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Brisbane International Airport

Prescribed Airspace Report

Prepared for Brisbane Airport Corporation Pty Ltd
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1. EXECUTIVE SUMMARY

This report has been prepared for Brisbane Airport Corporation Pty Ltd by TAG173 (TAG) Pty Ltd (licensee of The Airport Group Pty Ltd) for the purpose of seeking declaration of prescribed airspace for the Brisbane International Airport, in accordance with the Airports Act, 1996 and Airports (Protection of Airspace) Regulations, 1996.[1]

As outlined in *Regulation 2 – Object of Regulations*, of *the Regulations;* the existing and future operations of the airport need to be documented. As such, the various stages of runway development of the Brisbane International Airport have been documented as follows;

1) Existing configuration - Existing 2 runways
2) Future configuration - New 2 parallel runways (July 2020)
3) Future configuration - Future 2 parallel runways with runway extension

The runway threshold and end locations have been supplied by Brisbane Airport Corporation Pty Ltd for the opening day and future stages of development.

This data has then been used to construct a 3D model of the airport's various development stages as a basis for the PANS-OPS, OLS and CNS[2] development.

Using the design criteria published in the ICAO and CASA documents (refer to section 4.2 Design Standards for a full listing), and the current Instrument Flight Procedure charts published in Aeronautical Information Publications AIP DAP-163 (Effective 21 May 2020), the PANS-OPS surfaces for each individual Instrument Flight Procedure are reverse engineered and modelled in a 3D CAD system.

The CAD system is then used to determine and extract the lowest surfaces of the combined models, which is then used to generate the PAN-OPS, OLS and CNS critical surfaces diagrams included in this submission.

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[1] Guidance provided by *'Guidelines for declaration of prescribed airspace (under the Airports (Protection of Airspace) Regulations 1996 (the Regulations) made under the Airports Act 1996,* attached in Appendix 2.

[2] CNS data consists of; Communication, Navigation Aid, Runway Lighting, Surveillance and Radar Terrain Clearance Chart related surface models.

2. INTRODUCTION

Brisbane Airport Corporation Pty Ltd commissioned TAG173 Pty Ltd (a licensee of The Airport Group) to construct a three-dimensional model of Brisbane International Airport's terminal airspace. In accordance with Airports Act, 1996 and Airports (Protection of Airspace) Regulations, 1996, the existing 2 runways and future runway configurations were modelled. The following protection surfaces are included;

- Procedures for Air Navigation Services, Aircraft Operations (PANS-OPS)
- Obstacle Limitation Surface (OLS)
- Navigation Aids (Glide Slope, Localiser, DME, VOR and proposed GBAS)
- Runway lighting (HIAL, PAPI)
- Ground Base Microwave Link
- Advanced-Surface Movement Guidance and Control Systems (A-SMCGS)
- Terminal Airport Radar (TAR)
- Radar Terrain Clearance Chart (RTCC)

3. AIRPORT CONFIGURATIONS

As outlined by Airports (Protection of Airspace) Regulations, 1996 Regulation 2 – Object of Regulations; the existing and future operations of the airport need to be documented. As such, the existing and various stages of runway development are reported in subsequent paragraphs, as follows;

Paragraph	Stage	Existing / Future	Runways	Comments
3.1		Existing Condition	2 Runways	Current runway configuration
3.2	Stage 1	Future Condition	2 Runways	New parallel runways (Opening Day – July 2020)
3.3	Stage 2	Future Condition	2 Runways	Future parallel runways (Ultimate configuration)

3.1. Existing Conditions – 2 Runways

Presently the airport consists of 2 runway strips.

Runway #1 - 01/19 is 3560m in length and 45m in width, nominally heading N/S
Runway #2 - 14/32 is 1700m in length and 30m in width, nominally heading NW/SE

Declared distances
The declared runway distances are:

RUNWAY DISTANCE SUPPLEMENT 24 MAY 2018 RDS YBBN - 1

BRISBANE

RWY	(CN)	TORA	TODA	ASDA	LDA
01	(4)	3500 (11483)	3620 (11876) (1.2%)	3560 (11680)	3500 (11483)
	RWY 01 THR displaced 60(197).				
19	(4)	3560 (11680)	3620 (11876) (1.49%)	3560 (11680)	3560 (11680)
	Slope Level. RWY WID 45 RWS WID 300 Graded 150				
14	(3)	1700 (5577)	1760 (5774) (1.6%)	1700 (5577)	1700 (5577)
	RWY 14 THR displaced 60(197).				
32	(3)	1700 (5577)	1760 (5774) (1.56%)	1700 (5577)	1700 (5577)

1. RWY 32 THR displaced 60(197).
2. Physical distance between displaced THR is 1640M. Advertised runway length of 1700M includes 60M beyond the applicable departure THR.

Slope Level. RWY WID 30 RWS WID 150 Graded 150

Runway classifications

RWY	Code	RWY WID	RWS	Category Precision Instrument
01	4	45m	300m	CAT I (ILS)
19	4	45m	300m	CAT I (ILS)
14	3	30m	150m	-
32	3	30m	150m	-

See Figure 1 - Existing Airport – 2 Runways 01/19 and 14/32 on Page 10

3.2. Future – Stage 1 – 2 Parallel Runways (Opening Day 2020 configuration)

Stage 1 of the future conditions is planned for opening July 2020 and consists of 2 parallel runway strips.

A new North/South 3300m parallel runway will be commissioned 01L/19R to the west of the existing North/South 3560m runway. The existing North/South runway 01/19 will be re-designated 01R/19L. The existing NW/SE 1700m runway 14/32 will be decommissioned.

Runway #1 – 01R/19L is 3560m in length and 45m in width, nominally heading N/S
Runway #2 – 01L/19R is 3330m in length and 60m in width, nominally heading N/S

Declared distances
The declared runway distances are:

RUNWAY DISTANCE SUPPLEMENT 21 MAY 2020 RDS YBBN - 1

BRISBANE

RWY	(CN)	TORA	TODA	ASDA	LDA
01L	(4)	3300 (10827)	3360 (11023) (1.6%)	3300 (10827)	3300 (10827)
19R	(4)	3300 (10827)	3360 (11023) (1.6%)	3300 (10827)	3300 (10827)
	Slope 0.2% up from 600M both ends for 400M. Centre level. RWY WID 60 RWS WID 300 Graded 150				
01R	(4)	3500 (11483)	3620 (11876) (1.2%)	3560 (11680)	3500 (11483)
	RWY 01R DTHR 60M (197FT).				
19L	(4)	3560 (11680)	3620 (11876) (1.49%)	3560 (11680)	3560 (11680)
	Slope Level. RWY WID 45 RWS WID 300 Graded 150				

Runway classifications

RWY	Code	RWY WID	RWS	Category Precision Instrument
01R	4	45m	300m	CAT I (ILS)
19L	4	45m	300m	CAT I (ILS)
01L	4	60m	300m	CAT I (ILS)
19R	4	60m	300m	CAT I (ILS)

See Figure 2 - Future Conditions – Stage 1 – 2 Runways; 01L/19R, 01R/19L on Page 11

3.3. Future – Stage 2 – 2 Parallel Runways (Ultimate configuration)

Stage 2 of the future conditions are scheduled for operation beyond 2035 and consists of 2 parallel North / South runways 01L/19R and 01R/19L with runway extensions to the south.

The east parallel runway 01R/19L is extended in length to the south from 3560m to 4040m.

The west parallel runway 01L/19R is extended in length to the south from 3330m to 3600m.

Declared distances
Presently the declared runway distances are not available, but the design lengths are:

Runway #1 – 01R/19L is 4040m in length and 45m in width, nominally heading N/S
Runway #2 – 01L/19R is 3600m in length and 60m in width, nominally heading N/S

Runway classifications

RWY	Code	RWY WID	RWS	Category Precision Instrument
01R	4	45m	300m	CAT I (ILS)
19L	4	45m	300m	CAT I (ILS)
01L	4	60m	300m	CAT I (ILS)
19R	4	60m	300m	CAT I (ILS)

See Figure 3 - Future Conditions – Stage 2 – 2 Runways; 01L/19R extended and 01R/19L extended on Page 12

Existing Airport – 2 Runways 01/19 and 14/32

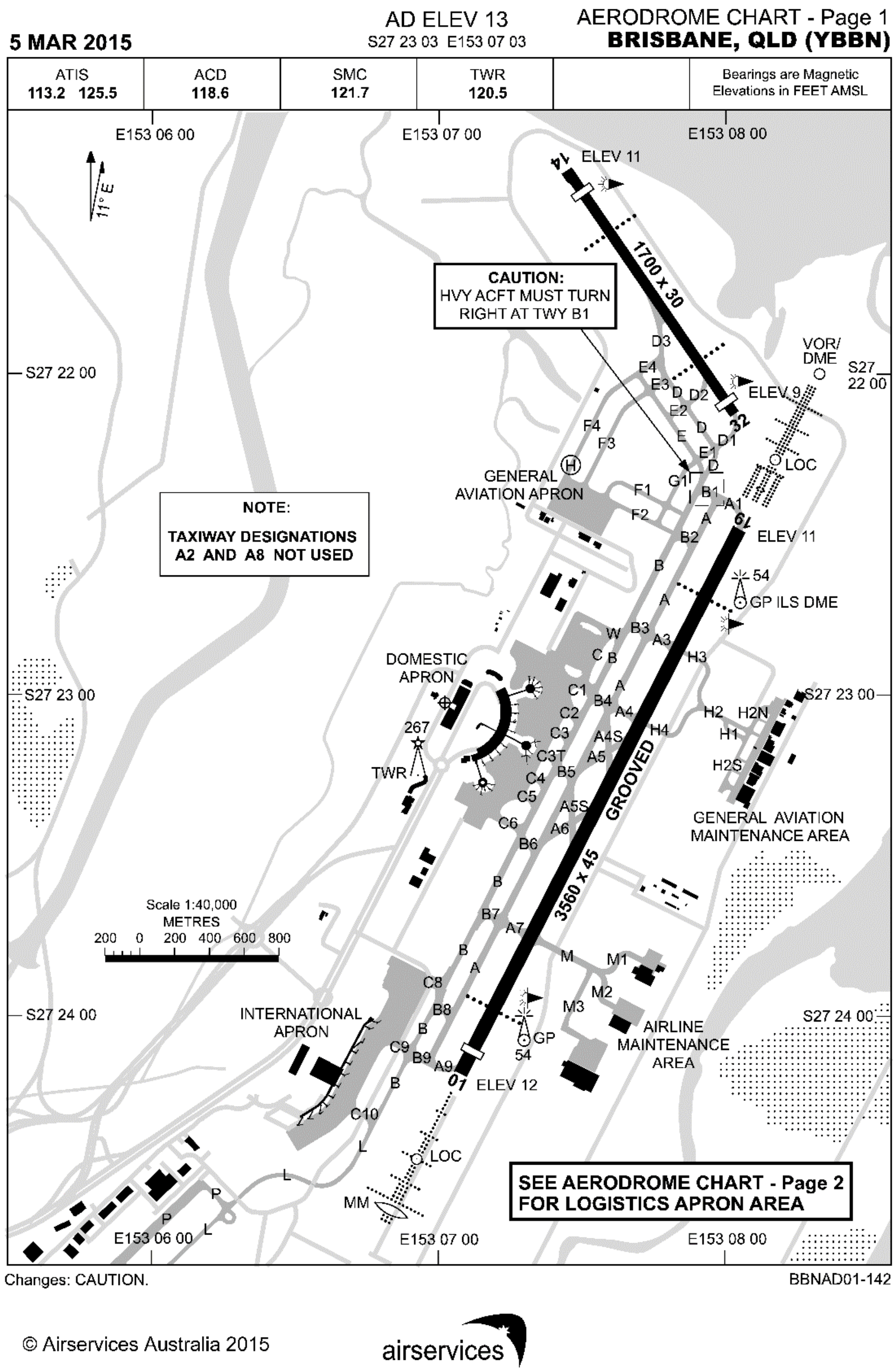

Figure 1 - Existing Airport – 2 Runways 01/19 and 14/32

Future Conditions – Stage 1 – 2 Runways 01L/19R and 01R/19L (Opening Day 2020)

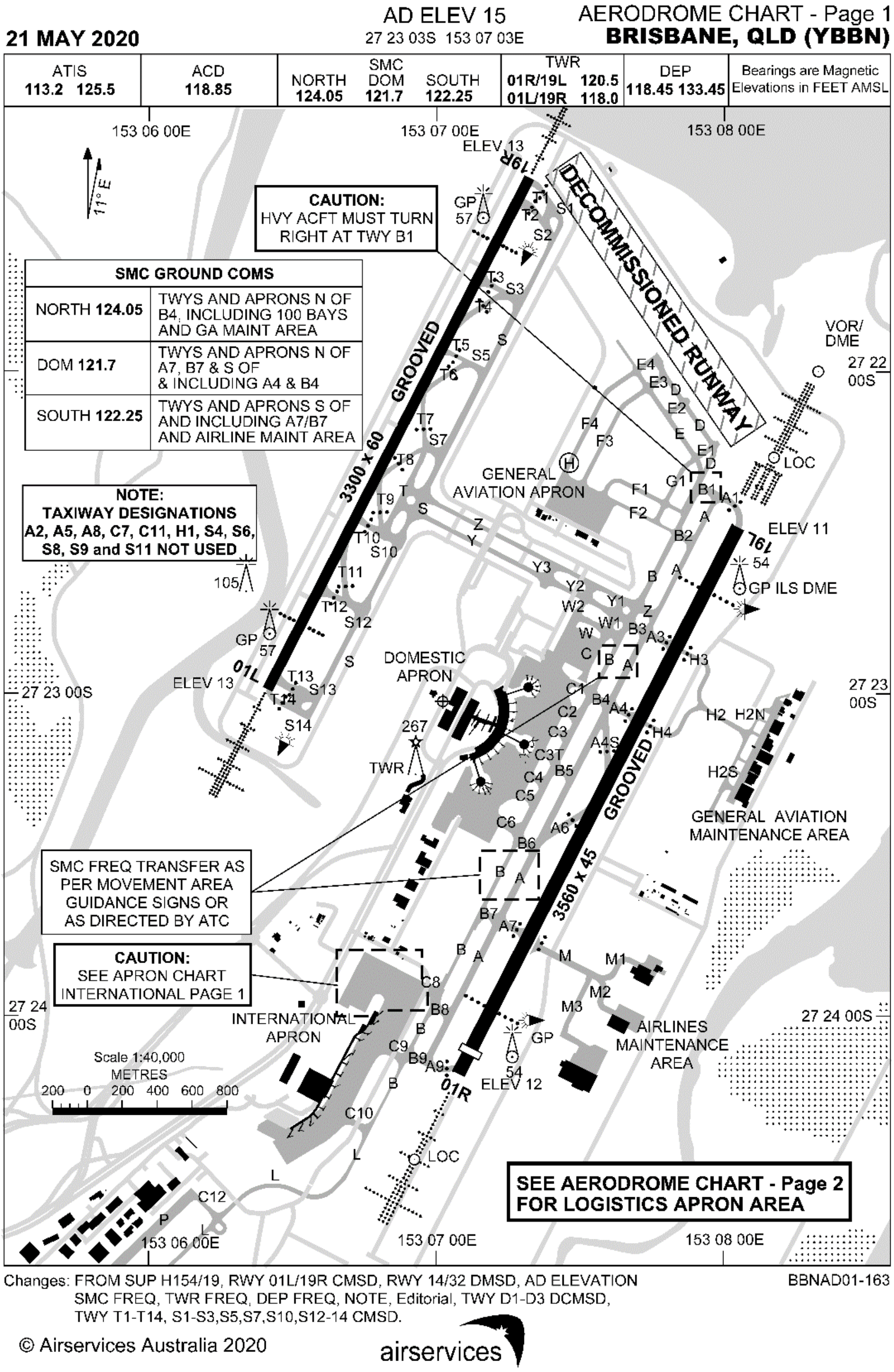

Figure 2 - Future Conditions – Stage 1 – 2 Runways; 01L/19R, 01R/19L

Future Conditions – Stage 2 – 2 Runways; 01L/19R extended, 01R/19L extended

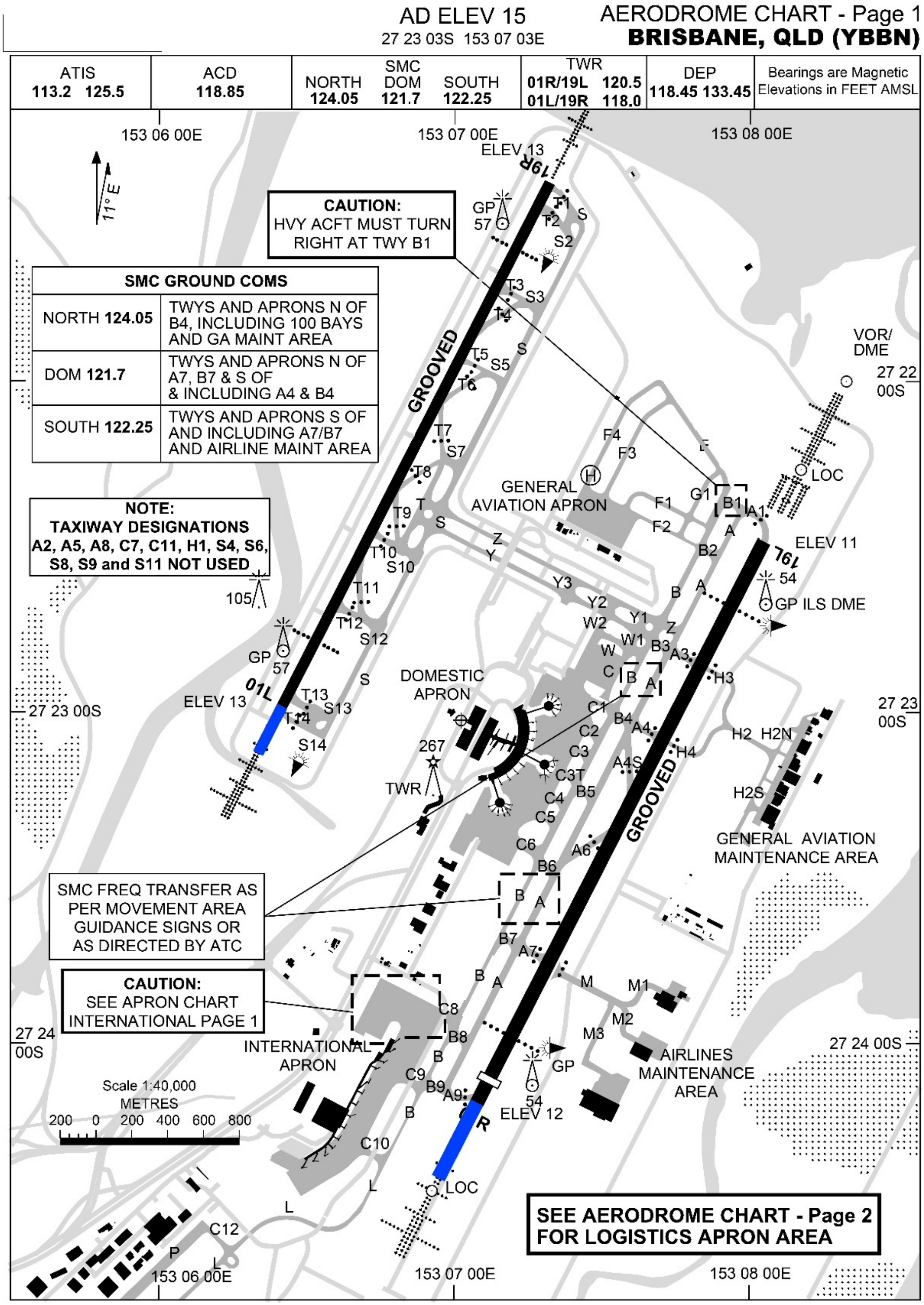

Figure 3 - Future Conditions – Stage 2 – 2 Runways; 01L/19R extended and 01R/19L extended

4. DESIGN

4.1. Design Criteria

An outline of the design criteria used for each surface model has been documented in Section 5

4.2. Design Standards

All PANS-OPS surface models and drawings have been designed and prepared in accordance with the following documents:

- Instrument Flight Procedures published in **AIP DAP 163 (effective 21-MAY-2020).**
- International Civil Aviation Organization document 8168 OPS/611 Procedures for Air Navigation Services, Aircraft Operations – Vol II Construction of Visual and Instrument Flight Procedures;
- Document 9905 (RNP-AR design manual), (Proprietary RNP-AR criteria have been assumed using basic knowledge and adding ICAO criteria);
- CASA Manual of Standards Part 173-Standards Applicable to Instrument Flight Procedure Design; and

Notes:

1) Obstacle Information - No obstacle information has been used in the creation of the approach, circling, missed approach or minimum segment altitudes. The PANS-OPS surface models as designed by Airservices Australia, have already considered obstacle assessment as part of the calculation of the minima elevations for each Instrument Flight Procedure. CASA and ICAO standards are used to determine the PANS-OPS surfaces associated with each procedure based on promulgated values.

All OLS surface models and drawings have been designed and prepared in accordance with the following documents:

- Civil Aviation Safety Authority (CASA) - Part 139 (Aerodromes) Manual of Standards 2019
- International Civil Aviation Organization Annex 14 Volume I Aerodrome Design and Operations.

All CNS (e.g. communication, runway lighting, navigational aid and RTCC) surface models and drawings have been designed and prepared in accordance with the following documents:

- National Airports Safeguarding Framework Principles and Guidelines
- CASA Manual of Standards Part 171-Aeronautical Telecommunication and Radio Navigation Services;
- CASA Manual of Standards Part 172-Air Traffic Services;

4.3. Critical Surface Determination Methodology

Each item requiring documentation is first laid out laterally in two-dimensions (2D). All spatial calculations are determined by the relevant design standards listed in section 4.2 Design Standards.

The 2D lateral design is then converted into a three-dimensional (3D) model by introducing elevation data to each of the surfaces. Each surface is then populated with major and minor contour lines at 1m, 10m, 50m intervals by the CAD system automation.

Once assembled in three dimensions, all individual models are combined into a complete dataset.

The lowest critical surface is then generated by identifying surface intersections, and then by removing higher surfaces which were undercut by lower surfaces, ultimately revealing the most critical protection surfaces.

This process was used to create critical surface models and drawings for the:

- Obstacle Limitation Surface (OLS)
- PANS-OPS; and
- Communication, Navigation and Surveillance (CNS), Lighting and Radar Terrain Clearance Chart (RTCC) surfaces.

5. DESIGN CRITERIA

This section describes the design criteria used to construct the various splays and shapes used in the construction of each surface model in accordance with the documents listed in Section 4.2 above.

For a complete listing, refer to the following appendices;

- Drawings supplied, refer to APPENDIX 1 – DRAWINGS LIST

The design criteria for the following data types have been grouped and sorted as follows:

PANS-OPS5.1.1 Radar directional departures
5.1.2 Route departures
5.1.3 Standard instrument arrivals
5.1.4 RNAV (GNSS) LNAV procedures
5.1.5 RNAV (GNSS) VNAV procedures
5.1.6 RNP approach procedures
5.1.7 ILS approach procedures
5.1.8 Localizer procedures
5.1.9 Visual circling
5.1.10 Minimum sector altitude (MSA)
5.1.11 Visual Segment Surface (VSS)

CNS SURFACES
5.2.1 Navigation aids
5.2.2 Terminal area radar
5.2.3 Runway lighting
5.2.4 Ground base microwave link
5.2.1 Radar terrain clearance chart (RTCC)
5.2.2 Advanced-surface movement guidance and control systems (A-SMCGS)

OBSTACLE LIMITATION SURFACES
5.3.1 OLS

5.1. PANS-OPS – Surface Models

5.1.1. RADAR DIRECTIONAL DEPARTURES

Two surfaces make up the RADAR (omnidirectional) departures, the 'turn initiation area' and the 'turn area'.

The 'turn initiation' area is divided into two segments:

Area 1 begins at the Departure End of Runway (DER), with an initial width of 300m splaying outward at an angle of 15° up to the point at which the Procedure Design Gradient (PDG) reaches the minimum height of 120m above the DER.

Area 2 of the 'turn initiation' area is a continuation from area 1 splaying at an angle of 30° to the departure track and terminating at a distance at which the PDG of reaches the published minimum turn altitude.

The elevation of the surface begins at a height 5m above the DER and continues upward at the published minimum required climb gradient (GRAD) minus 0.8%.

The 'turn area' adjoins the full perimeter of the turn initiation area. The elevation of the surface begins at a height 75m lower than the published minimum turn altitude. This surface then slopes upward in all directions at the PDG until a distance 9.375km from the DER, it then continues to slope upward at the published PDG minus 0.8%.

5.1.2. ROUTE DEPARTURES

Only route departures that have a lower departure gradient than the RADAR departures are included in the lowest protection surfaces, as route departures with the same gradient or higher, are completely contained within the protection surfaces of the RADAR departures and hence will not contribute to the determination of the critical PANS-OPS surface for Brisbane International Airport's airspace.

Promulgated in the BRISBANE FOUR DEPATURES (RADAR) ALL RWYS, the initial departure gradient for RWY 01L, 01R and 19L is 3.3%, while RUNWAY 19R is 3.6% to 600FT, then 3.3%.

For the route departure that tracks over the Brisbane CBD and surrounds, BIXAD ONE DEPARTURE 19R, promulgates a departure gradient of 3.3%, which is below the 3.6% gradient of the RADAR departure in the same sector. The lower gradient surface is of this route departure has been modelled and is accounted for final lowest surface solution.

All other route departures have the same or steeper departure gradient than those listed for the RADAR departures and hence contained within the lowest protection surfaces created by the RADAR departures

5.1.3. STANDARD INSTRUMENT ARRIVALS

Standard Instrument Arrivals (STARS) link the en-route and instrument approach segments.

The ½ area width is based on RNP-1 and 2.5 NM either side of the nominal track. The central 1.25 NM either side is primary area, with the outer 1.25 NM being secondary area. Turn expansions are applied to turns greater than 30°.

The elevation of the primary area surface is a horizontal plane 300m lower than the published segment minimum safe altitude. Secondary area surfaces link, the outer edge of the secondary area, at the published segment minimum safe altitude, to the outer edge of the primary area.

5.1.4. RNAV-Z (GNSS) LNAV PROCEDURES

Secondary areas are applied to all segments of the RNAV approach procedures. The total area width of each segment is as listed below[3]:

- Arrival, Initial and Intermediate approach segments – 5 NM
- Width at the FAF - 2.9 NM
- Final approach segment – width of segment as per the missed approach point width, including a transition from intermediate area intercepting approach track at 30°
- Missed approach point – 1.9 NM
- Missed approach segment – 4 NM

The missed approach surface is a climbing surface beginning at a calculated start of climb position from the missed approach point and then sloping upward at 2.5%.

The elevation of each surface has been calculated using the published altitudes less the minimum obstacle clearance (MOC) as shown below:

- Arrival and initial approach segments – 300m
- Intermediate approach segment – 150m
- Final approach segment – 75m
- Initial missed approach segment – transitions from 75 to 30m Intermediate missed approach segment 30m
- Final missed approach segment 50m

Note: The primary areas include full MOC protection. The secondary areas taper from full protection at boundary of the primary area to zero MOC protection at the limit of the area.

5.1.5. RNAV-Z (GNSS) BARO-VNAV PROCEDURES

The slope of the Final Approach segment, known as the Final Approach Surface (FAS), is calculated using the published approach angle using the minimum prescribed temperature.

The primary area of the Final Approach segment is defined laterally by the RNAV (GNSS) LNAV procedure and vertically by the slope of the FAS. It begins at the intersection of the Intermediate Approach primary surface and terminates at the intersection of the Missed Approach Initial primary surface.

The secondary area of the Final Approach segment is also defined laterally by RNAV (GNSS) LNAV procedure and vertically it parallels the Final Approach primary area 75m above (due to 75m MOC). It begins at the intersection of the Intermediate Approach secondary surface and terminates at the intersection of the Decision Altitude (DA) elevation.

The primary area of the Missed Approach Initial segment is defined laterally by the RNAV (GNSS) LNAV procedure and its surface elevation is calculated using the formula (DA - Height Loss). The surface begins where it intersects the FAS and remains flat until the MOC transition point, then

[3] *Widening is applied where turn expansions are required.*

inclines at the prescribed Missed Approach climb gradient, of typically 2.5%. The Missed Approach Initial segment ends below the start of climb of the missed approach (SOC).

The secondary area of the Missed Approach Initial segment is also defined laterally by the RNAV (GNSS) LNAV procedure. The lower edge intersects with the Missed Approach Initial primary area, and the upper edge terminates at the DA elevation. It begins at the intersection of FAS secondary surface and ends at the Missed Approach SOC.

The primary area of the Missed Approach Intermediate / Final area is defined laterally by the RNAV (GNSS) LNAV procedure and vertically it inclines, from the end of the Missed Approach Initial segment primary area, at the prescribed Missed Approach climb gradient, of typically 2.5%.

The secondary area of the Missed Approach Intermediate / Final area is defined laterally by the RNAV (GNSS) LNAV procedure and vertically it inclines parallel to the Missed Approach primary surface from the Missed Approach SOC.

5.1.6. RNP APPROACH PROCEDURES

Required Navigation Performance (RNP) are Performance Based Navigation procedures using modern aircraft equipment and Global Navigation Satellite System (GNSS) to provide aircraft with track guidance.
The width of the final approach area is 2 times the published RNP on either side of the approach track. The missed approach begins at the DA and widens at 15° to a width of 2 NM either side of centreline.

Both the final and missed approach are sloping surfaces. The final approach slopes from the FAF to the published touch down zone elevation (TDZE) and is provided protection of 75m MOC and cold temperature allowance.

The missed approach surface begins to climb at a calculated start of climb position from the DA and then slope upward at 2.5% and is provided protection consisting of 30m MOC throughout.

5.1.7. ILS APPROACH PROCEDURES

Instrument Landing System (ILS) protection surfaces are made up of the Basic ILS surface, the ILS Obstacle Assessment Surface (OAS) and the precision VSS.

The Basic ILS surfaces are equivalent to the inner approach surfaces of an OLS. These surfaces do not reflect runway length or ILS installation.

The OAS is a simplified mathematical representation of a probability model. It accounts for runway length and considers ILS parameters.

**As the volume a CAT II and III obstacle assessment surface is contained within a CAT I assessment surface, only CAT I procedures require modelling to determine the PANS-OPS protection surfaces for all ILS procedures.*

5.1.8. LOCALISER PROCEDURES

As a localiser is the lateral part of the ILS, the localiser splays are dependent on criteria for ILS.
The lateral width of the final and missed approach areas of the Localiser (LOC) procedures are determined by the OAS of the ILS procedures.

An intermediate approach segment commences at the initial approach fix (IAF) and terminates at the FAF. This area transitions from 5 NM wide at the IAF to the width of the final segment at the FAF. The outer half is considered secondary areas.

The elevation of surfaces, are calculated from the published segment minimum safe altitude less the minimum obstacle clearance (MOC) as shown below:

- Intermediate approach segment – 150m
- Final approach segment – 75m
- Initial missed approach segment – transitions from 75 to 30m
- Intermediate missed approach segment 30m
- Final missed approach segment 50m

The missed approach surface is a climbing surface beginning at a calculated start of climb position from the missed approach, sloping upward at 2.5%.

The secondary areas of the final and missed approach areas, are also determined by the construction of the OAS from the ILS procedure.

5.1.9. VISUAL CIRCLING

The dimensions of the visual manoeuvring areas are in accordance with AIP ENR 1.5. The elevation of each surface has been calculated using the published altitudes less the minimum obstacle clearance (MOC) as shown below:

	MOC
• Category A:	90m
• Category B:	90m
• Category C:	120m
• Category D:	120m

5.1.10. MINIMUM SECTOR ALTITUDE (MSA)

Both the 10NM and 25NM MSA surfaces have been modelled to include 300m Minimum Obstacle Clearance from the altitudes published on the departure and approach procedures.

As the MSA reference is the ARP, in the AIP DAP procedures published as of the date of this report, the MSA boundaries have been modelled for both reference locations and then combined into a single model. The ARP is not redefined after the opening of the new parallel or extended runways.

5.1.11. VISUAL SEGMENT SURFACE (VSS)

The visual segment surface (VSS) has been modelled, beginning 60m before the threshold splaying outward at 15%. The surface slopes upward from threshold elevation at an angle 1.12° less than the procedures promulgated descent angle. This surface continues until it reaches the elevation of the final critical surface.

Note that the precision approach VSS does not splay outward and is wholly contained within a non-precision VSS to the same runway.

5.2. Communication, Navigation and Surveillance Surface Models

5.2.1. NAVIGATION AIDS

The navigation surfaces consist of the following:

- Glide Path protections surfaces for each precision approach runway,
- Localiser protection surfaces for each precision approach runway,
- VOR and DME protection surface for 'BN VOR/DME'.
- GBAS installation (proposed)

The navigation aid surfaces were modelled in accordance with the 'National Airports Safeguarding Framework - Guideline G' and unpublished Airservices documents.

5.2.2. TERMINAL AREA RADAR (TAR)

The navigation surfaces consist of the following:

- The Terminal Area Radar – located in the northern area of the Brisbane International Airport.

The navigation aid surfaces were modelled in accordance with the 'National Airports Safeguarding Framework - Guideline G' and unpublished Airservices documents.

5.2.3. RUNWAY LIGHTING

The following two types of lighting plane surfaces have been modelled;

1. Precision Approach Path Indicator (PAPI) surfaces
2. High Intensity Approach Lighting (HIAL) surfaces.

PAPI lighting protection surfaces have been modelled according to the criteria 9.9.2 Obstacle Assessment Surface of the CASA document Part 139 (Aerodromes) Manual of Standards 2019, where the area begins 60m before the threshold at a width of 150m, the area splays outwards at 7.5°, slopes up at 1.9°, with an overall length of 9km.

HIAL surfaces exist overhead the High Intensity Approach Lighting installations to the precision approach runways. The surfaces have been modelled according to the criteria defined in the ICAO document ANNEX-14 5.3.4.10 - 5.3.4.39, where the area is rectangular, beginning 60m before the runway threshold, at a width of 120m, and extending;

1. For non-precision approach: 900m and inclined upwards at 2°
2. For precision approach: 1350m and inclined upwards at 2°

5.2.1. RADAR TERRAIN CLEARANCE CHART (RTCC)

The RTCC layout was supplied by Airservices Australia. Each segment of the RTCC includes 1000FT Minimum Obstacle Clearance.

5.2.2. ADVANCED-SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEMS (A-SMCGS) AND GROUND BASE MICROWAVE LINKS

The microwave link path is a line of sight corridor measuring 60m x 60m, centred and projecting from the top of the designated antennas.

The following facilities and links have been modelled.

- Brisbane International Airport - A-SMGCS installations
- Brisbane International Airport - Terminal Area Radar
- Capalaba - RSM to RADAR (Mt. Hardgrave)
- North Stradbroke Island - RADAR (Mt. Hardgrave)

The antenna heights have been modelled using the data supplied by Brisbane Airport Corporation where possible, otherwise, using data available from the Australian Communications and Media Authority online map https://web.acma.gov.au/rrl/site_proximity.main_page

5.3. Obstacle Limitation Surfaces

5.3.1. OLS

The Obstacle Limitation Surfaces (OLS) have been modelling as per the standards set out CASA document Part 139 (Aerodromes) Manual of Standards 2019.

The following surfaces have been modelled and documented on all OLS diagrams:

- Inner horizontal surface
- Outer horizontal surface
- Conical surface
- Take-off climb surfaces
- Transitional surfaces
- Approach surfaces
  (All runways have an approach inner edge and runway strip width (RWS) of 300m)

The take-off surfaces have been modelled at 1.6% in accordance with CASA MOS Part 139 table 7.1-2 (Take-off runways) Note [e][4] to cater for critical operating conditions as specified in CAO 20.7.1B.

5.3.2. Reference Elevation Datum

A Reference Elevation Datum (RED) is to be established as a benchmark for the horizontal and conical surfaces of the OLS.

As defined in section 7.04 of CASA document Part 139 (Aerodromes) Manual of Standards 2019, the Reference Elevation Datum is calculated by comparing the elevation of the Aerodrome Reference Point (ARP) to the average elevation of all existing and proposed runway ends.

The following RED calculation has been determined using the data from Table 5-2 - Proposed Future Runway Elevations

	ft	m
Runway End Elevation (Average)	12.41	3.78
ARP Elevation	N/A	N/A
difference		0.00
Reference Elevation Datum (As no ARP elevation is defined, use Runway End Elevation average, rounded down to next 1/2m)	11.48	**3.50**

Table 5-1 - Reference Elevation Datum calculations

As the ARP elevation is not defined for the airport, the airport's Reference Elevation Datum is determined by the proposed Runway End average elevations (rounded off to the next half-metre below), which equals **3.50m**

[4] Table 7.1-2 Note[e] The operational characteristics of aircraft for which the runway is intended should be examined to see if it is desirable to reduce the slope to cater for critical operating conditions as specified in CAO 20.7.1B. If the specified slope is reduced, corresponding adjustment in length for take-off climb is to be made so as to provide protection to a height of 300 m. If no object reaches the 2% take-off climb surface, new objects should be limited to preserve the existing obstacle free surface or a surface down to a slope of 1.6%.

This value for the reference elevation datum, has been used for the preparation of all OLS diagrams and models.

5.3.3. Runway Elevations

Following are the Runway Threshold and Departure End of Runway (end of runway clearway) elevations for the proposed Ultimate runway layout.

RWY	OLS TABLE CODE	3D INST APPR	TORA	TODA	LDA	CWY	RWS	THR ELEV (ft)	DER ELEV (ft)	THR ELEV (m)	DER ELEV (m)
RWY 01L	4P1	ILS CAT I	3300	3360	3300	60	300	13.34	13.34	4.066	4.066
RWY 19R	4P1	ILS CAT I	3300	3360	3300	60	300	13.34	13.34	4.066	4.066
RWY 01R	4P1	ILS CAT I	3500	3620	3500	120	300	11.81	10.82	3.60	3.30
RWY 19L	4P2	ILS CAT II	3560	3620	3560	60	300	10.50	12.46	3.20	3.80

Table 5-2 - Proposed Future Runway Elevations

6. Conclusion

In accordance with the *Guidelines*[5]*,* the existing and future operations at Brisbane International Airport have been documented for the following operational stages;

1) Existing Condition - 2 Runways
2) Stage 1 - Future Condition - 2 Runways (Opening Day configuration)
3) Stage 2 - Future Condition - 2 Runways (Ultimate configuration)

Included in this submission is the following information;

- Runway distances
- Runway classifications
- Aerodrome Reference Elevation
- OLS diagrams for existing and future operations
- PAN-OPS critical surfaces diagrams for existing and future operations
- Communication, Surveillance and Navigation surface protection diagrams (i.e. communication, runway lighting, navigational aid and RTCC) for future and existing operations
- Design criteria and methodology

We believe that this material is suitable for the basis of submission to the Department of Infrastructure and Regional Development (DIRD) for the purpose of declaration of prescribed airspace (under the Airports (Protection of Airspace) Regulations 1996, made under the Airports Act 1996

Prepared by;

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On behalf of;

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[5] *Guidelines for declaration of prescribed airspace (under the Airports (Protection of Airspace) Regulations 1996 (the Regulations) made under the Airports Act 1996 – see Appendix 2*

APPENDIX 1 – DRAWINGS LIST

1.1 Future – Stage 1 - 2 RWY - Opening Day Configuration (2020)

Stage	Group	Type	Title	DrgNo	Sheet
1	OLS	OLS	OBSTACLE LIMITATION SURFACES (OLS) FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OLS-OPD-1	1 OF 4
1	OLS	OLS	OBSTACLE LIMITATION SURFACES (OLS) FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OLS-OPD-2	2 OF 4
1	OLS	OLS	OBSTACLE LIMITATION SURFACES (OLS) FUTURE 2 RUNWAYS (OPENING DAY) - NORTH	BBN-2RWY-OLS-OPD-3	3 OF 4
1	OLS	OLS	OBSTACLE LIMITATION SURFACES (OLS) FUTURE 2 RUNWAYS (OPENING DAY) - SOUTH	BBN-2RWY-OLS-OPD-4	4 OF 4
1	CNS	LIGHTING	HIAL OBSTACLE PROTECTION SURFACES FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OPD-CNS-HIAL-1	1 OF 1
1	CNS	COMMS	MICROWAVE PROTECTION SURFACES FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OPD-CNS-MW-1	1 OF 3
1	CNS	COMMS	MICROWAVE PROTECTION SURFACES FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OPD-CNS-MW-2	2 OF 3
1	CNS	COMMS	MICROWAVE PROTECTION SURFACES FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OPD-CNS-MW-3	3 OF 3
1	CNS	NAVAIDS	NAVAID PROTECTION SURFACES FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OPD-CNS-NAV-1	1 OF 2
1	CNS	NAVAIDS	NAVAID PROTECTION SURFACES FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OPD-CNS-NAV-2	2 OF2
1	CNS	LIGHTING	PAPI OBSTACLE PROTECTION SURFACES FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OPD-CNS-PAPI-1	1 OF 1
1	CNS	RTCC	RADAR TERRAIN CLEARANCE CHART (RTCC) FUTURE 2 RUNWAYS (OPENING DAY)	BBN-2RWY-OPD-CNS-RTCC-1	1 OF 1
1	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - OPENING DAY (70KM)	BBN-2RWY-OPD-PANSR-1	1 OF 6
1	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - OPENING DAY (NORTH)	BBN-2RWY-OPD-PANSR-2	2 OF 6
1	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - OPENING DAY (SOUTH)	BBN-2RWY-OPD-PANSR-3	3 OF 6
1	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - OPENING DAY (NORTH)	BBN-2RWY-OPD-PANSR-4	4 OF 6
1	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - OPENING DAY (SOUTH)	BBN-2RWY-OPD-PANSR-5	5 OF 6
1	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - OPENING DAY (AIRPORT)	BBN-2RWY-OPD-PANSR-6	6 OF 6

APPENDIX 1 – DRAWINGS LIST… cont'd

1.2 Future – Stage 2 - 2 RWY - Ultimate Runway Configuration (>2035)

2	OLS	OLS	OBSTACLE LIMITATION SURFACES (OLS) FUTURE 2 RUNWAYS (ULTIMATE)	BBN-2RWY-OLS-ULT-1	1 OF 4
2	OLS	OLS	OBSTACLE LIMITATION SURFACES (OLS) FUTURE 2 RUNWAYS (ULTIMATE)	BBN-2RWY-OLS-ULT-2	2 OF 4
2	OLS	OLS	OBSTACLE LIMITATION SURFACES (OLS) FUTURE 2 RUNWAYS (ULTIMATE) - NORTH	BBN-2RWY-OLS-ULT-3	3 OF 4
2	OLS	OLS	OBSTACLE LIMITATION SURFACES (OLS) FUTURE 2 RUNWAYS (ULTIMATE) - SOUTH	BBN-2RWY-OLS-ULT-4	4 OF 4
2	CNS	LIGHTING	PAPI OBSTACLE PROTECTION SURFACES FUTURE 2 RUNWAYS - ULTIMATE (70KM)	BBN-2RWY-ULT-CNS-PAPI-1	1 OF 1
2	CNS	COMMS	MICROWAVE PROTECTION SURFACES FUTURE 2 RUNWAYS (ULTIMATE)	BBN-2RWY-ULT-CNS-MW-1	1 OF 2
2	CNS	COMMS	MICROWAVE PROTECTION SURFACES FUTURE 2 RUNWAYS (ULTIMATE)	BBN-2RWY-ULT-CNS-MW-2	2 OF2
2	CNS	NAVAIDS	NAVAID PROTECTION SURFACES FUTURE 2 RUNWAYS (ULTIMATE)	BBN-2RWY-ULT-CNS-NAV-1	1 OF 2
2	CNS	NAVAIDS	NAVAID PROTECTION SURFACES FUTURE 2 RUNWAYS (ULTIMATE)	BBN-2RWY-ULT-CNS-NAV-2	2 OF2
2	CNS	LIGHTING	HIAL OBSTACLE PROTECTION SURFACES FUTURE 2 RUNWAYS (ULTIMATE)	BBN-2RWY-ULT-CNS-HIAL-1	1 OF 1
2	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - ULTIMATE (70KM)	BBN-2RWY-ULT-PANSR-1	1 OF 6
2	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - ULTIMATE (NORTH)	BBN-2RWY-ULT-PANSR-2	2 OF 6
2	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - ULTIMATE (SOUTH)	BBN-2RWY-ULT-PANSR-3	3 OF 6
1	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - ULTIMATE (NORTH)	BBN-2RWY-ULT-PANSR-4	4 OF 6
2	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - ULTIMATE (SOUTH)	BBN-2RWY-ULT-PANSR-5	5 OF 6
2	PANS-OPS	PANS	PANS-OPS/ RTCC COMBINED CRITICAL SURFACES FUTURE 2 RUNWAYS - ULTIMATE (AIRPORT)	BBN-2RWY-ULT-PANSR-6	6 OF 6

APPENDIX 2

2.1 Guidelines for declaration of prescribed airspace

Australian Government

Department of Infrastructure, Transport, Cities and Regional Development

GUIDELINES FOR THE DECLARATION OF PRESCRIBED AIRSPACE

(UNDER THE AIRPORTS (PROTECTION OF AIRSPACE) REGULATIONS 1996)

FOR OPERATORS OF LEASED FEDERAL AIRPORTS

1. In accordance with Regulation 6 of the Airports (Protection of Airspace) Regulations 1996 (APARs), prescribed airspace for an airport is:
   a) the airspace above any part of either an Obstacle Limitation Surface (OLS) or a Procedures for Air Navigation Systems Operations (PANS-OPS) surface for the airport; and
   b) airspace declared in a declaration, under Regulation 5 of the APARs.

   In accordance with Regulation 6, the airspace above the current OLS and PANS-OPS surfaces does not need to be declared as these surfaces are defined to be prescribed airspace.

2. Under Regulation 5 paragraph (1) the Secretary may declare in writing, that specified airspace around an airport should, in the interests of the safety, efficiency or regulatory of future air transport operations into or out of the airport, be prescribed airspace.

3. Together, Regulations 5 and 6 establish three categories of prescribed airspace:
   a) the OLS relating to the airport's current runway system;
   b) the PANS-OPS surface, also relating to the airport's current runway system; and
   c) airspace which becomes prescribed airspace through a declaration.

4. The primary focus of a declaration is the airport's OLS and PANS-OPS surfaces relating to the future runway configuration and instrument flight procedures.

5. Under Regulation 5 paragraph (2), in making a declaration, the Secretary must have regard to:
   a) if there is a final master plan for the airport—any changes to the OLS and PANS-OPS surfaces for the airport proposed in the final master plan; and
   b) any advice from CASA on the matter; and
   c) any other matters the Secretary considers relevant.

6. To prepare for a declaration, the airport operator will need to arrange for charts of its proposed airspace to be prepared. These proposed surfaces should be ascertained as follows:
   a) an OLS in accordance with the procedures in Annex 14 to the Chicago Convention; and
   b) PANS-OPS surface in accordance with the standards set out in International Civil Aviation Organization document number 8168 OPS-611 Procedures for Air Navigation Services, Aircraft Operations.

7. The Department requires that the airport operator provide a statement signed by the author of any proposed OLS or PANS-OPS chart, indicating that the chart has been prepared in accordance with the standards referred to under paragraph 5 above.

8. The Department acknowledges that, in relation to future PANS-OPS surfaces, there is room for considerable flexibility for the airport operator to determine how particular instrument flight procedures should be designed, and which segments of a particular procedure should be protected. Notwithstanding this, the Department will be careful to avoid declaring any future PANS-OPS surface which would be unnecessarily restrictive, particularly where such action would unreasonably limit current or future land uses around the airport.

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9. Airport operator companies must undertake a public consultation process on the proposed airspace prior to applying for declaration, including:
    a) consultation with CASA, Airservices Australia, relevant state, territory and local governments authorities (including building authorities) in the vicinity of the airport, airlines that use the airport, surrounding airports (civil and military) whose airspace or operations would be affected by the declaration, and if the airport is a joint user airport – the Department of Defence;
    b) publishing a notice in relevant local/state newspapers and on the airport's website of the availability of the proposed airspace charts on the airport's website; and
    c) inviting comments about the proposed airspace to the airport within 20 business days after the publication of the notice.

10. Following consultation, the airport operator would be in a position to apply to the Department for declaration of its airspace. The application should include:
    a) details of the existing airspace and any previous declarations;
    b) details of the proposed airspace for declaration, including all relevant charts in both hard copy and electronic form;

       Note: maps should provide enough detail so that the geographical borders for different levels of the OLS and/or PANS-OPS can be identified e.g. with reference to main roads or other geographical features

    c) the reasons why a declaration is being sought with respect to addressing the safety, efficiency and regulatory of future air transport operations;
        - in particular, specific justification should be provided where surfaces other than the future OLS and PANS-OPS (for example Radar Lowest Sector Altitude Terrain (RLSAT)/Radar Terrain Clearance Chart (RTCC), High Sensitivity Approach Lighting (HIAL), Precision Approach Path Indicator (PAPI) and future navigation aid surfaces) are proposed to be declared;
    d) the key assumptions behind the design of the proposed airspace (for example, runway configuration and planned future instrument flight procedures);
    e) details of the public consultation undertaken on the proposed airspace comprising a list of authorities, organisations and other interested parties that were consulted, the manner and outcomes of the consultation including:
        - copies of any written comments received during consultation; and
        - the airport operators summary and response to the issues raised during consultation including showing due regard to the comments in preparing the application submitted for declaration;
    f) written assessments of the proposed airspace by CASA and Airservices Australia indicating technical endorsement of the proposed airspace to be declared;
    g) if there is a final master plan for the airport – information as to whether the proposed changes are consistent with the master plan; and
    h) a signed statement by the responsible technician certifying that the OLS and/or PANS-OPS charts have been prepared in accordance with the international standards set out in paragraph 5 above.

Failure to provide any of this information may lead to delays in a decision being able to be made by the Department.

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11. It is the Department's preference to receive applications in both hard copy and via email. Applications should be addressed to:

    The Director – Airspace Protection and Safeguarding
    Department of Infrastructure, Transport, Cities and Regional Development
    GPO Box 594
    CANBERRA ACT 2601

    and email to: flysafe@infrastructure.gov.au

12. All queries are to be emailed to the above address.

13. The Department will seek to make a decision within 50 business days once all required information is available.

14. Following a declaration, the airport operator is to notify and work with relevant state and local government authorities to ensure the updated prescribed airspace information is readily available.

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