities should not be disregarded.

Any levels referred to in Civiltest reports should be regarded as general and are not to be interpreted as surveyed confirmed levels. All levels should be checked and confirmed by a licensed surveying organisation or qualified personnel.

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Should you require any further information regarding this matter, please do not hesitate to contact me at our Mornington office.

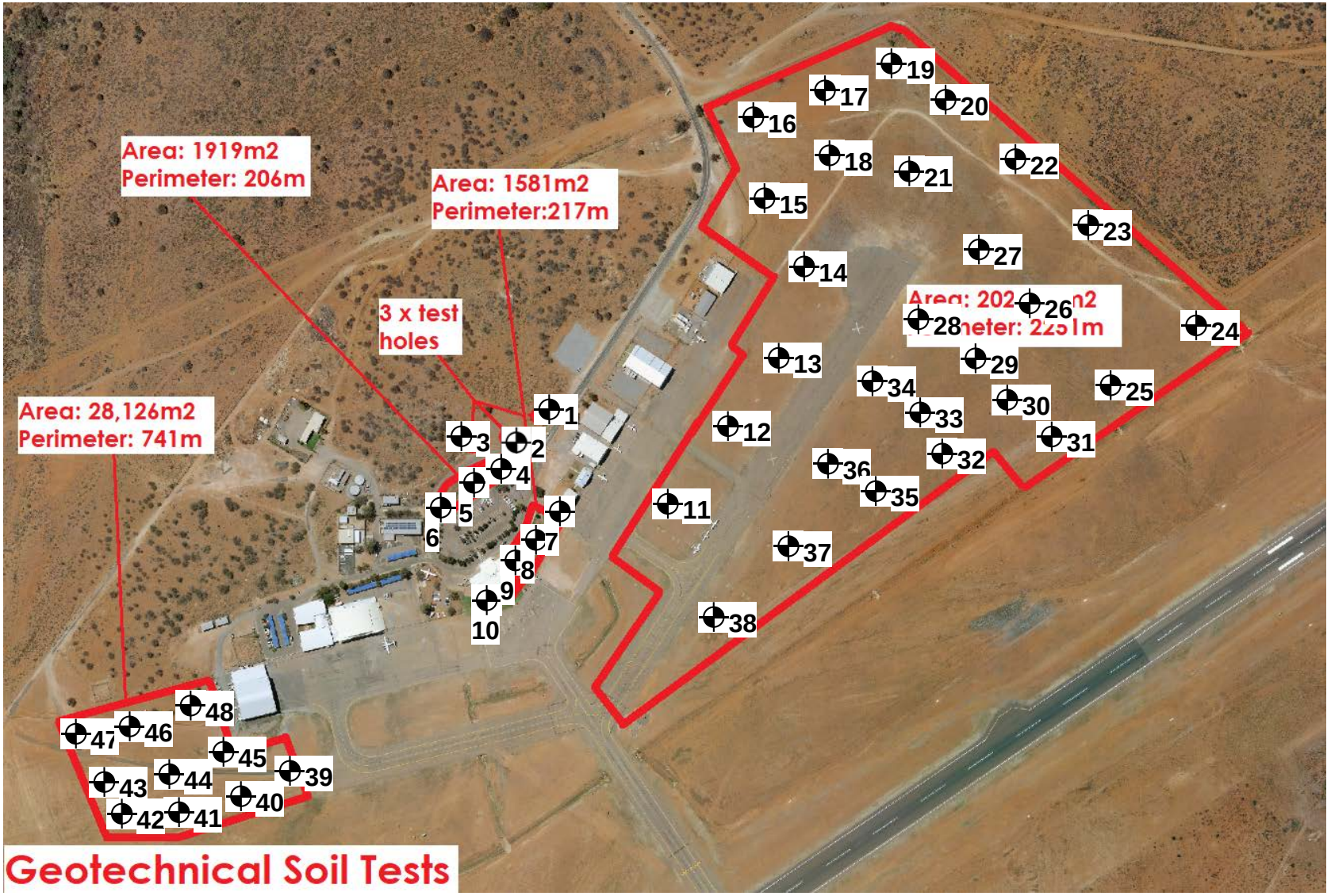
This report consists of five pages including a site plan. Appendix A (Engineering Logs) is attached.

Yours faithfully

PREETI KUMMARI
GEOTECHNICAL ENGINEER
CIVILTEST PTY LTD

REF: AM/PK/PO/JY/rb

LOCATION OF TEST SITES: BROKEN HILL AIRPORT UPGRADE



N

Denotes Boreholes

THIS PLAN IS NOT INTENDED TO PROVIDE AN ACCURATE DEPICTION OF THE NUMBER, SIZE OR LOCATION OF TREES AND/OR SHRUBS

NOT TO SCALE

APPENDIX A

ENGINEERING LOGS

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 1** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)	STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
				DEPTH (m)	RESULTS				
					DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0	**FILL**, CLAY, sandy, trace gravel; Brown red; Dry;								
0.100	Stiff								
	CL CLAY, sandy; Brown red; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	Becoming dry from 0.5m to 1.2m								
1									
1.200	CL CLAY, sandy, trace gravel; Pale brown; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1.500	refusal Rock to hard								
	END OF BORE (24-Jul-2023)								
2									
3									
4									

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 2** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		**FILL**, SAND, clayey; Brown red; Dry; Medium dense								
	0.100	CL CLAY, sandy; Brown red; Dry; Stiff to very stiff; Sand is medium to fine grained refusal Rock to hard								
1		Becoming pale white from 1.0m to 1.6m								
	1.600	END OF BORE (24-Jul-2023)								
2										
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 3** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		**FILL**, SAND, clayey; Brown red; Dry; Loose								
	0.100	CL CLAY, sandy, trace gravel; Brown red; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	0.500	CL CLAY, sandy, trace gravel; Pale brown; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
	1.500	SP SAND, clayey, trace gravel; Pale grey; Dry; Loose; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained refusal Rock to hard								
2										
	2.400	END OF BORE (24-Jul-2023)								
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 4** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		**FILL**, SAND, clayey, trace gravel; Brown red; Dry;								
	0.100	Loose								
		CL CLAY, sandy, trace gravel; Brown red; Moist(w≈PL); Stiff to very stiff; Sand is medium to								
	0.400	fine grained; Gravel is sub-angular, medium to fine grained								
		CL CLAY, sandy, trace gravel; Brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
		refusal Rock to hard								
1		Becoming pale brown from 1.1m to 1.3m								
		Becoming grey from 1.3m to 1.7m								
	1.700	END OF BORE (24-Jul-2023)								
2										
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 5** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		**FILL**, SAND, clayey, trace gravel; Brown red; Dry;								
	0.100	Loose								
		CL CLAY, sandy, trace gravel; Brown red; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	0.700	CL CLAY, sandy, trace gravel; Pale white; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
	1.400	CL CLAY, sandy, trace silt and gravel; Grey; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
2										
3	3.000	END OF BORE (24-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 6** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)	STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
				DEPTH (m)	RESULTS				
					DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0	CL CLAY, sandy, with gravel; Brown red; Dry; Stiff								
0.100	to very stiff; Sand is medium to fine grained; Gravel is sub-angular, coarse to medium grained								
	CL CLAY, sandy, with gravel; Brown; Moist(w≈PL); Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	refusal Rock to hard								
	Becoming pale brown at 0.6m								
1									
1.400	END OF BORE (24-Jul-2023)								
2									
3									
4									

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 7** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		**FILL**, SAND, clayey; Brown; Moist; Medium dense								
	0.200	CL CLAY, sandy; Brown; Moist(w>PL); Stiff to very stiff; Sand is medium to fine grained								
1										
	1.800	SP SAND, gravelly, trace clay; Brown orange; Moist; Medium dense; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
2										
3	3.000	END OF BORE (24-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 8** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		**FILL**, CLAY, sandy; Brown; Moist; Stiff								
	0.200	CL CLAY, sandy; Brown; Moist(w>PL); Stiff to very stiff; Sand is medium to fine grained								
1										
	1.500	CL CLAY, sandy, trace gravel; Brown; Moist(w>PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	1.800	refusal Rock to hard								
		END OF BORE (24-Jul-2023)								
2										
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 9** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		**FILL**, CLAY, sandy; Brown; Moist; Stiff								
	0.200	CL CLAY, sandy; Brown; Moist(w>PL); Stiff to very stiff; Sand is medium to fine grained								
1										
	1.500	CL CLAY, sandy, trace gravel; Brown; Moist(w>PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
2										
3	3.000	END OF BORE (24-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 10** **DATE: 24-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		**FILL**, CLAY, sandy; Brown; Moist; Stiff								
	0.200	CL CLAY, sandy; Brown; Moist(w>PL); Stiff to very stiff; Sand is medium to fine grained								
1										
	1.500	CL CLAY, sandy, trace gravel; Brown; Moist(w>PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
2										
	2.600	CL CLAY, sandy, with gravel; Brown white; Moist(w≈PL); Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
3	3.000	END OF BORE (24-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 11** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey; Brown orange; Dry; Loose; Sand is								
	0.100	medium to fine grained								
		CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.500	CL CLAY, sandy; Brown; Dry; Very stiff; Sand is medium to fine grained								
	0.700	CL CLAY, sandy, trace gravel; Pale brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
2										
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 12** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained								
	0.700	CL CLAY, sandy, trace gravel; Pale brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
2										
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 13** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.500	CL CLAY, sandy; Pale brown; Dry; Very stiff; Sand is medium to fine grained trace gravel at 0.7m								
1										
	1.500	CL CLAY, sandy, trace gravel; Brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
2										
	2.700	CL CLAY, sandy, trace gravel; Grey; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 14** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey, trace gravel; Brown orange; Dry;								
	0.100	Loose; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
		CL CLAY, sandy, trace gravel; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained;								
	0.500	Gravel is sub-angular, medium to fine grained								
		CL CLAY, sandy; Brown; Dry; Very stiff; Sand is medium to fine grained								
	0.800	CL CLAY, sandy; Pale brown orange; Dry; Very stiff; Sand is medium to fine grained								
1		Becoming brown orange from 1.0m to 1.8m								
	1.800	becoming pale brown at 1.8m								
		CL CLAY, sandy, trace gravel; Pale brown; Dry;								
2		Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
		refusal Rock to hard								
	2.300	END OF BORE (25-Jul-2023)								
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 15** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy, trace gravel; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	0.400	CL CLAY, sandy, trace gravel and silt; Pale white; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained refusal Rock to hard								
1										
	1.900	END OF BORE (25-Jul-2023)								
2										
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 16** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)	STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
				DEPTH (m)	RESULTS				
					DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0	CL CLAY, sandy, trace gravel; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
0.400	SP SAND, clayey, trace silt and gravel; Pale yellow; Dry; Medium dense; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained refusal Rock to hard Becoming grey at 0.8m								
1									
1.500	END OF BORE (25-Jul-2023)								
2									
3									
4									

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 17** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown grey white; Dry; Stiff to very stiff; Sand is medium to fine grained								
	0.300	CL CLAY, sandy, trace gravel; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1	1.000	CL CLAY, sandy; Pale brown; Dry; Very stiff; Sand is medium to fine grained refusal Rock to hard								
	1.600	END OF BORE (25-Jul-2023)								
2										
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 18** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey; Brown orange; Dry; Loose; Sand is								
	0.100	medium to fine grained								
		CL CLAY, sandy; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained								
1		Becoming pale brown at 1.0m								
2										
	2.700	CL CLAY, sandy, trace gravel and silt; Grey; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 19** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)	STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
				DEPTH (m)	RESULTS				
					DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0	SP SAND, clayey; Brown orange; Dry; Loose; Sand is								
0.100	medium to fine grained								
	CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
0.400	CL CLAY, sandy, trace gravel; Pale brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1									
1.300	CL CLAY, sandy, trace gravel; Grey; Dry; Very stiff; Sand is medium to fine grained; Gravel is								
1.500	sub-angular, medium to fine grained refusal Rock to hard								
	END OF BORE (25-Jul-2023)								
2									
3									
4									

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 20** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey, trace gravel; Brown; Dry; Loose;								
	0.100	Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
		CL CLAY, sandy; Brown; Dry; Very stiff; Sand is medium to fine grained								
	0.500	CL CLAY, sandy; Pale brown; Dry; Very stiff; Sand is medium to fine grained								
1										
		Becoming brown with trace gravel from 1.7m to 2.7m								
2										
	2.700	CL CLAY, sandy, trace gravel; Grey; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 21** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey, trace gravel; Brown; Dry; Loose; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	0.300	CL CLAY, sandy; Brown; Moist(w≈PL); Very stiff; Sand is medium to fine grained								
	0.500	CL CLAY, sandy; Brown orange; Dry; Very stiff; Sand is medium to fine grained								
1										
	1.400	CL CLAY, sandy, trace gravel; Brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	1.800	CL CLAY, sandy; Brown; Dry; Very stiff; Sand is medium to fine grained								
2		trace gravel from 2.6m to 3.0m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 22** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained								
	0.900	CL CLAY, sandy, trace gravel; Brown orange; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
2		Becoming pale brown from 2.6m to 3.0m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 23** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained								
	0.900	CL CLAY, sandy, trace gravel; Brown orange; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
		Becoming pale brown from 1.8m to 2.6m								
2										
		Becoming pale grey from 2.6m to 3.0m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 24** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey; Brown orange; Dry; Loose; Sand is								
	0.100	medium to fine grained								
		CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
		Becoming pale brown trace gravel from 0.4m to 3.0m								
1										
2										
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 25** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained								
		Becoming pale brown at 0.5m								
1	1.000	CL CLAY, sandy, trace gravel; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
2										
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 26** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey; Brown orange; Dry; Loose; Sand is medium to fine grained								
	0.200	CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.400	Becoming dry at 0.4m								
		CL CLAY, sandy, trace gravel; Brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
2		Becoming pale brown from 2.3m to 3.0m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 27** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey; Brown; Dry; Loose; Sand is medium to fine grained								
	0.200	CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.400	Becoming dry at 0.4m								
		CL CLAY, sandy, trace gravel; Brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
2										
		Becoming grey from 2.7m to 3.0m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 28** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained								
	0.200	CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.400	CL CLAY, sandy; Brown; Dry; Very stiff; Sand is medium to fine grained								
1										
2		Becoming with trace gravel at 2.2m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 29** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.400	CL CLAY, sandy; Pale brown; Dry; Stiff to very stiff; Sand is medium to fine grained								
1		Becoming with trace gravel at 1.4m								
2										
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 30** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey; Brown; Dry; Loose; Sand is								
	0.100	medium to fine grained								
		CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.400	CL CLAY, sandy, trace gravel; Pale brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, fine grained								
1										
2										
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 31** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy, trace gravel; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	0.400	CL CLAY, sandy, trace gravel; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, fine grained								
1		More moist with depth at 1.0m								
	1.500	CL CLAY, sandy, trace gravel; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
2										
	2.200	CL CLAY, sandy, trace gravel; Pale brown grey; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	2.500	2400mm rock refusal Rock to hard								
		END OF BORE (25-Jul-2023)								
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 32** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained								
	0.800	CL CLAY, sandy, trace gravel; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1		2400mm rock refusal Rock to hard Becoming pale grey at 1.3m								
2										
	2.500	END OF BORE (25-Jul-2023)								
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 33** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.300	CL CLAY, sandy; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained								
1										
2		Becoming with trace gravel from 2.6m to 3.0m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 34** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.300	CL CLAY, sandy; Pale brown; Dry; Stiff to very stiff; Sand is medium to fine grained								
1										
2		Becoming with trace gravel from 2.6m to 3.0m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 35** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)	STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
				DEPTH (m)	RESULTS				
					DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0	CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
0.300	CL CLAY, sandy; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained 1500mm Rock refusal to hard								
1.500	END OF BORE (25-Jul-2023)								
1									
2									
3									
4									

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 36** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
	0.300	CL CLAY, sandy; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained								
1		Becoming pale brown from 1.4m to 3.0m								
2		trace gravel at 2.7m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 37** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey, trace gravel; Brown orange; Dry;								
	0.100	Loose; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
		CL CLAY, sandy; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained								
1										
2		trace gravel at 2.2m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 38** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		SP SAND, clayey; Brown orange; Dry; Loose; Sand is								
	0.100	medium to fine grained								
		CL CLAY, sandy; Brown; Dry; Stiff to very stiff;								
		Sand is medium to fine grained								
1										
		Becoming pale brown from 1.5m to 3.0m								
2										
		trace gravel from 2.7m to 3.0m								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 39** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy, trace gravel; Brown orange; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	0.500	CL CLAY, sandy, trace gravel; Pale brown pale white; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
	1.200	hard rock at 1.2m								
		CL CLAY, sandy, with gravel; Pale white; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
2										
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 40** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy, trace silt; Brown orange; Dry; Stiff								
	0.100	to very stiff; Sand is medium to fine grained								
		CL CLAY, sandy, trace gravel; Brown red; Dry; Stiff								
	0.300	to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
		CL CLAY, sandy; Brown red; Moist(w≈PL); Very stiff; Sand is medium to fine grained								
	0.700	CL CLAY, sandy, trace gravel; Pale brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1										
2										
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 41** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy, trace gravel; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, fine grained								
	0.400	CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
1										
2										
	2.200	CL CLAY, sandy, trace gravel; Brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
3	3.000	END OF BORE (25-Jul-2023)								
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 42** **DATE: 26-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)	STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
				DEPTH (m)	RESULTS				
					DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0	CL CLAY, sandy, trace gravel; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, fine grained								
0.400	CL CLAY, sandy; Brown; Moist(w≈PL); Stiff to very stiff; Sand is medium to fine grained								
1									
2									
2.200	CL CLAY, sandy, trace gravel; Brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
3 3.000	END OF BORE (26-Jul-2023)								
4									

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 43** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained								
	0.400	CL CLAY, sandy; Brown; Dry; Stiff to very stiff; Sand is medium to fine grained refusal Rock to hard								
1	1.000	END OF BORE (25-Jul-2023)								
2										
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 44** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)	STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
				DEPTH (m)	RESULTS				
					DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0	CL CLAY, sandy; Brown red; Dry; Stiff to very stiff; Sand is medium to fine grained								
0.400	CL CLAY, sandy, trace gravel; Pale white; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, coarse to medium grained								
0.500	Rock at 500mm refusal Rock to hard								
	END OF BORE (25-Jul-2023)								
1									
2									
3									
4									

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 45** **DATE: 25-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown red; Dry; Stiff to very stiff; Sand is medium to fine grained								
	0.400	CL CLAY, sandy, trace gravel; Pale white; Dry; Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, coarse to medium grained								
	0.500	Rock at 500mm refusal Rock to hard								
		END OF BORE (25-Jul-2023)								
1										
2										
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 46** **DATE: 26-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy; Brown orange; Dry; Stiff to very stiff; Sand is medium to fine grained								
	0.600	CL CLAY, sandy, trace gravel; Pale brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained refusal Rock to hard								
1										
	1.200	END OF BORE (26-Jul-2023)								
2										
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 47** **DATE: 26-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)		STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
					DEPTH (m)	RESULTS				
						DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0		CL CLAY, sandy, trace gravel; Brown orange; Moist(w<PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
	0.700	CL CLAY, sandy, with gravel; Pale brown; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
1		refusal Rock to hard								
2										
	2.600	END OF BORE (26-Jul-2023)								
3										
4										

ENGINEERING LOG

REPORT NO. 3230270-1 **BOREHOLE NO. 48** **DATE: 26-JUL-2023**
FIELD TECHNICIAN: Am **DRILLING METHOD: : Land Cruiser Mounted Rig**
PROJECT LOCATION: Airport Upgrade BROKEN HILL

DEPTH (m)	STRATA DESCRIPTION	NOTES	GRAPHIC LOG	TESTING					
				DEPTH (m)	RESULTS				
					DCP Blows/100mm	FIELD CBR (%)	SPT	MC (%)	PP (kg/cm^2)
0	CL CLAY, sandy, trace gravel; Brown red; Moist(w<PL); Stiff to very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained								
0.400	CL CLAY, sandy, with gravel; Pale white; Dry; Very stiff; Sand is medium to fine grained; Gravel is sub-angular, medium to fine grained hard rock 800mm refusal Rock to hard								
1									
1.500	END OF BORE (26-Jul-2023)								
2									
3									
4									