SouthPAN

Southern Positioning Augmentation Network
Resilience through innovation in spectrum

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Geoscience Australia Strategy 2028

Positioning Australia:
10cm positioning across Australia,
and 3-5cm in areas of mobile coverage

Building Australia's resources wealth

Supporting Australia's community safety

Securing Australia's water resources

Managing Australia's marine jurisdictions

Enabling an informed Australia

Ensuring a high performing organisation

Creating a location-enabled Australia

Positioning Australia @ GA

Accurate and Reliable Positioning for Everyone

SouthPAN

- Lead and coordinate a whole-of-Government positioning capability
- Lead and strengthen governance of positioning in Australia, by coordinating;
  - geodesy and positioning standards,
  - capabilities,
  - advice, and
  - information in national and international forums;
- Be the national authority on position verification;
- Sustain and improve the Australian Geospatial Reference System; and
- Deliver and enable access to precise positioning information that is reliable, accurate, nationally consistent and openly accessible.

GNSS –

doesn't work without Spectrum Allocation

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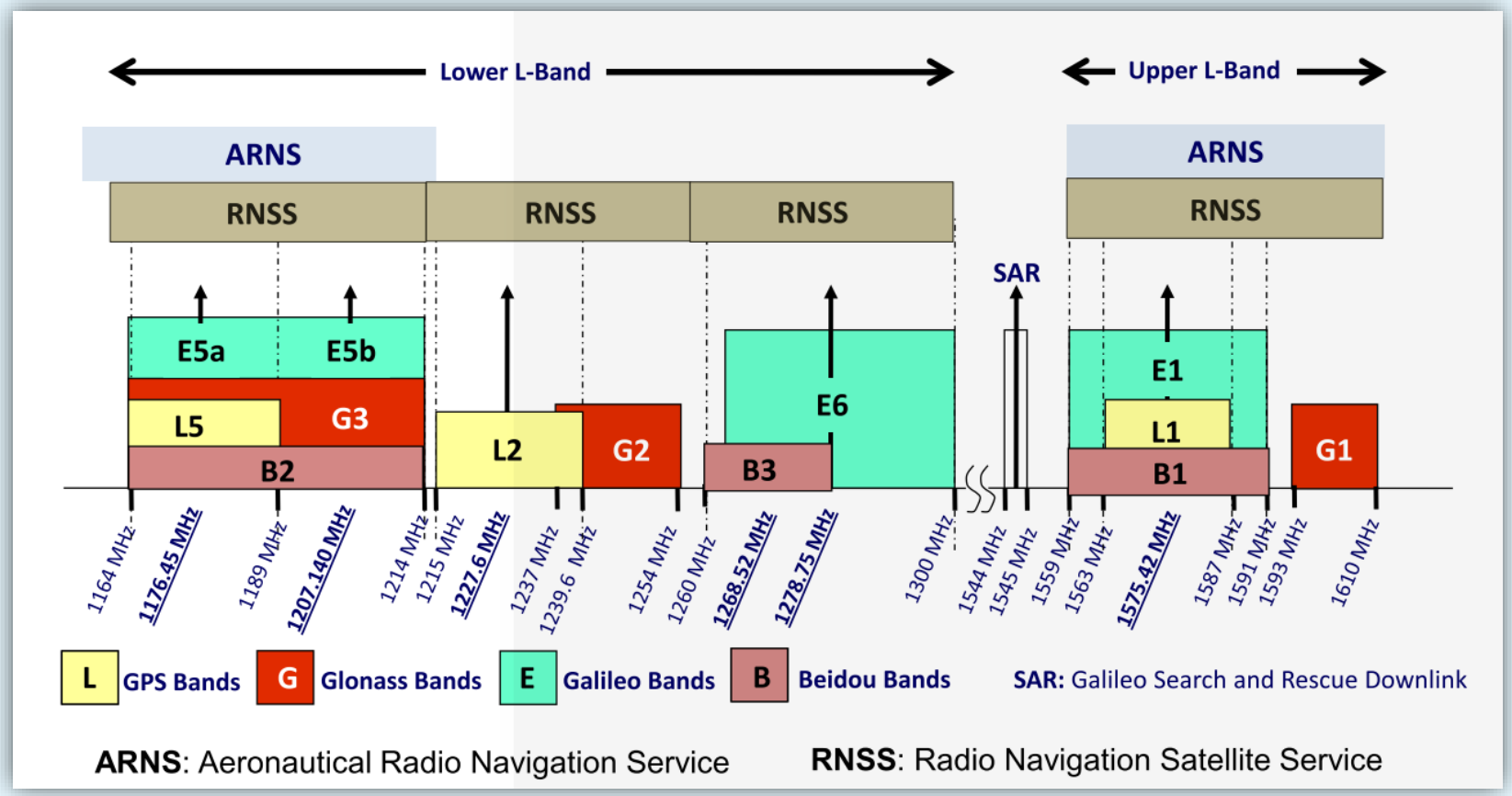
GNSS Frequency Bands



Satellite Based Augmentation Systems (SBAS)

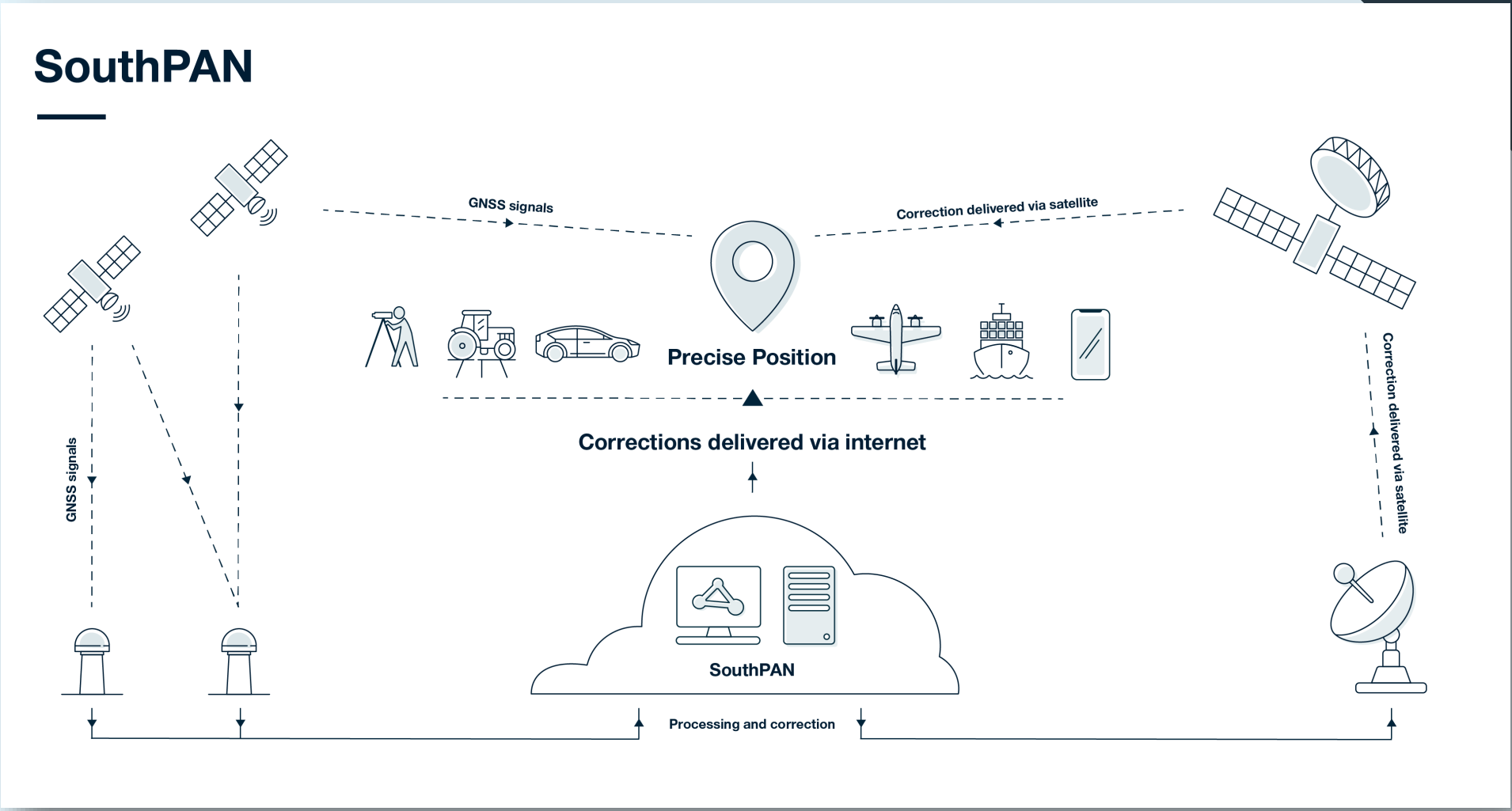
- Standalone GNSS is not sufficient for safety critical applications;
  - Insufficient accuracy
  - Can not be relied on for safety-of-life applications
- SBAS is proven, internationally accepted solution.
- Most countries already have or are implementing SBAS services.

What is SouthPAN?
Southern Positioning Augmentation Network

- A Joint service delivered by Geoscience Australia and Toitū Te Whenua Land Information New Zealand.
- Improve and augment the accuracy, integrity and availability of GNSS in Australia and New Zealand.
- Benefit all users of satellite positioning, particularly in remote areas without mobile phone coverage.
- Designed as safety-of-life service to provide best interoperability with other SBAS (frequency, PRN etc.)
- A network of ground-based reference stations, processing centres and uplink facilities
- Satellite broadcast capability on two satellites (SGP-01 & SGP-02)

Photo: The Inmarsat 4F1 satellite is being used to provide SouthPAN early Open Services until its replacement with two new satellites.

How does SouthPAN work?



SouthPAN benefits

- EY was engaged by FrontierSI to provide an independent assessment of the economic benefits of Satellite-Based Augmented Systems across Australia and New Zealand. The basis for this assessment was SouthPAN's SBAS test-bed demonstrator project that ran from 2017 to 2019 across 10 industry sectors through 27 demonstrator projects.

- SouthPAN's SBAS test-bed demonstrator project, that was delivered in June 2019, found that the present value across all industry sectors is anticipated to be **$7.6b for Australia and New Zealand**, with **Australia alone expecting $6.2b of benefits**. According to the trial, key industries that will benefit economically include:

    - Agriculture ($2.2b)
    - Resources ($1.6b)
    - Construction ($1.2b)
    - Road ($1.1b)

SBAS beneficiaries

Geospatial Applications

- Mapping applications
- Rural cadastral surveys
- Accurate data collection in remote regions.

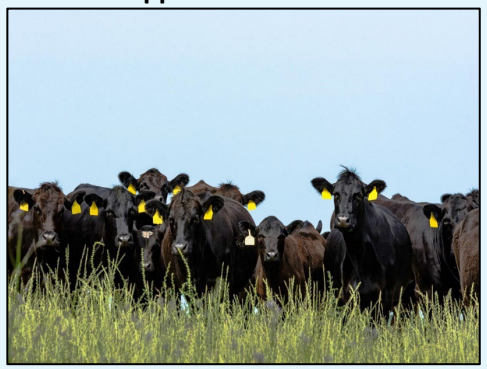
Road Applications

- Automated driving
- Cooperative Intelligent Transport Systems
- 3D digital mapping
- Regulatory vehicle speed determination
- Real-time road pricing

Aviation Applications

- Approach procedures with vertical guidance (APV)
- Helicopter procedures
- Availability of Instrument Flight Procedures (IPF)

Livestock Applications

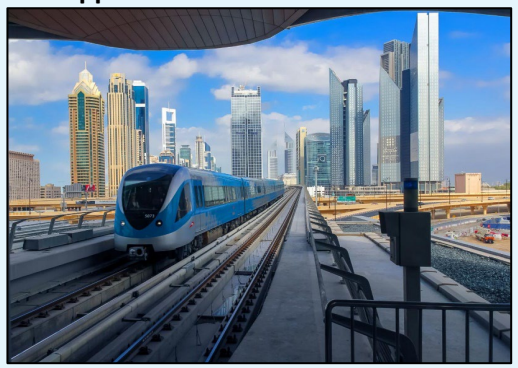


- Virtual fencing for strip grazing
- Behaviour modelling to enable disease detection
- Quantification of reproductive relationships
- Herd dynamics
- Tracking feeding zones for pasture management

Maritime Applications

- Safer navigation
- Tracking container movements

Rail Applications



- Advanced train management systems
- Track surveys
- Track worker and track vehicle safety systems

SouthPAN Early Open Services

L1 SBAS Open Service (TX L1 frequency)

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

DFMC SBAS Open Service (TX L5 frequency)

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

PPP via SouthPAN (TX L5 frequency)

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

1. Early Open Service performance will improve as SouthPAN is deployed
2. Safety-of-Life Services are in development, expected 2028


Service Definition Document for Open Services

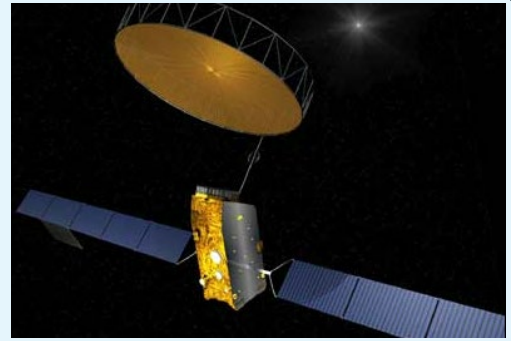
Project: Southern Positioning Augmentation Network

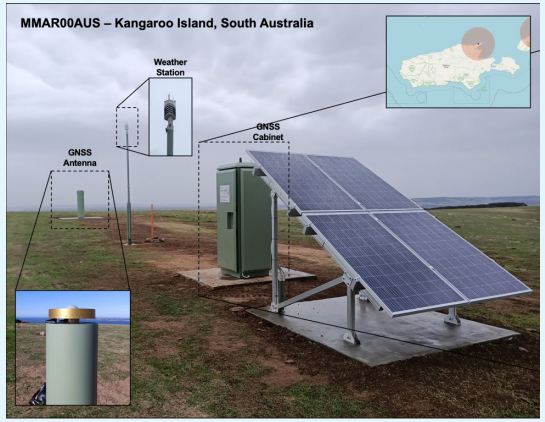
Effective Date:	14 September 2022
Document Code:	SBAS-STN-0001
Classification (AU)	OFFICIAL
Classification (NZ)	UNCLASSIFIED
Record ID (AU):	D2022-51289
Record ID (NZ):	A5013157
Revision No.:	01

More detail is available in the SouthPAN Service Definition Document for Open Services.

Future Development

- System design: Critical Design Review in 2024
- 35 ground stations constructed
- 2 uplink centres in Australia and New Zealand
- 2 new SouthPAN GEO Payloads
- New navigation signal on 1,207.14 MHz





Future Milestones

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Q3 2022

Initial Operating Capability 95

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

Early 2024 (Indicative)

Initial Operating Capability 99.5

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

Late 2026 (Indicative)

Initial Operating Capability 99.9

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

Late 2027 (Indicative)

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 (Indicative)

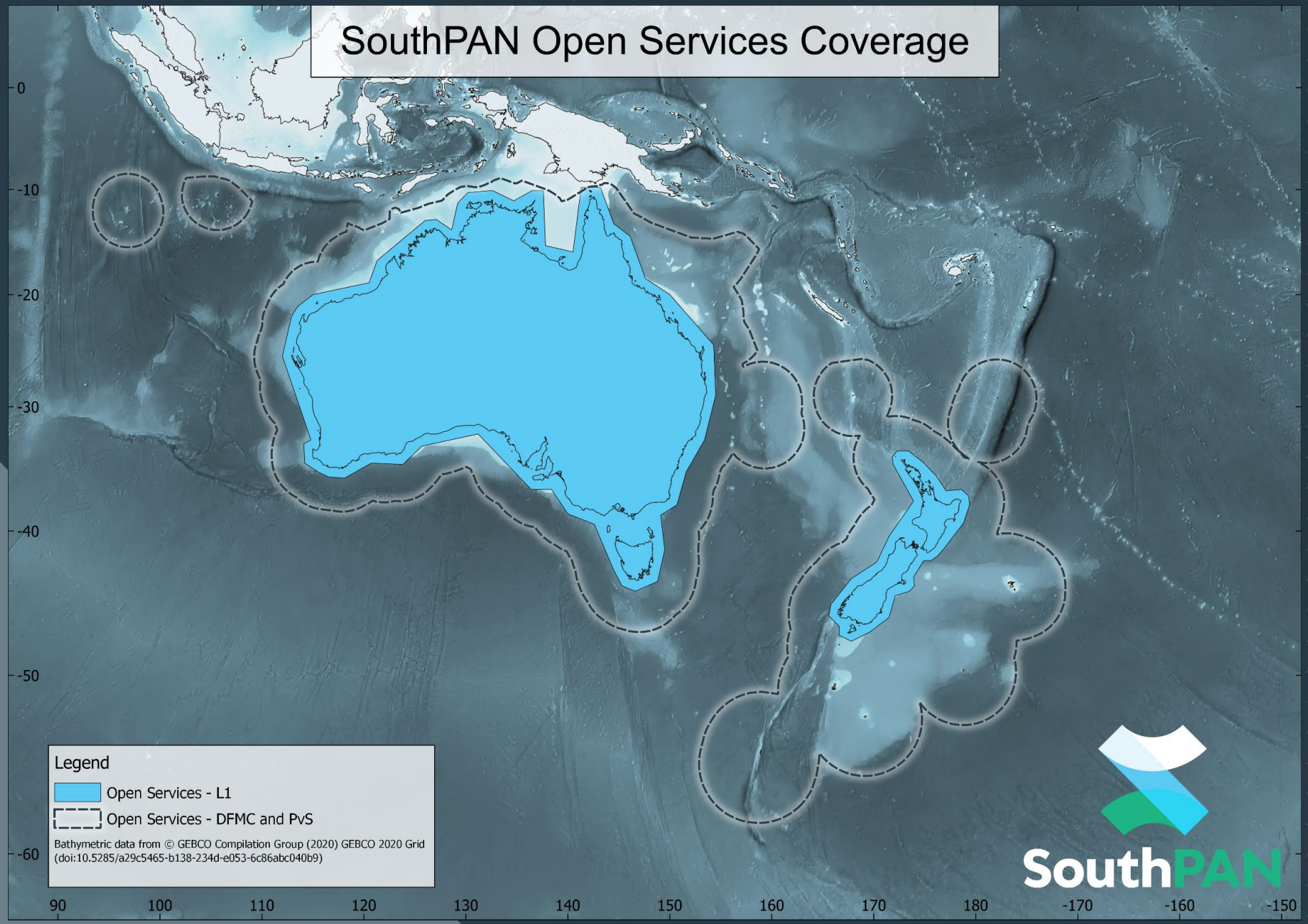
Initial Operating Capability 99.9 with safety-of-life services

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

Late 2028 (Indicative)

Full Operating Capability

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


SouthPAN Open Services Coverage
0
-10
-20
-30
-40
-50
-60
90
100
110
120
130
140
150
160
170
180
-170
-160
-150
Legend
Open Services - L1
Open Services - DFMC and PvS
Bathymetric data from © GEBCO Compilation Group (2020) GEBCO 2020 Grid
(doi:10.5285/a29c5465-b138-234d-e053-6c86abc040b9)
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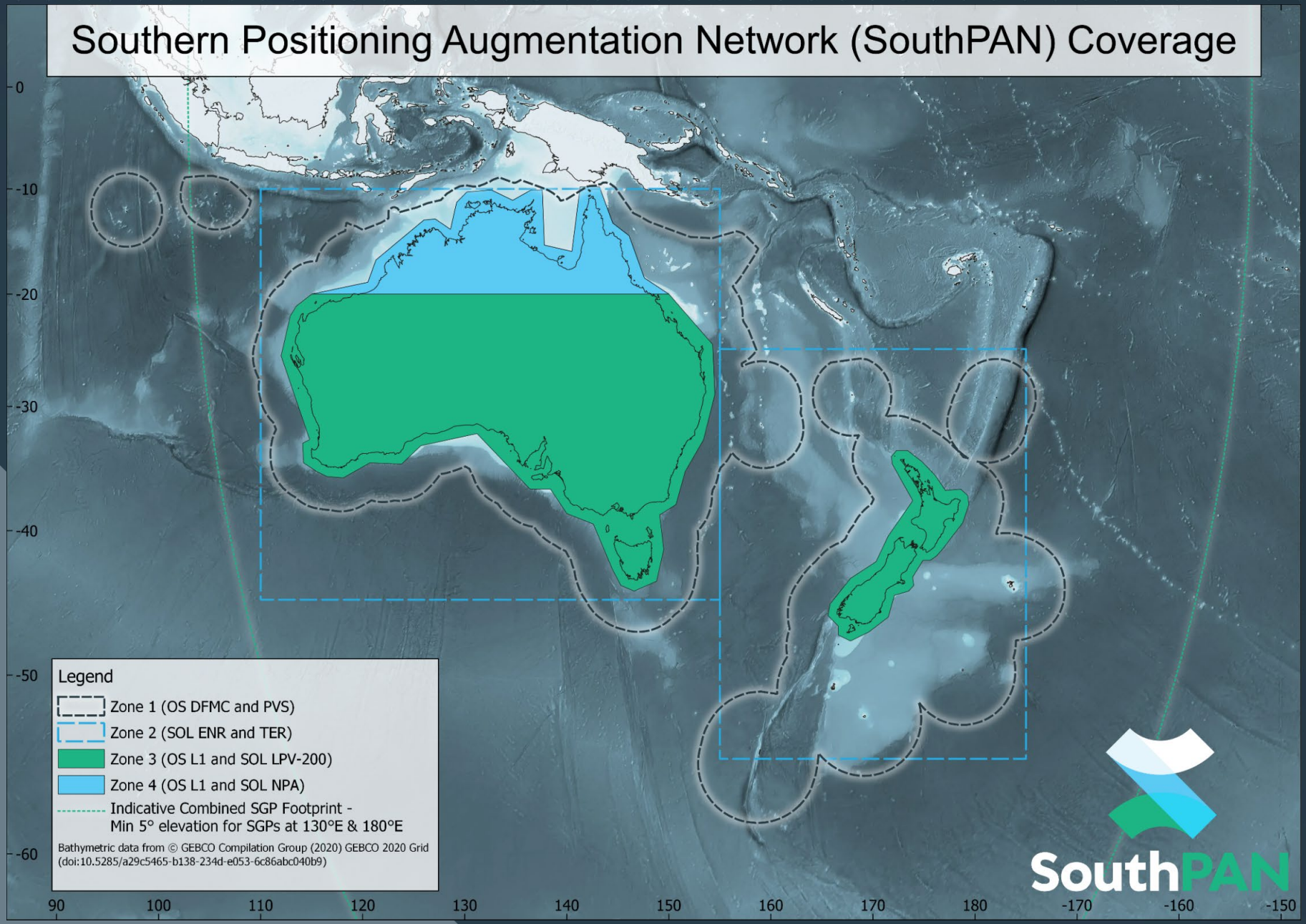
Southern Positioning Augmentation Network (SouthPAN) Coverage



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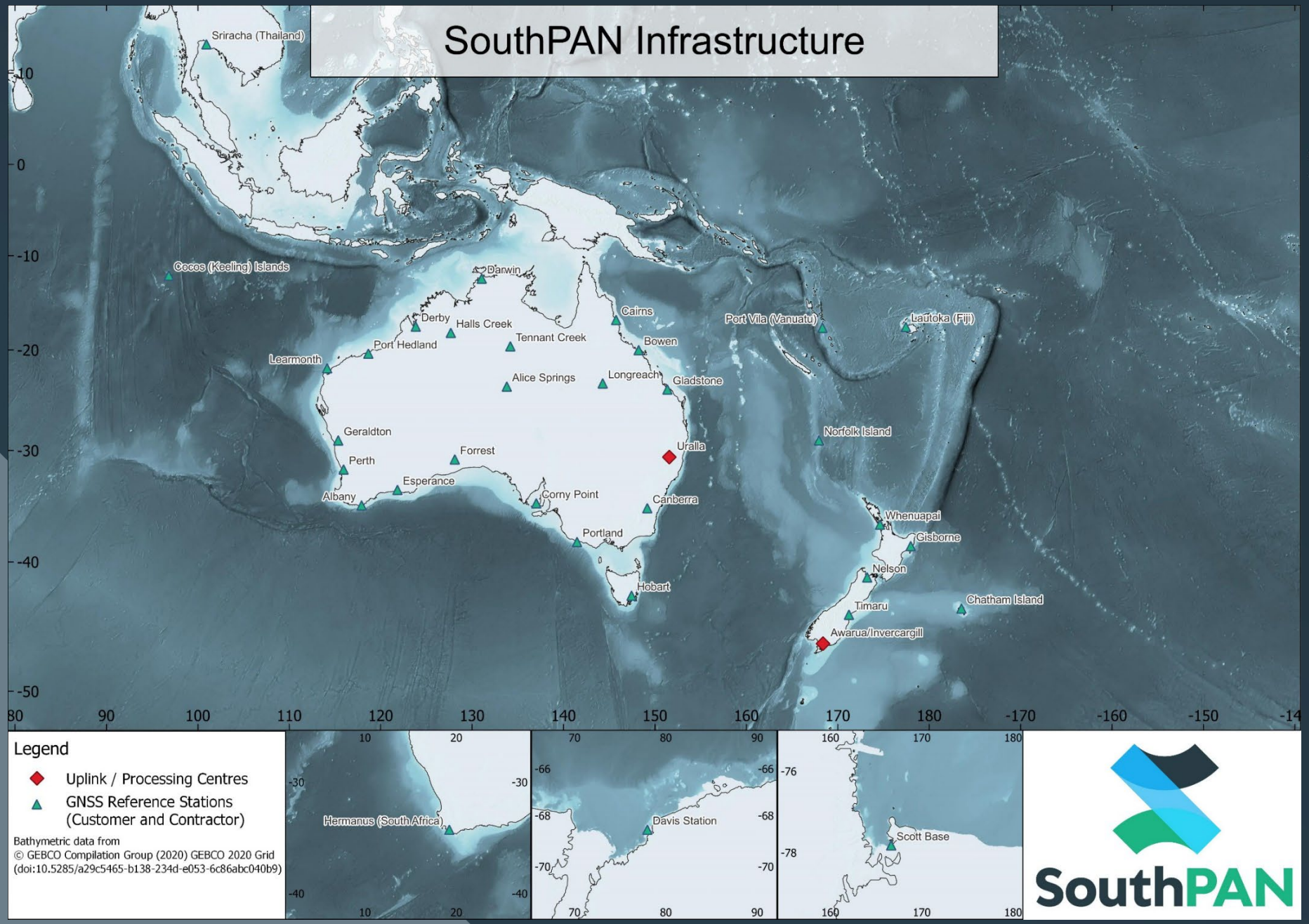
SouthPAN Infrastructure
Sriracha (Thailand)
Cocos (Keeling) Islands
Darwin
Derby
Halls Creek
Port Hedland
Learmonth
Tennant Creek
Alice Springs
Cairns
Bowen
Longreach
Gladstone
Port Vila (Vanuatu)
Lautoka (Fiji)
Norfolk Island
Geraldton
Perth
Forrest
Esperance
Albany
Corny Point
Uralla
Canberra
Portland
Hobart
Whenuapai
Gisborne
Nelson
Timaru
Awarua/Invercargill
Chatham Island
Hermanus (South Africa)
Davis Station
Scott Base
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)
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Service definition document available on above websites