SouthPAN

International Information Subcommittee of CGSIC/64

Baltimore USA

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Geoscience Australia

Program objectives

- Improve and augment the accuracy, integrity and availability of basic GNSS signals in Australia and New Zealand.
- Positively contribute to the aviation, maritime, road, rail, agriculture, construction, resource and utility sectors.
- Positively impact all users of satellite positioning, particularly citizens in regional and remote areas without mobile phone coverage

SouthPAN services and roadmap

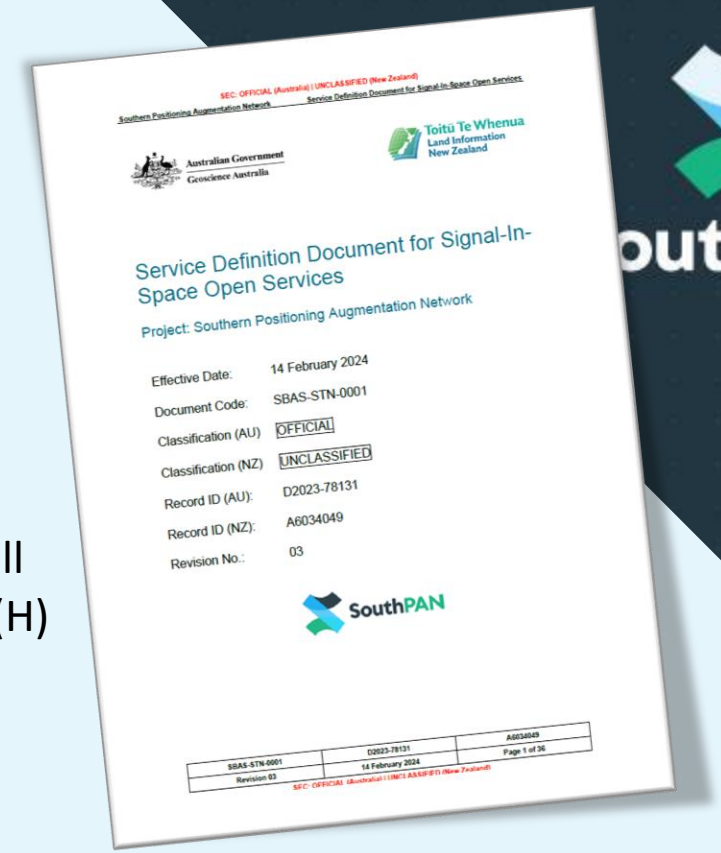
L1 SBAS Open Service (L1 SIS)

- Augments GPS L1 C/A
- Better than 3m (H) and 4m (V)

DFMC SBAS Open Service (L5 SIS)

- Augments GPS L1 C/A + L5, and Galileo E1 + E5a
- Better than 1.5m (H) and 2.5m (V)

1. Performance will improve to 1.0 (H) and 1.5 (V)



PPP via SouthPAN (L5 SIS)

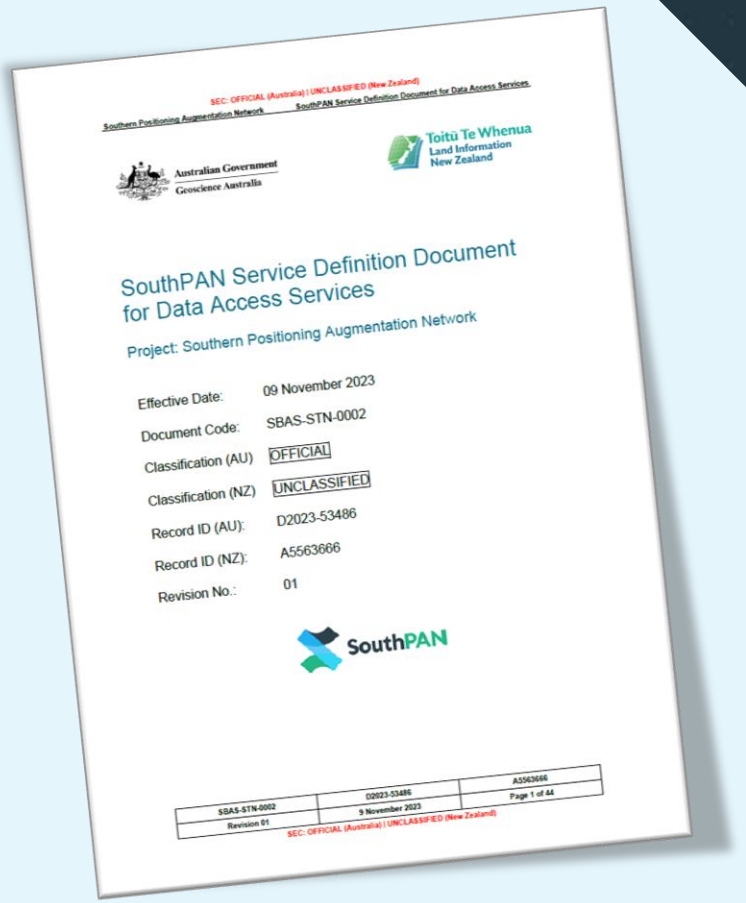
- Augments GPS L1 C/A + L5, and Galileo E1 + E5a
- Better than 0.375m (H) and 0.525m (V), with 80 min convergence

1. Performance will improve to 15 cm (H), 22.5 cm (V), and 40 min
2. **PVS will transition from L5 SIS to L5b SIS in late 2027**

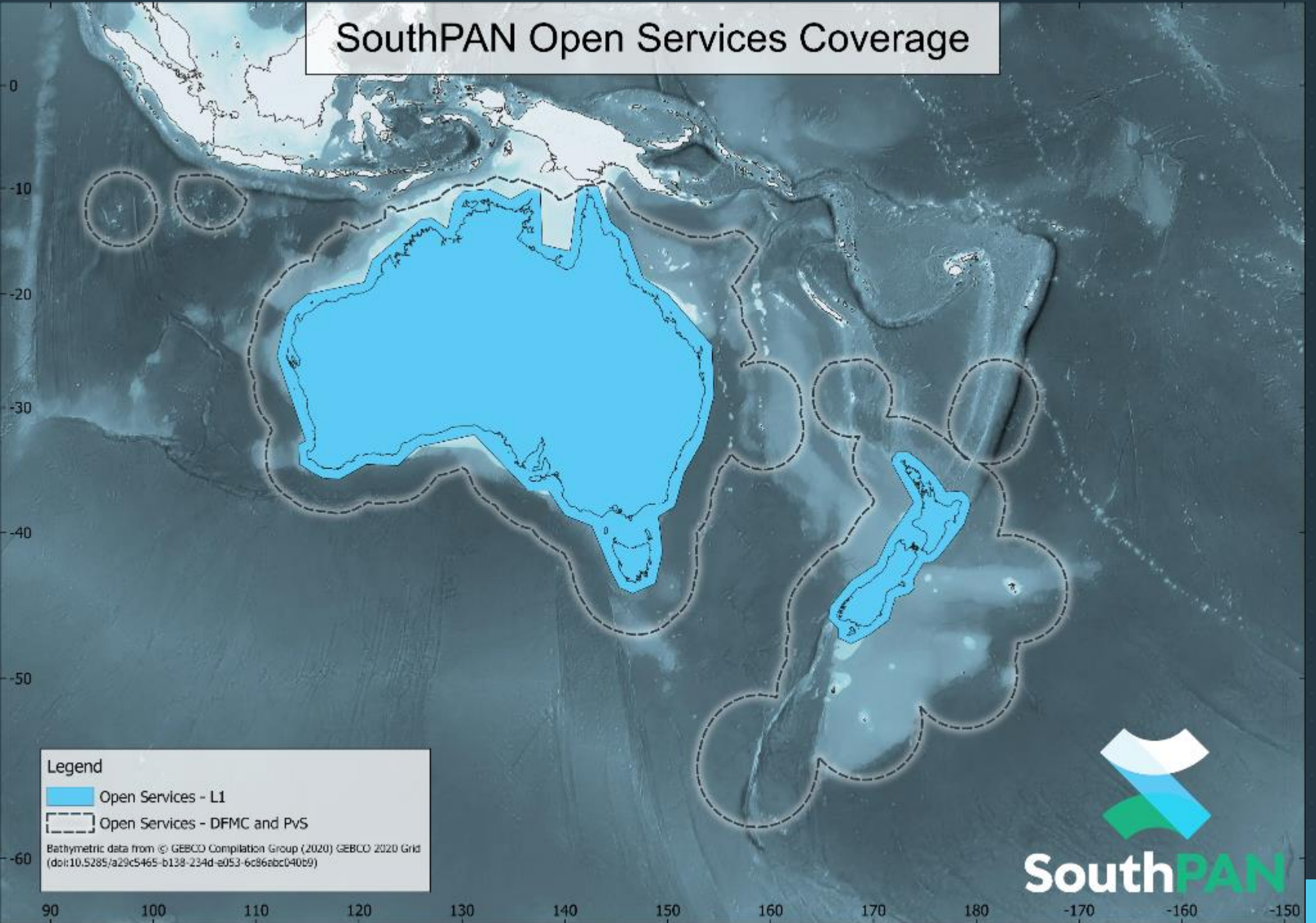
1. Early Open Service performance will improve as SouthPAN is deployed
2. L1 SBAS Safety-of-Life Services are in development, expected 2028
3. DFMC SBAS and PPP Via SouthPAN will remain as Open Service for the foreseeable future

SouthPAN Data Access Services

- To encourage uptake and interoperability, SouthPAN DAS has been developed to be compliant with the SISNeT protocol similar to the EGNOS Data Access Service (EDAS).
- SouthPAN DAS is defined in the Service Definition Document (SDD) for DAS, accessible on GA and LINZ websites. The SDD includes:
  - Connection and registration details
  - Interface protocol
  - Message definitions (same as navigation SIS)
  - Performance commitment
- For more info on how to access:
  - www.ga.gov.au/southpan
  - www.linz.govt.nz/southpan



SouthPAN Open Services Coverage



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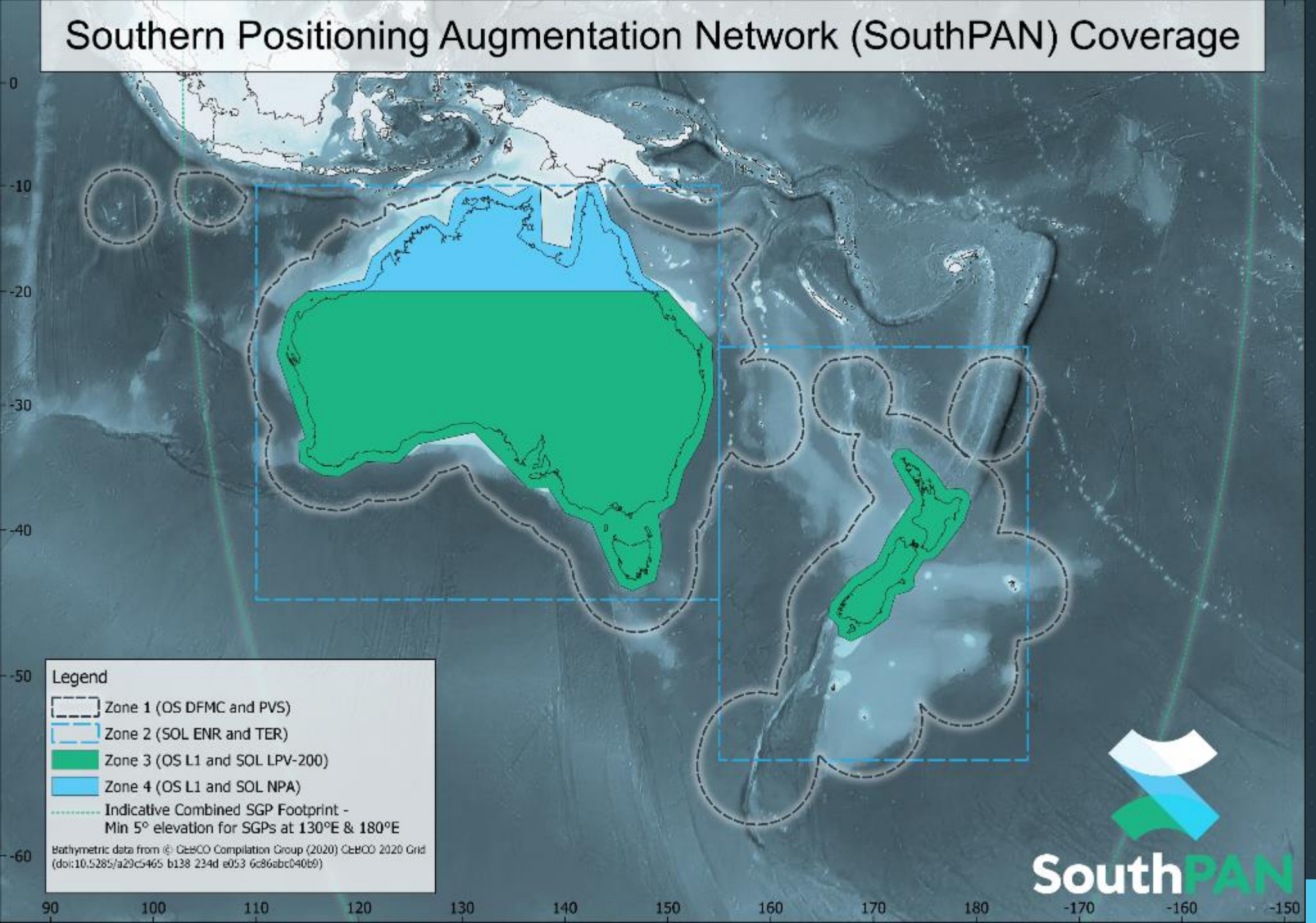
Southern Positioning Augmentation Network (SouthPAN) Coverage



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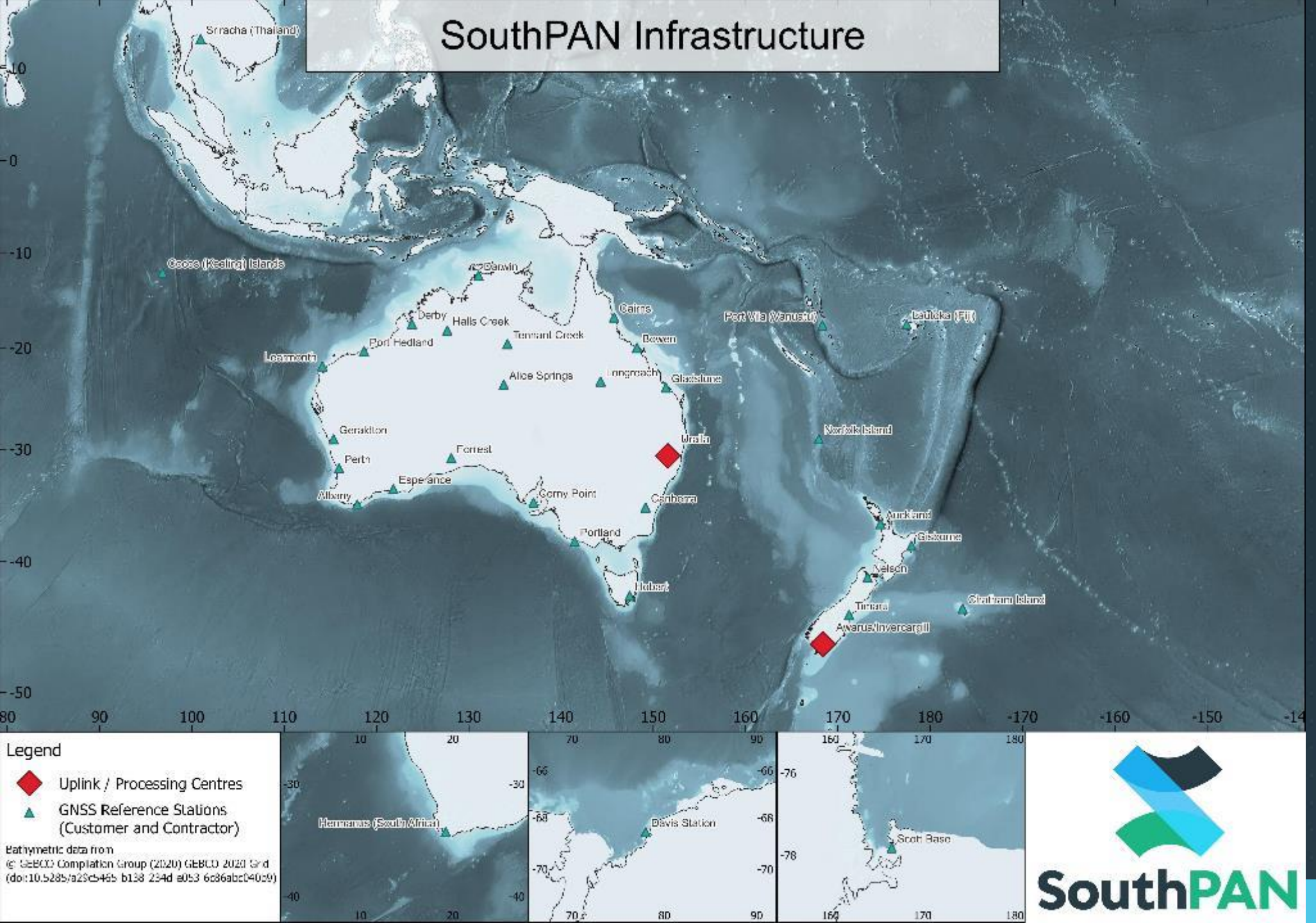
SouthPAN Infrastructure



Legend

- Uplink / Processing Centres
- GNSS Reference Stations (Customer and Contractor)

Bathymetric data from
© GEBCO Compilation Group (2020) GEBCO 2020 Grid
(doi:10.5285/a29c5465-b138-234d-e053-6c86abc040b9)

SouthPAN

SouthPAN

Program schedule

- During the Initial Operating Capability (IOC), services are incrementally improved as infrastructure is deployed. Some disruption may occur due to integration & test activities—check GA and LINZ websites for notifications.
  - IOC-99.5 indicates service availability of 99.5%.

- During the Final Operating Capability (FOC) phase, services will be high performing and stable.

Q3 2022

Commencement of early services using existing infrastructure.
Open services only.

Early 2024

IOC-99.5

Additional infrastructure will be integrated into the SouthPAN system, improving accuracy and availability.
Open services only.

Late 2026

IOC-99.9

Additional infrastructure will be integrated into the SouthPAN system, improving accuracy and availability.
Open services only.

Late 2027

Introduction of new navigation signal

A new satellite will include functionality for a new navigation signal on 1207.14 MHz, which will be used for the PVS service.
Open services only.

Early 2028

IOC-99.9 with safety-of-life services

Following a safety assessment, SouthPAN will be certified for use in safety-of-life applications.
Open services and safety-of-life services.

Late 2028

FOC

The final satellite will be integrated into the SouthPAN system, providing the maximum level of service availability.
Open services and safety-of-life services.

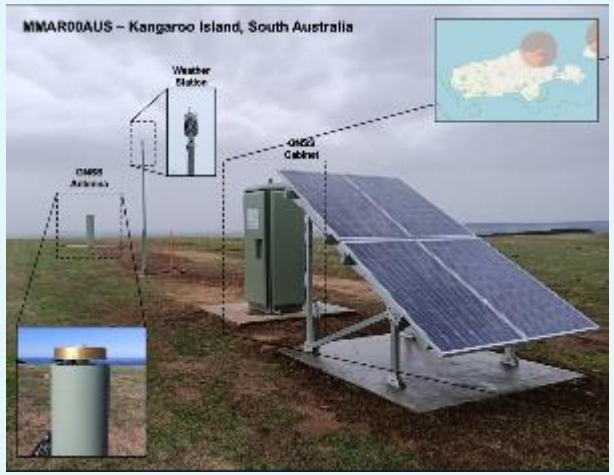
Progress

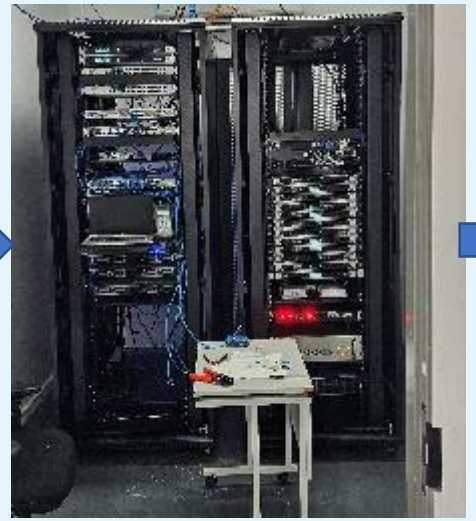
- Program
  - System Preliminary Design Review completed 13 February 2023
  - 34/35 reference station site surveys complete ahead of civil works in 2025
  - System CDR scheduled for 4Q 2024
  - Safety algorithms undergoing validation prior to software development

- Service delivery
  - Initial Operating Capability (IOC) 95% phase commenced 26 September 2022 and ended 14 March 2024—all service Key Performance Indicators were exceeded.
  - IOC 99.5% cutover completed on 14 March 2024—improved availability, comparable accuracy.
  - SouthPAN Data Access Services commissioned December 2023 (‘SiSNET-like’) to provide L1 SBAS, DFMC SBAS, and PVS SIS over the internet.

Ground segment

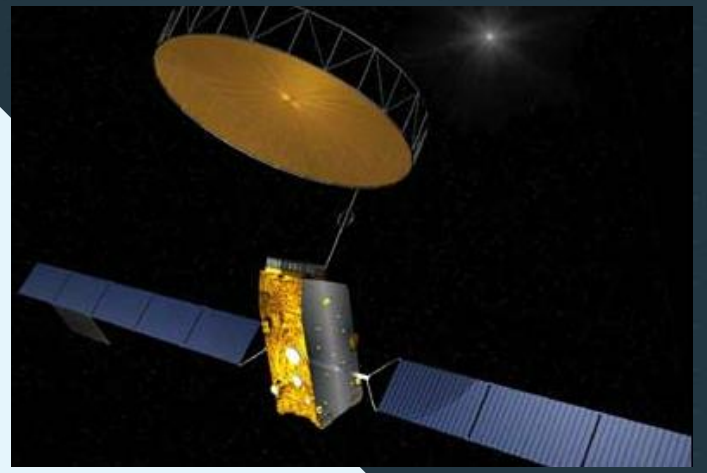
- ‘Build 1’ SouthPAN configuration uses existing infrastructure to provide Open Services with a base level of performance.
- 62 of Aus/NZ ~600 Continuously Operating Reference Stations
- Prototype software and hardware for corrections processing and message generation
- Novatel navigation signal generator for L1 and L5
- Redundant uplink centres in New South Wales, Australia and Invercargill, New Zealand





Space segment: SouthPAN GEO Payloads

- SGP-00:
  - Inmarsat transferred 4F2 into 143.5 East
  - Transition of services completed 20 November 2023
- SGP-01:
  - Contract awarded to Inmarsat Australia on 1 May 2023 for the first new satellite (3 navigation signals L1/L5/L5b)
  - Navigation payload PDR completed 25 January 2024
  - SGP-01 will be commissioned in late 2027
- SGP-02:
  - Request For Tender closed 25 January 2024
  - SGP-02 is planned to be commissioned in late 2028
- PRN code 122 renewed on 11 January 2023 (Inmarsat 4F2)
- PRN code 124 acquired on 13 April 2024 (Inmarsat 4F1)



SGP-00

SGP-01

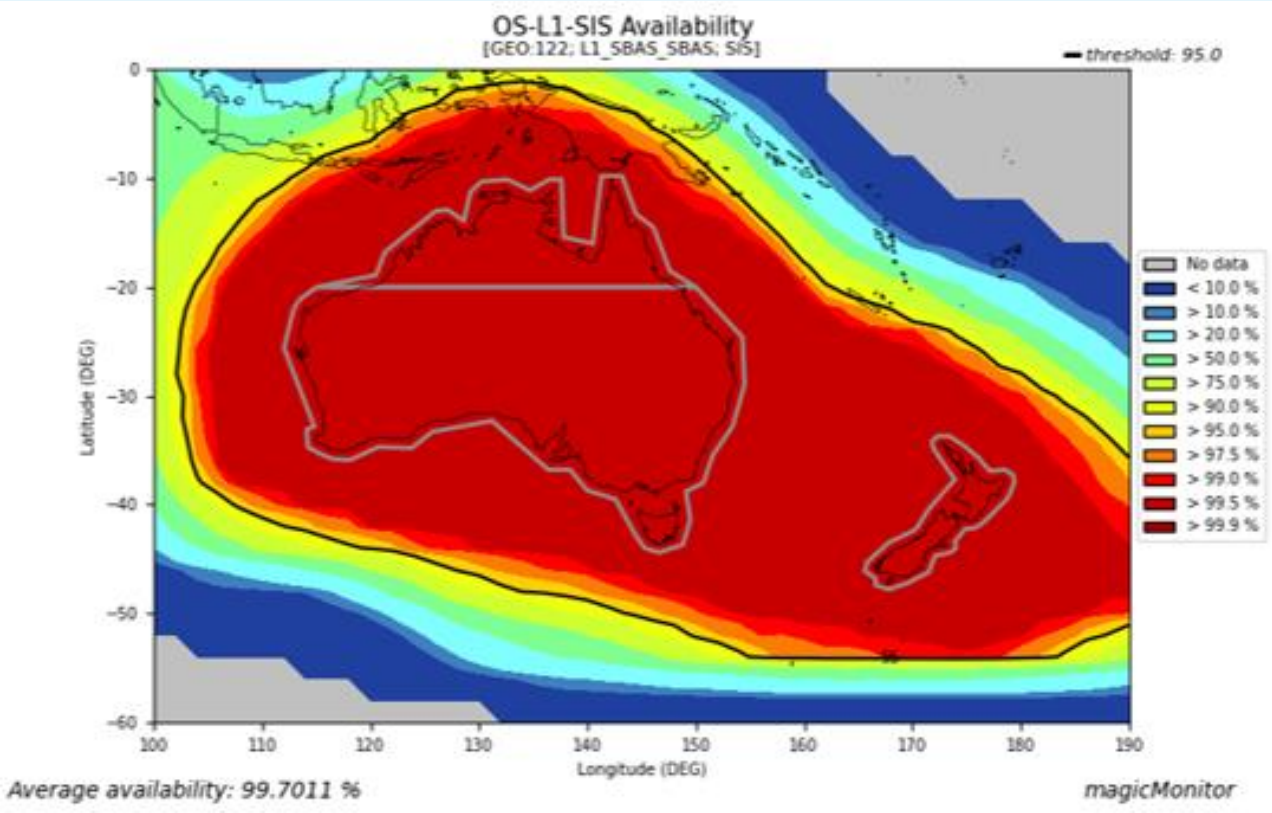
User segment

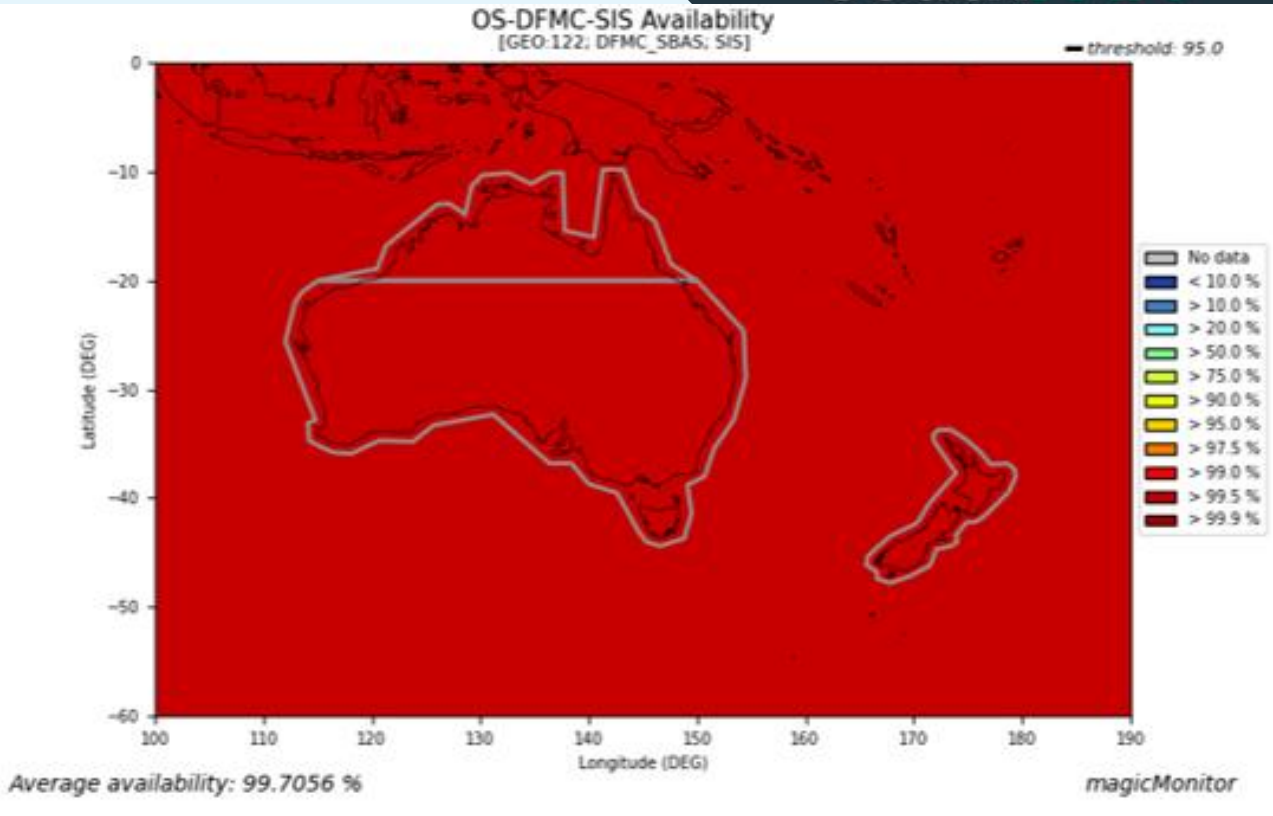
- L1 SBAS Signal-in-Space (SIS):
  - Useable by any RTCA DO-229E-compliant receiver (non-SOL)
- DFMC SBAS SIS:
  - Useable by any RTCA DO-401 / EUROCAE ED-259A compliant receiver (non-SOL)
- PVS SIS:
  - Useable by any receiver that can decode L5 SIS and process message protocol defined in the SouthPAN SIS Open Service Definition Document (SBAS-STN-0001)
- SDAS:
  - Useable by any software that can interface with Geoscience Australia's caster in accordance with DAS Service Definition Document (SBAS-STN-0002)

Report card Sep-22 thru Mar-24 (IOC-95)

Service	Metric	Target	Actual
OS-L1-SIS	L1 navigation signal availability (%)	95.000	99.971
OS-L1-SIS	HPE (m) (worst)	3.0	2.9
OS-L1-SIS	VPE (m) (worst)	4.0	2.6
OS-L1-SIS	L1 SBAS open service availability (%)	90.000	99.843
OS-DFMC-SIS	L5 navigation signal availability (%)	95.000	99.969
OS-DFMC-SIS	HPE (m) (worst)	1.5	1.3
OS-DFMC-SIS	VPE (m) (worst)	2.5	2.2
OS-DFMC-SIS	DFMC SBAS open service availability (%)	90.000	99.727
OS-PVS-SIS	L5 navigation signal availability (%)	95.000	99.969
OS-PVS-SIS	HPE (m) (worst)	0.375	0.160
OS-PVS-SIS	VPE (m) (worst)	0.525	0.250
OS-PVS-SIS	Convergence time (min)	80	76.27
OS-PVS-SIS	PVS open service availability (%)	90.000	99.727

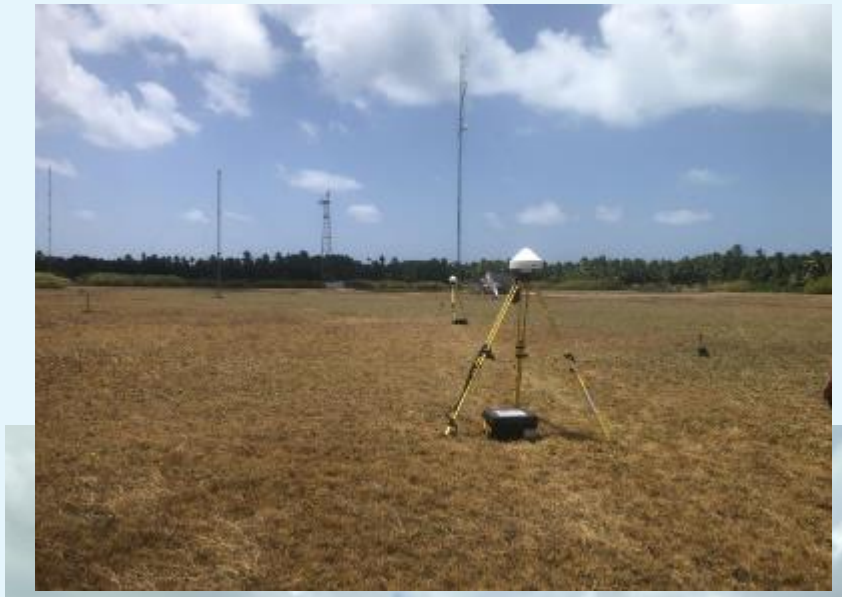
Coverage plot



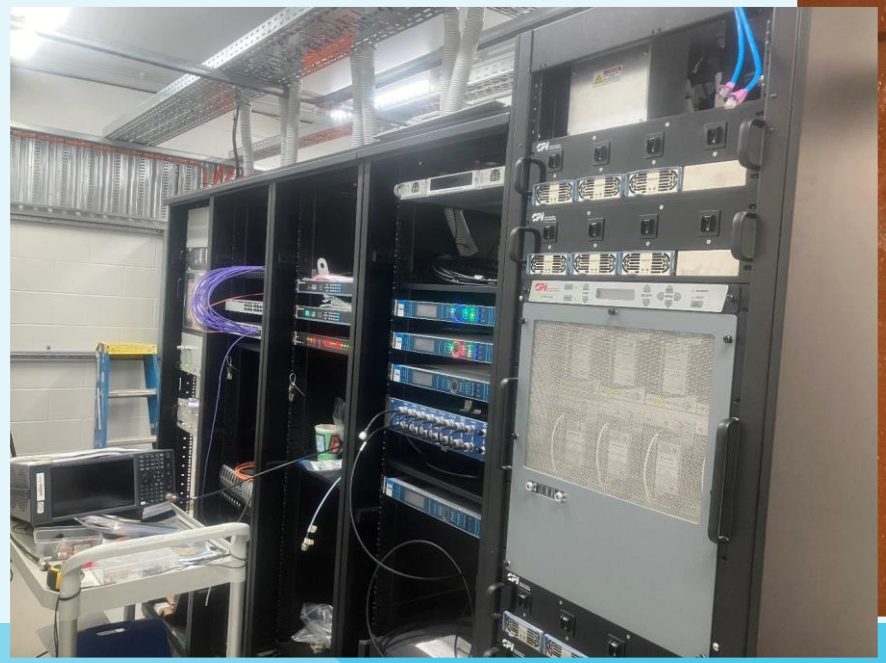


THE OPEN SERVICE HAS NO INTEGRITY AND THIS IS NOT REPRESENTATIVE OF THE AVIATION SERVICE, particularly in the north

Build phase



Build phase



Useful information and contact details

- Contact details:
  - clientservices@ga.gov.au
  - southpan@linz.govt.nz

- Informational websites (including SouthPAN Service Definition Documents):
  - www.ga.gov.au/southpan
  - www.linz.govt.nz/southpan