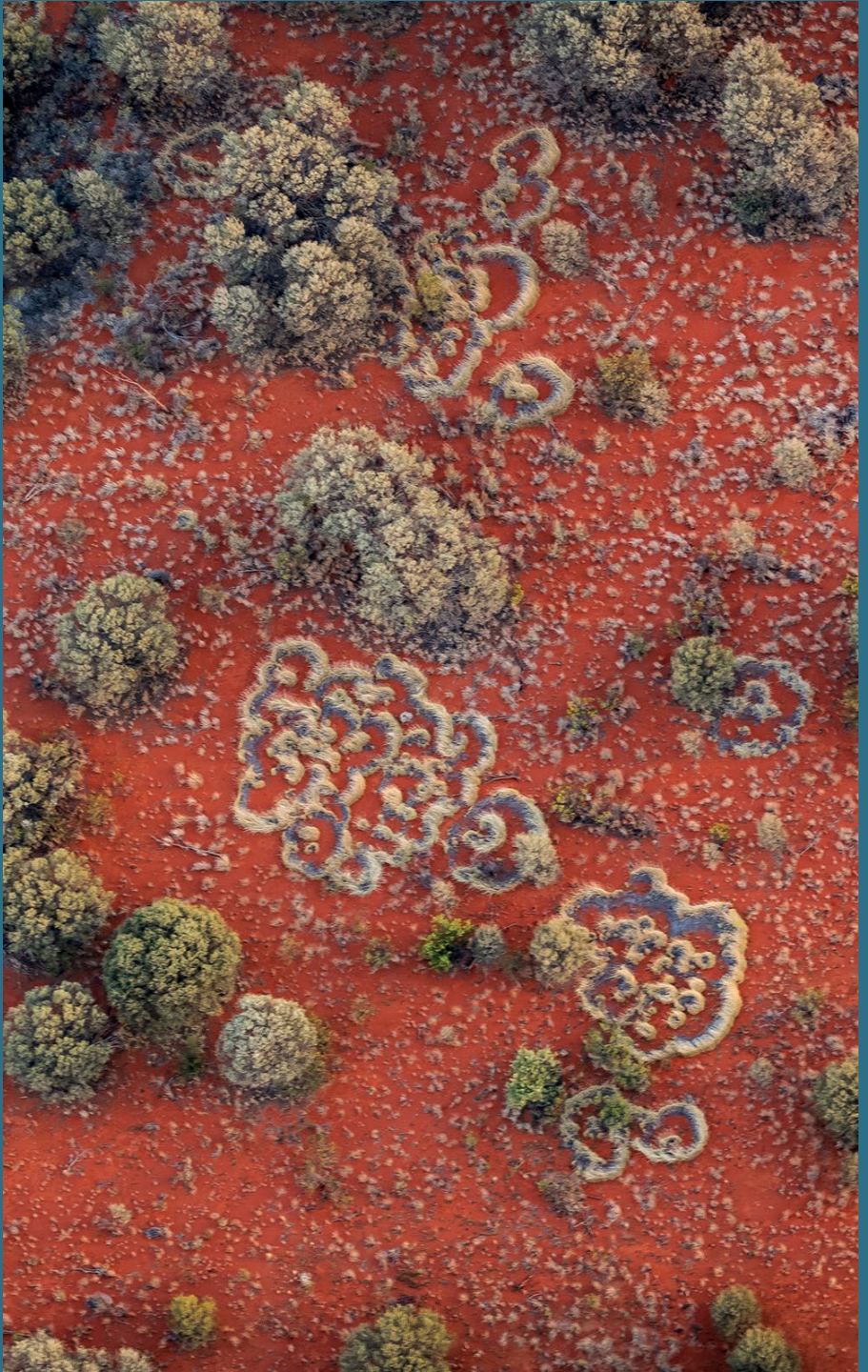


Australian Government
Geoscience Australia

Positioning Australia

Building the case for investment in geodesy in the Australian Government

Dr Martine Woolf, Branch Head Positioning Australia

Space Division, Geoscience Australia

Positioning Australia

Since 2018/19 Australian Government has invested additional funding (more than $84.6m p.a.) ongoing, to the geodesy supply chain through:

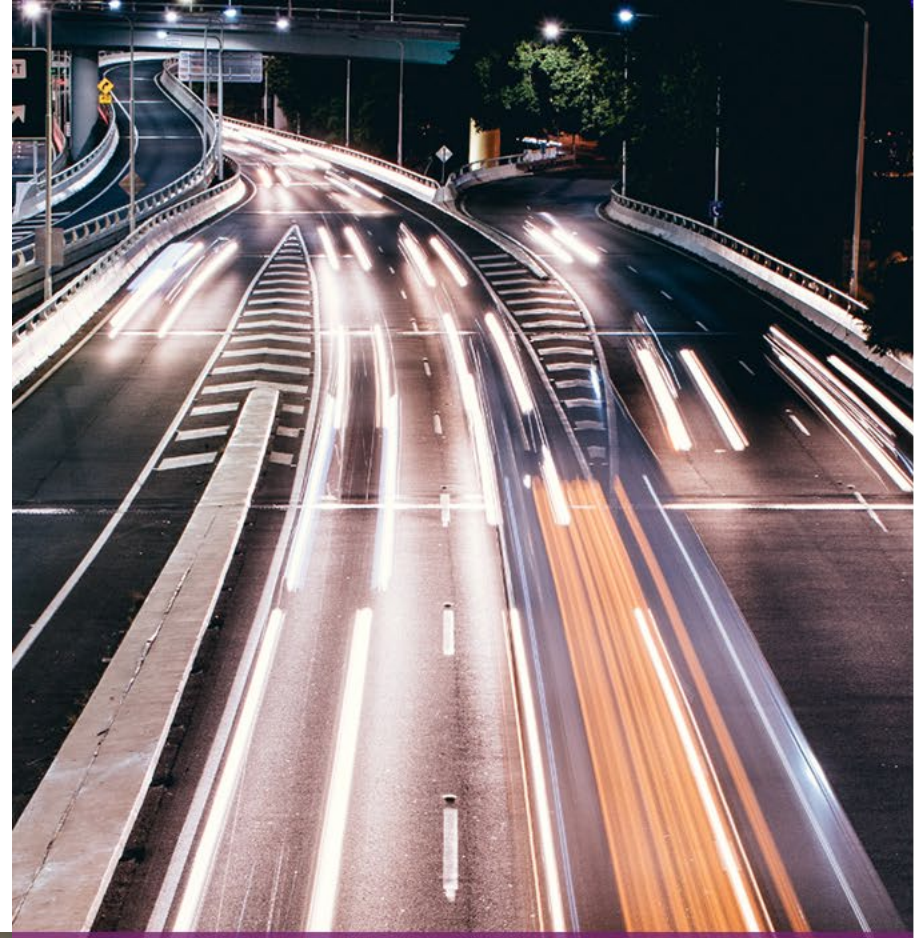
- ✓ Upgrade and expansion of a national-scale high quality GNSS Infrastructure, with over 700 stations across the country;
- ✓ Very Long Baseline Interferometry infrastructure and operations;
- ✓ Satellite Laser Ranging infrastructure and operations;
- ✓ Development of an innovative multi-GNSS analytical capability;
- ✓ Operational data facilities, delivering FAIR geodesy data

How was the business case made?

PARK00AUS – Parkes, New South Wales

Context: Geoscience Australia

- Australian Government lead for position and navigation
- Operate world-class geodetic infrastructure and applied geoscience research
- Engagement with international positioning and geodesy communities on data and standards
- Provides analytic capability and trusted platforms
- Deliver precise positioning services that are reliable, accurate, nationally consistent, and openly accessible



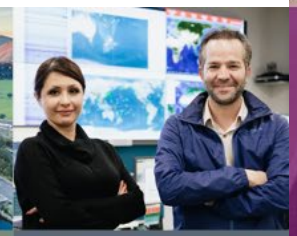
Building Australia's resources wealth

Supporting Australia's community safety

Securing Australia's water resources

Managing Australia's marine jurisdictions

Enabling an informed Australia

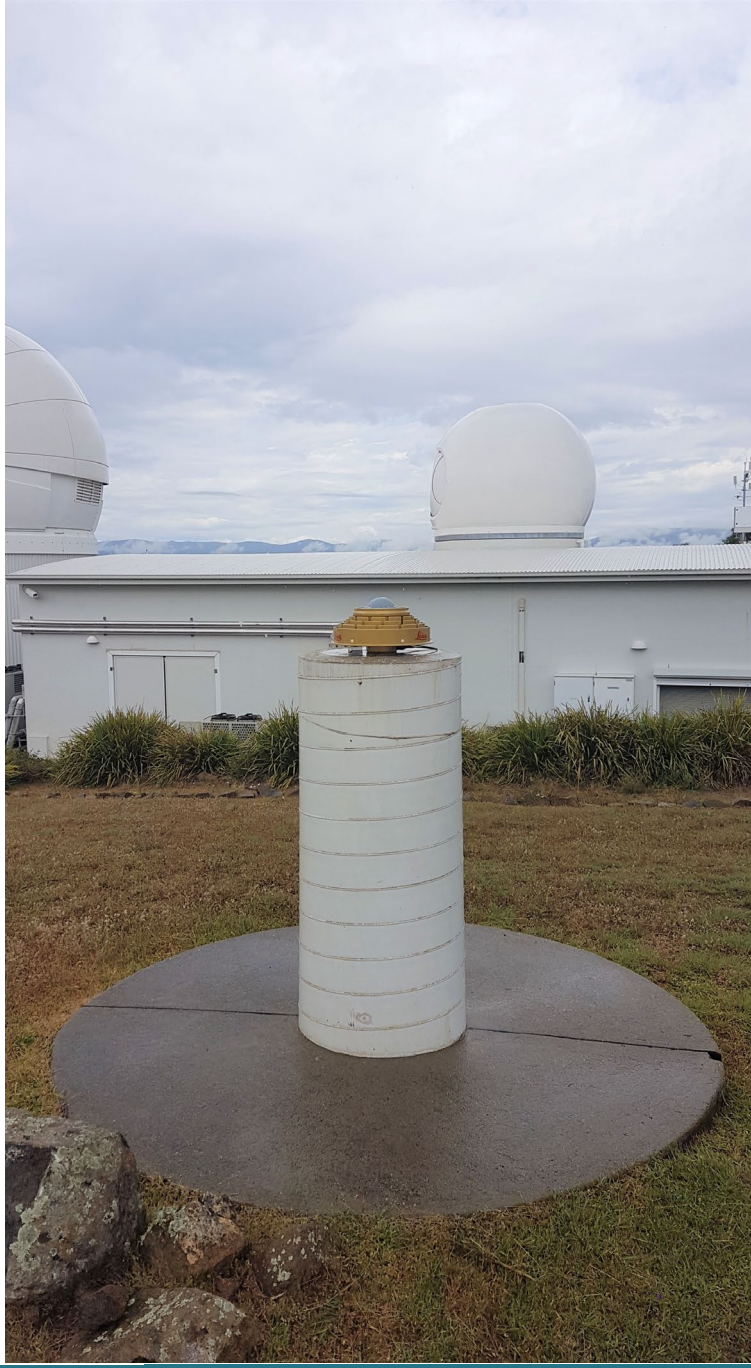


Ensuring a high performing organisation

Creating a location-enabled Australia

Business case

- ✓ Simple, consistent narrative, no jargon
- ✓ Stated in terms of strategic impacts:
  - ✓ Politically strategic: thinking outside our box
  - ✓ Find the baubles
  - ✓ Spoke to domestic stakeholders
- ✓ Built evidence-base
- ✓ Return On Investment
- ✓ Built stakeholder support across governments, industry, academia
- ✓ Who does what?
  - ✓ Academic vs government funding
  - ✓ Industry partnerships
  - ✓ Working governance structures & networks
- ✓ Keeping time: Slow, slow, quick-quick slow…



STR200AUS – Mount Stromlo, Australian Capital Territory

Business case

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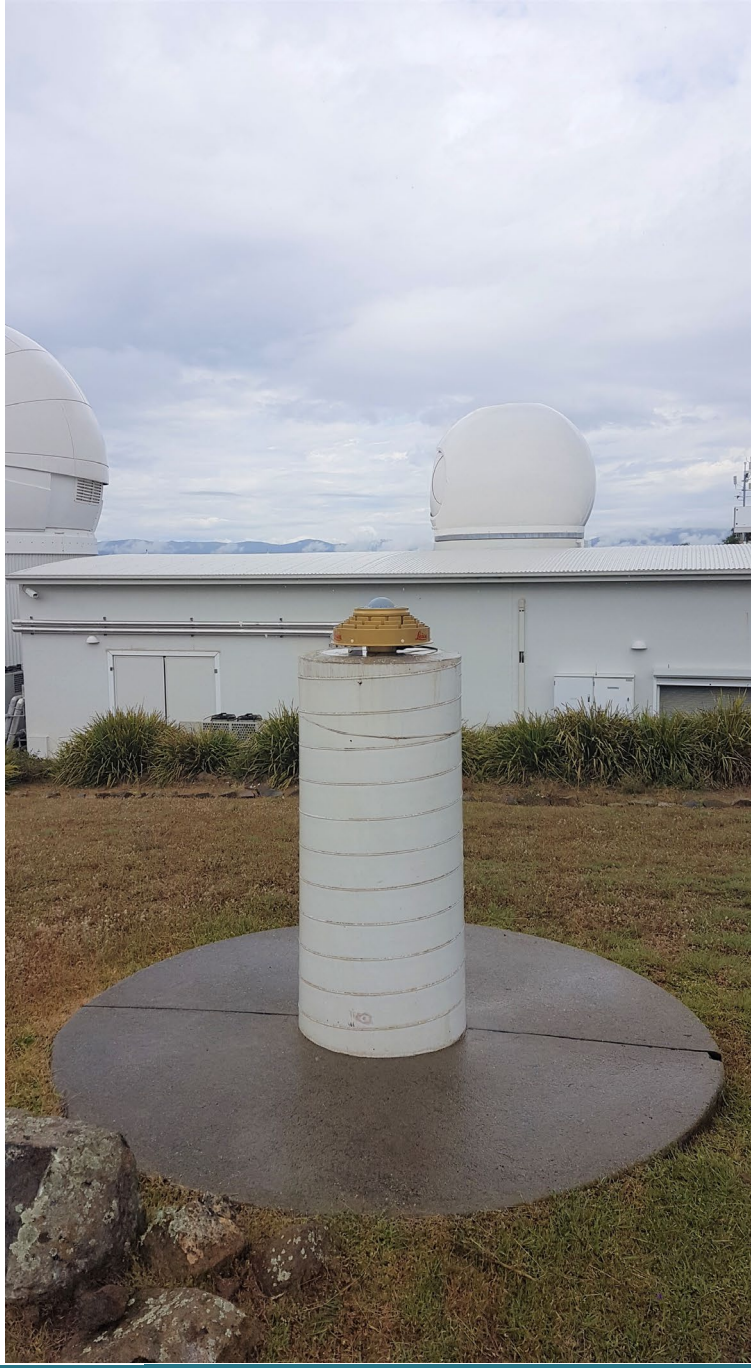

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How was the business case made?

PARK00AUS – Parkes, New South Wales

Australian Government
Geoscience Australia

Positioning Australia

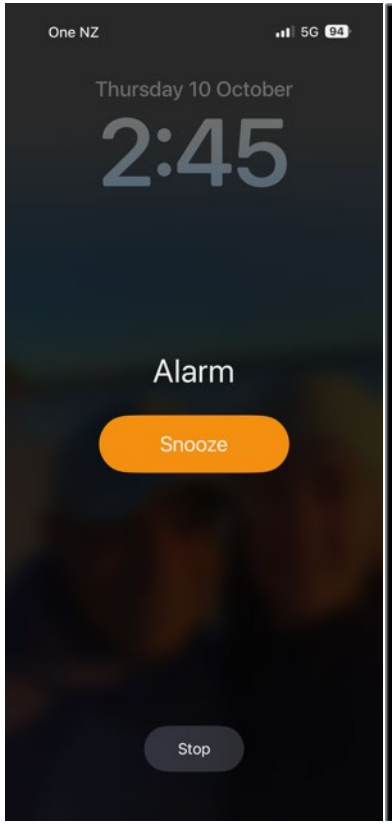
Accurate and reliable positioning for everyone

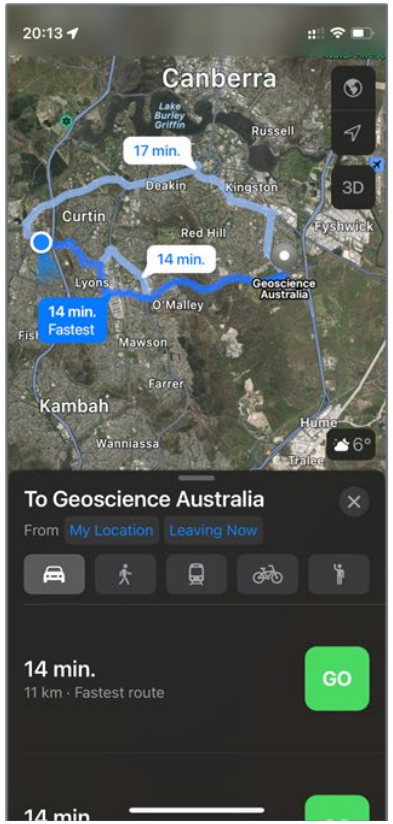
The allocation of **$83.6 million p.a. ongoing funding** to Geoscience Australia to establish a world-class satellite positioning capability.

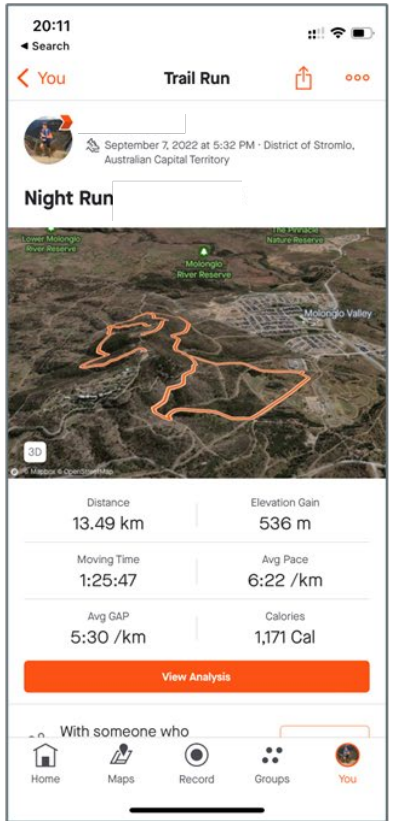
1. **Better GPS for regional Australia**
   - as little as 10 cm accurate positioning service across Australia
   - high integrity for safety-of-life applications

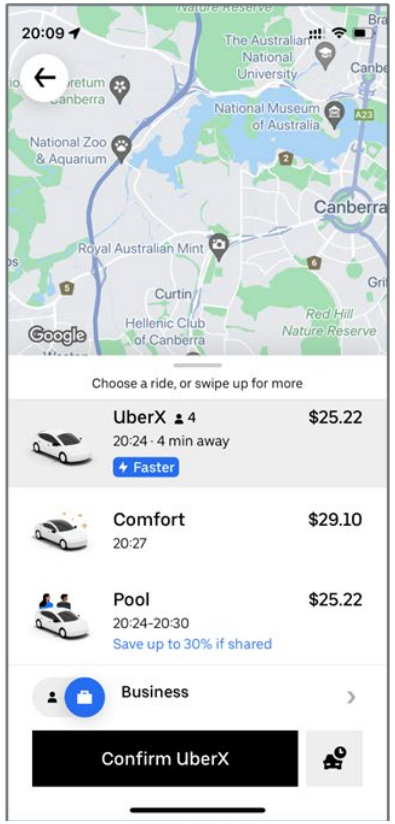
2. **Better GPS to support Australian businesses**
   - a 3-5 cm accurate positioning capability in areas with mobile coverage
   - open-source tools and software to deliver positioning services

How have you used positioning, navigation and timing today?









PNT in the city:

- ✓ Electricity networks
- ✓ Banking system

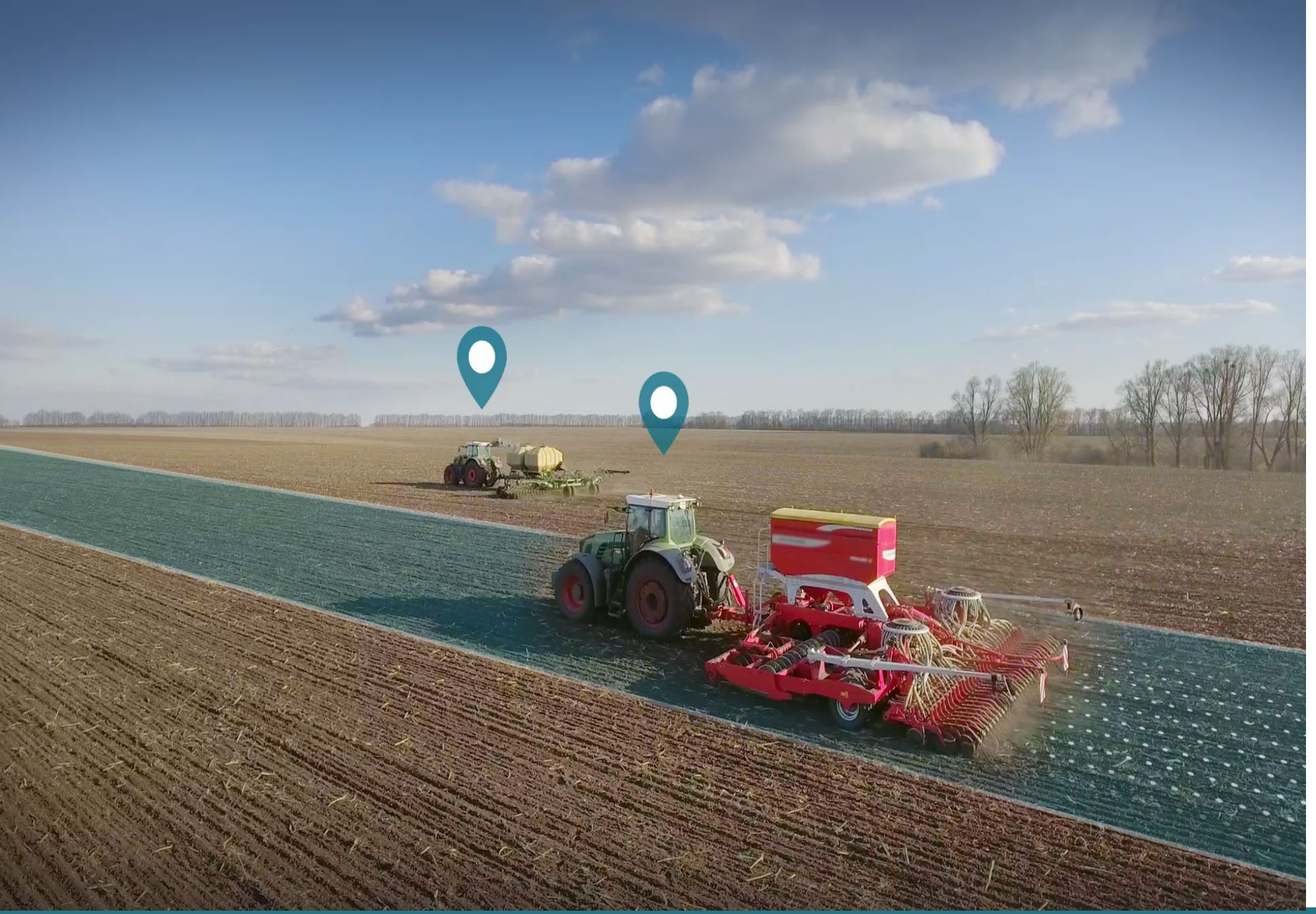
- ✓ Intelligent transport
- ✓ Traffic lights
- ✓ Toll roads

- ✓ Supermarket logistics
- ✓ Just in time supply chains
- ✓ Parcel delivery

- ✓ Cadastral systems
- ✓ Building and construction
- ✓ Dial-before-you-dig

- ✓ Uber and taxi
- ✓ Aviation
- ✓ Electric scooters

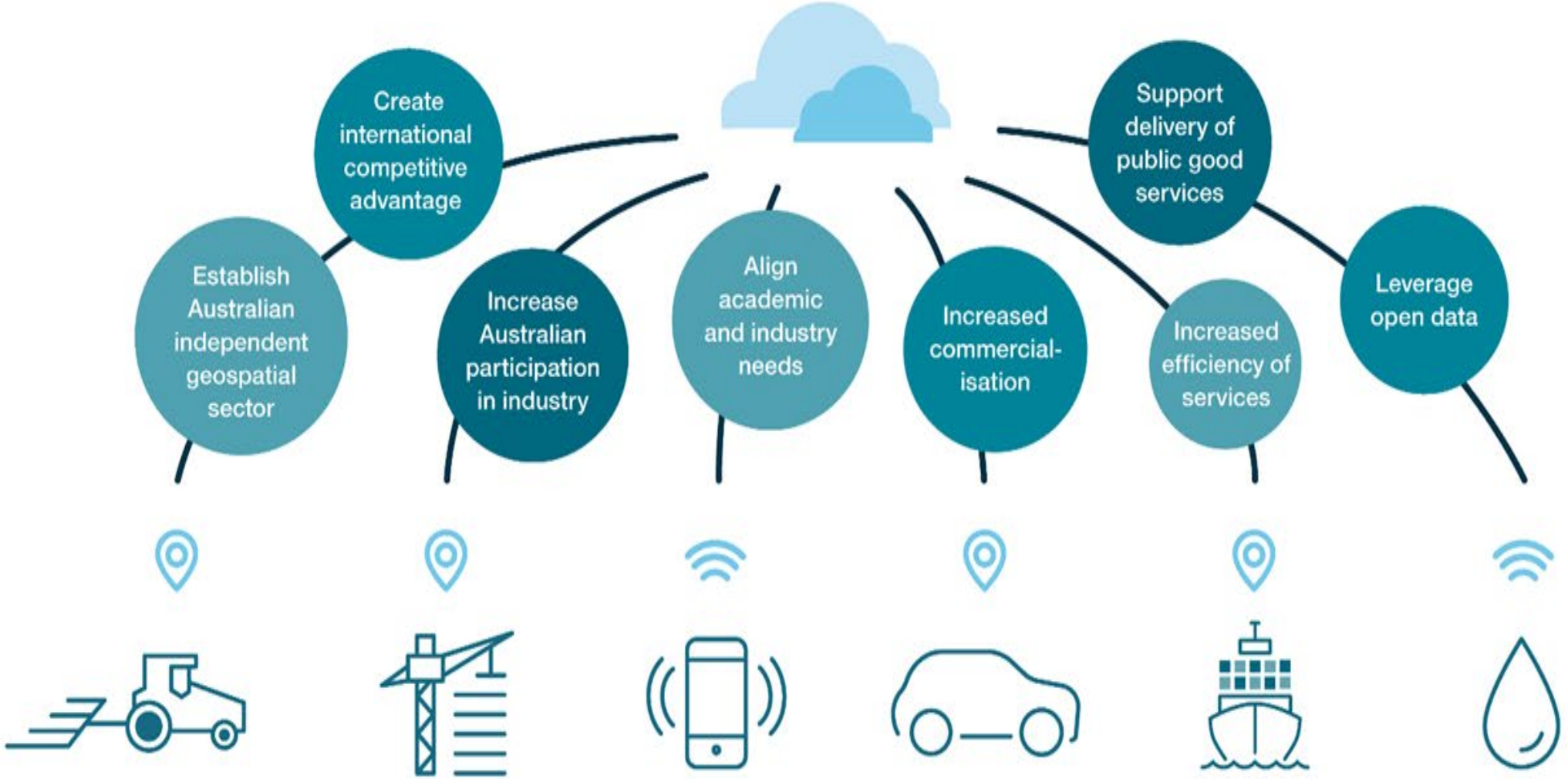
- ✓ Internet of Things



Agriculture Sector:

- ✓ Precision agriculture
- ✓ Precision water and nutrient spraying
- ✓ Automated strip grazing and virtual fencing
- ✓ Livestock monitoring
- ✓ Inter-row seeding
- ✓ Environmental and disease hazard monitoring and relocation
- ✓ Enhanced yield mapping
- ✓ Controlled traffic farming

Positioning Australia



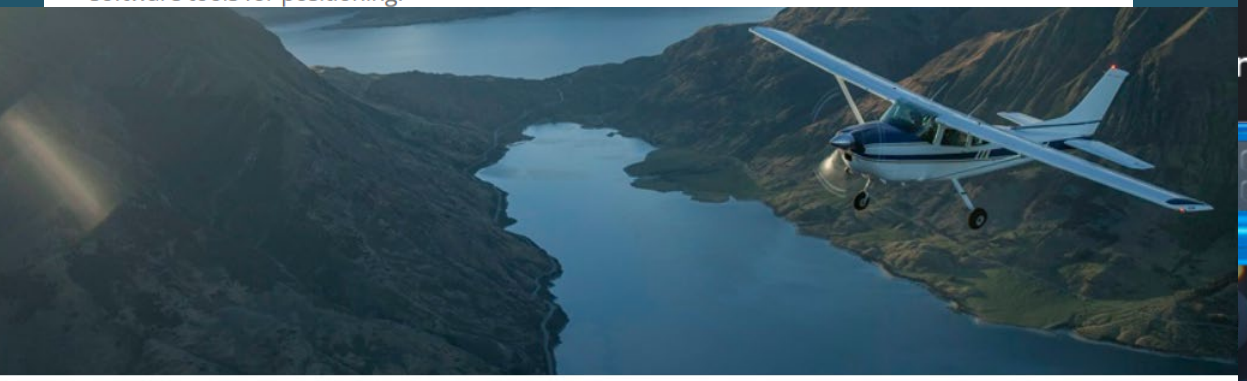
Mastering Innovation NT –

National Positioning Infrastructure Capability

September 4, 2018 @ 11:00 am - 12:30 pm ACST

National Positioning Infrastructure Capability – World-leading positioning for Australia

The Australian Government announced an investment towards developing a world-leading satellite positioning capability for Australia. Funding will support the development of an Australian Satellite-Based Augmentation System (SBAS) to upgrading Australia's ground Global Navigation Satellite (GNSS) network. The funding will also improve coordination across government and the private sector and ensure Australian industry has access to world-leading software tools for positioning.



hoto by Mike Fizer.

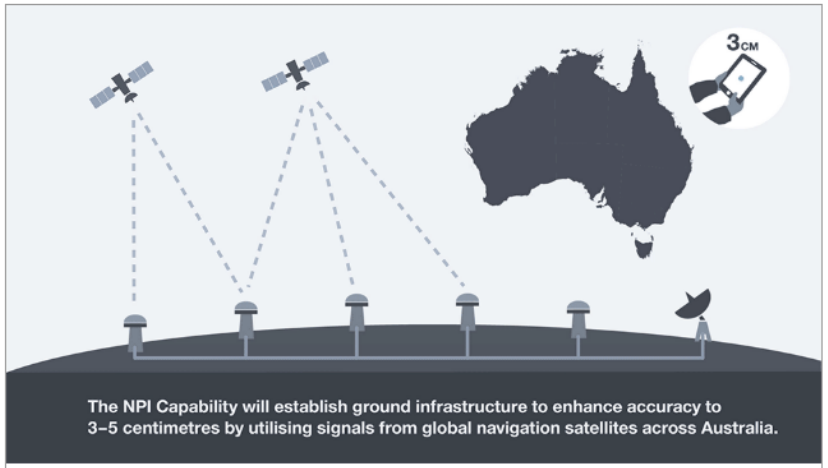
BAS is analogous to the Wide Area Augmentation System (WAAS) in the United States, and the lack of it utside major airports has left Australia and New Zealand "well behind" comparable countries, according t ne GA advocate.

To remedy that trend, the aircraft owner and pilot associations of

Minister for Resources and Northern Australia, Senator Matt Canavan, said the government is investing more than $260 million to develop the satellite technology.

"We rely on satellite and GPS technology for just about every aspect of our lives — from Google Maps on our individual phones, through to air traffic control at the busiest airports," Canavan said. "More precise technology will make Australian businesses more productive, safer and more efficient.

Specifically, Canavan said, "More accurate GPS will improve productivity by allowing new technology to be created and used across the economy. Growing Australia's digital economy will also benefit developed sectors such as mining, transport, construction, aviation and agriculture. "This investment will improve competitiveness and secure jobs across the Australian economy."



(Image: © Commonwealth of Australia (Geoscience Australia) 2018)

In summary

- Positioning is ubiquitous and expanding
- Due to Australia's geography, positioning is costly to access, and not available everywhere
- Funding investment delivers better access to precise positioning for industry, academia, society
- …bringing
  - Productivity
  - Efficiency
  - Safety
  - Innovation

Return on Investment

INCREASE OF 1866 SUCCESSFULLY COMPLETED

medical helicopter rescue missions in remote locations

ACCESSIBLE CITY NAVIGATION: ENABLE ASSISTIVE TECNOLOGIES

for the visually impaired, reducing the risks of incidents associated with trips, falls and collisions

SAVE $205 MILLION THROUGH INCREASED EFFICIENCY DURING BLACKOUTS

PRECISION MINING:

Increase the accuracy of autonomous vehicles
Improving safety and efficiency

Example 2 – Satellite imaging

- Satellite land imaging relies on accurate use and integration of geospatial datasets
  - → critical reliance on accurate reference frames

- Geographical location of geodetic observatories has direct impact on the quality of the global reference frame
  - Australian geodetic observatories have disproportionate impact on quality of the reference frame, particularly the Southern Hemisphere

- Ensuring sustainment of investment benefits by funding geodetic observatories

Business case

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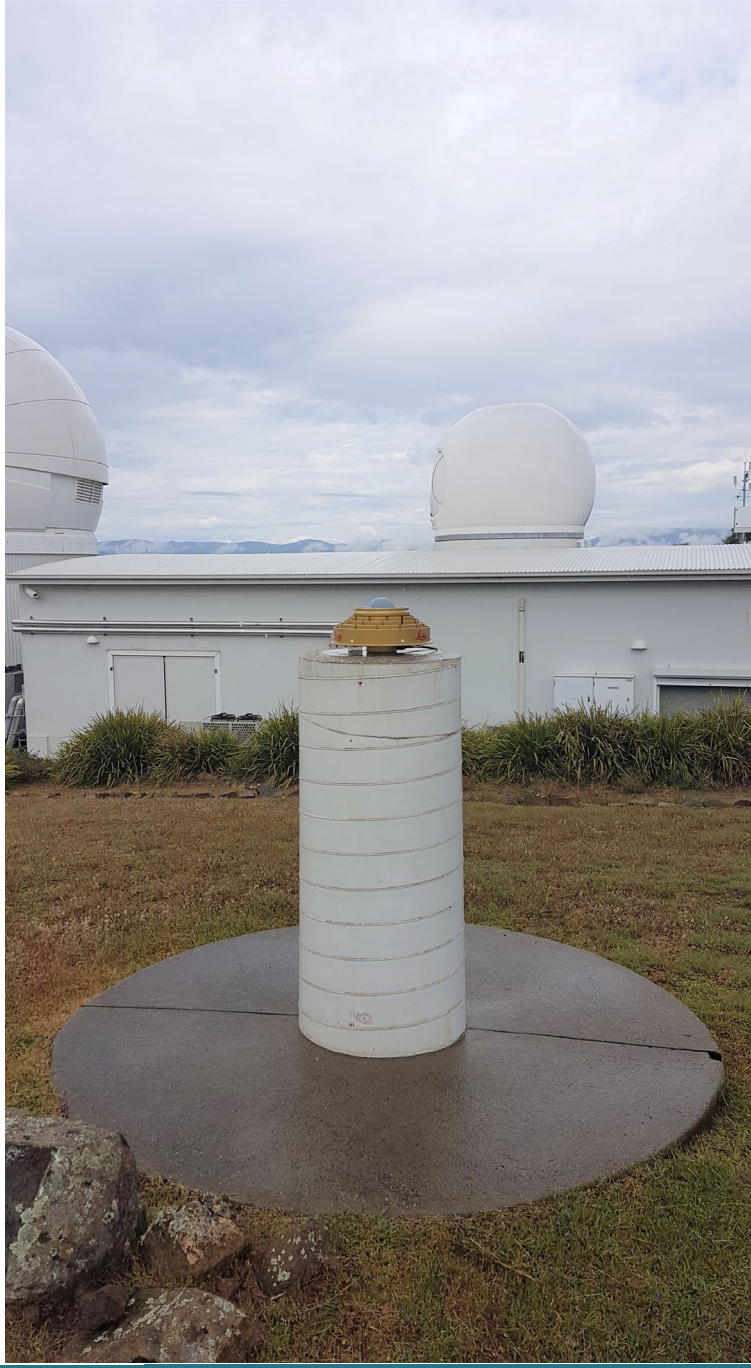


STR200AUS – Mount Stromlo, Australian Capital Territory

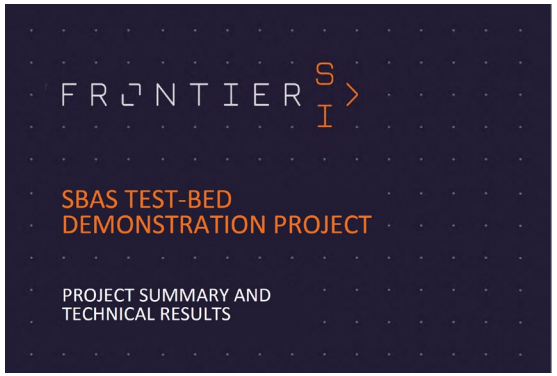
Initial evidence base

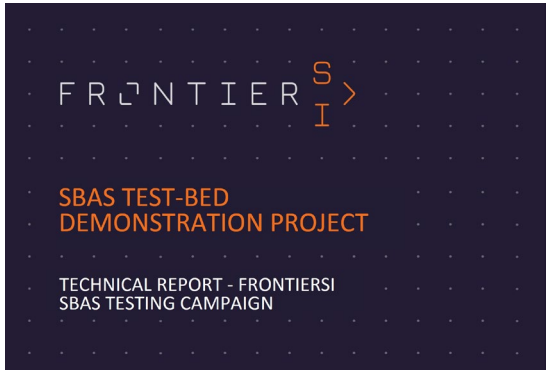
- Positioning could add up to 2.1% to Australia's GDP by 2030 through productivity gains in mining, construction and agriculture alone
- 6.4 billion GNSS devices worldwide
  - Mass market consumer devices
  - Transport and safety critical solutions
  - High precision applications
- GPS has generated roughly $1.4 trillion in economic benefits to the US
- Sectors generating 11.3% of UK GDP are supported directly by GNSS.

SouthPAN Test-Bed

- Test transmissions from space: 2017 to mid-2020
- Technology evaluation – application specific testing
- Economic benefits analysis – counterfactuals examined too

https://frontiersi.com.au/project/satellite-based-augmentation-system-test-bed/





Economic Benefits

$6.2BN

Benefits from SouthPAN positioning Services over 30 years.

Accessibile city navigation: enable assitive technologies

for the visually impaired, reducing the risks of incidents associated with trips, falls and collsions

Decrease of network delays by 29% and $36 million savings

through SBAS enabled C-ITS

Livestock monitoring: save $100 per dairy cow

every year with virtual fencing and 6 million sellable Australian sheep valued at $80 million

Increase of 1866 successfully completed

medical helicopter rescue missions in remote locations

Increased vessel capacity of 1375 days

for port operations

Precision agriculture

Improve the efficient spraying of nutrients, chemicals and water by 1-7%

Cultural Heritage Site Mapping

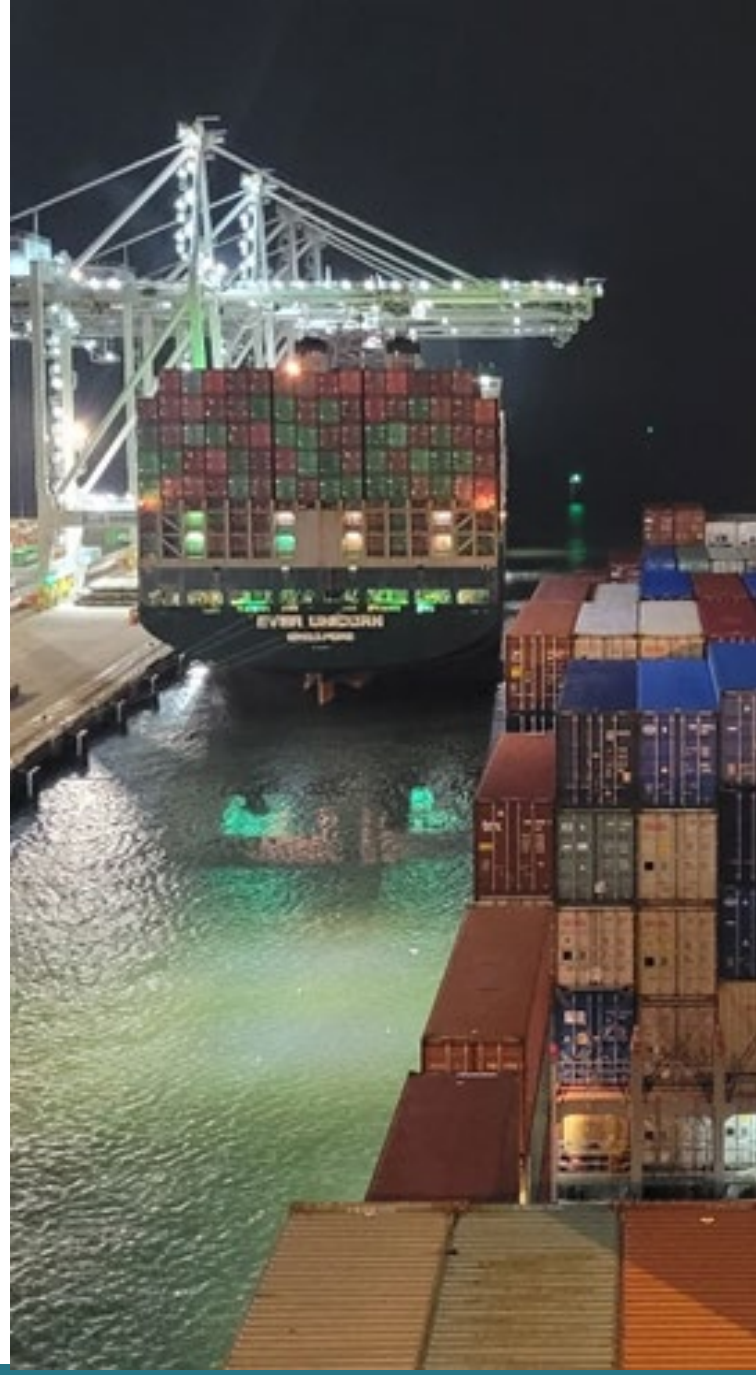
- ✓ Enhance field-survey accuracy and precision, enabling detailed recording of cultural heritage sites in regional and remote areas.
- ✓ Ensure current and future compliance with industry regulatory standards.
- ✓ Reduce equipment costs, improve mapping workflow efficiency and improved productivity in challenging conditions over standalone GPS.

ACHM
AUSTRALIAN CULTURAL HERITAGE MANAGEMENT

Sea Pilots

- ✓ Reliable, highly accurate navigation information with integrity for Port Philip operations to increase safety and efficiency of port activities.
- ✓ Improve situational awareness, aid decision-making and provide recordings for training and investigation purposes
- ✓ SouthPAN offers Precise Point Positioning services, providing reliably high accuracy. Operations efficiency improvements, Open Services provides cost effectiveness for maritime port operations throughout Australia.

PORT PHILLIP
SEA PILOTS

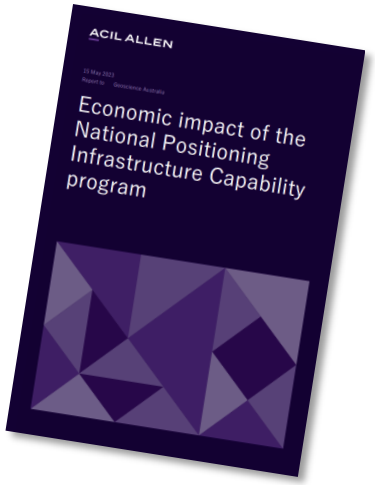


Forestry

- ✓ Accurate forest resource information to optimise forest management and support profitability of forestry
- ✓ Reduced time in the field by decreasing point acquisition from 3 min down to 20-30 seconds
- ✓ Enabled Scion field crews to collect data 3-5x faster, plus make the final location data available within minutes compared to days, previously
- ✓ Little or no post-processing required

SCION
FORESTS | PRODUCTS | INNOVATION

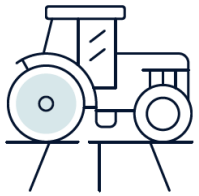
Economic benefits



$545M

Benefit for 3-5cm
NPIC positioning services
over 19 years.

Agriculture



$163 million*

Direct benefit this sector from 2019-2038

Construction

$68 million*

Direct benefit for this sector from 2019-2038

Mining

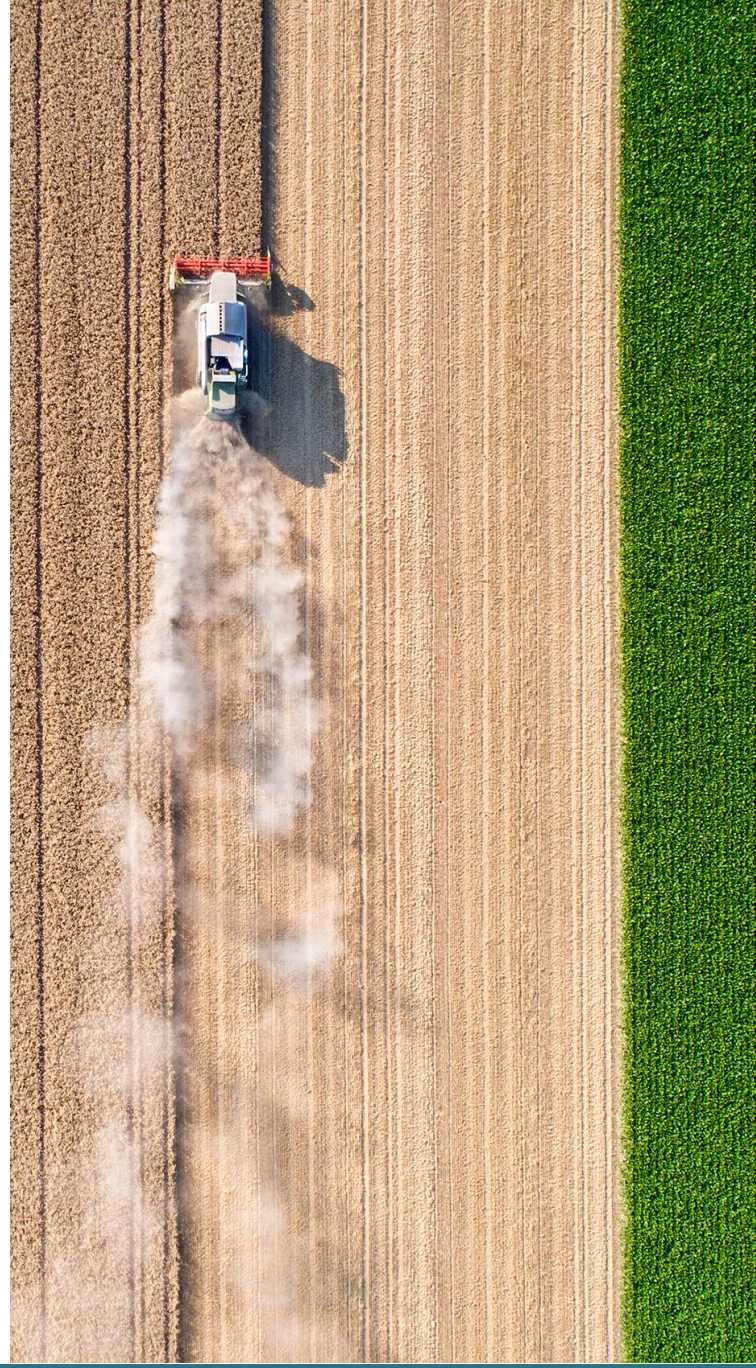
$91 million*

Direct benefit for this sector from 2019-2038

Surveying and Geospatial

$43 million*

Direct benefit for this sector from 2019-2038



Who is using National Positioning Infrastructure Capability?

Direct Subscribers

+6500

Research and Development

20%

Agriculture

20%

Mining

9%

Geospatial and Surveying

40%

Construction

20%

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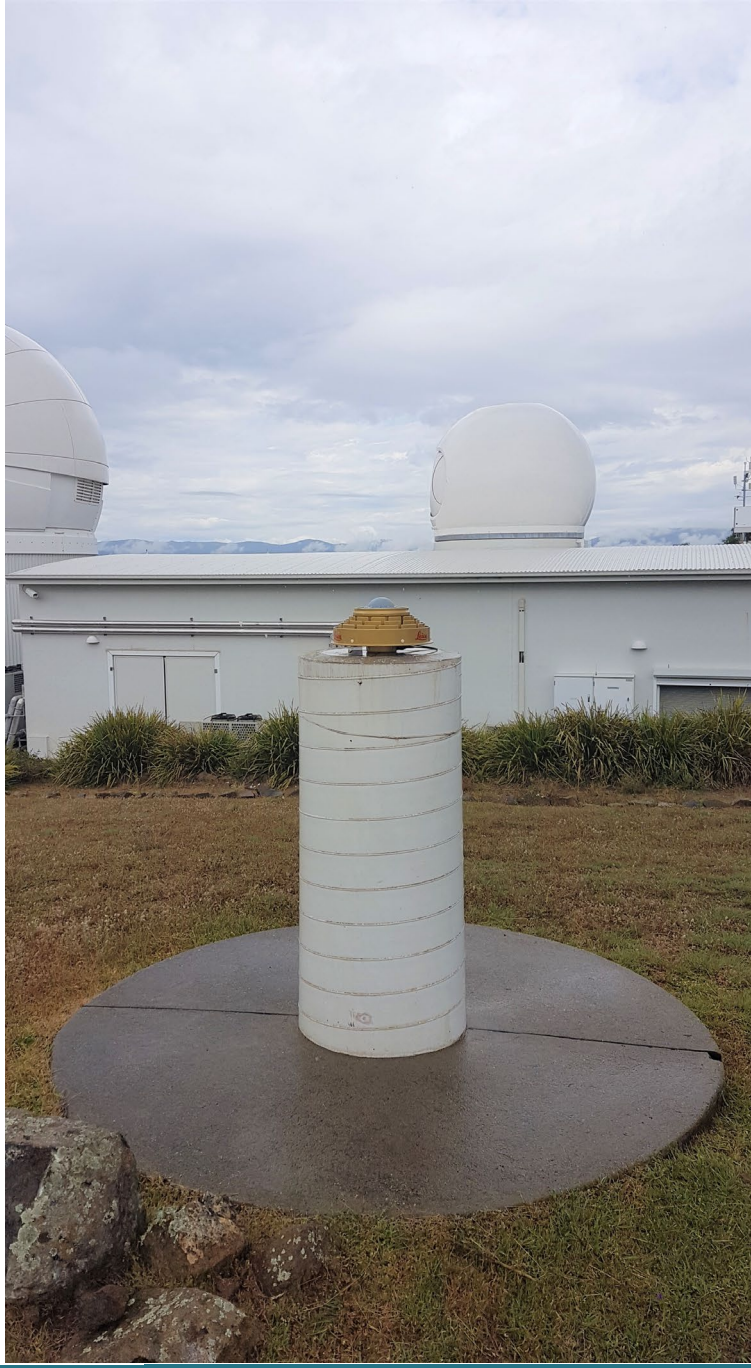
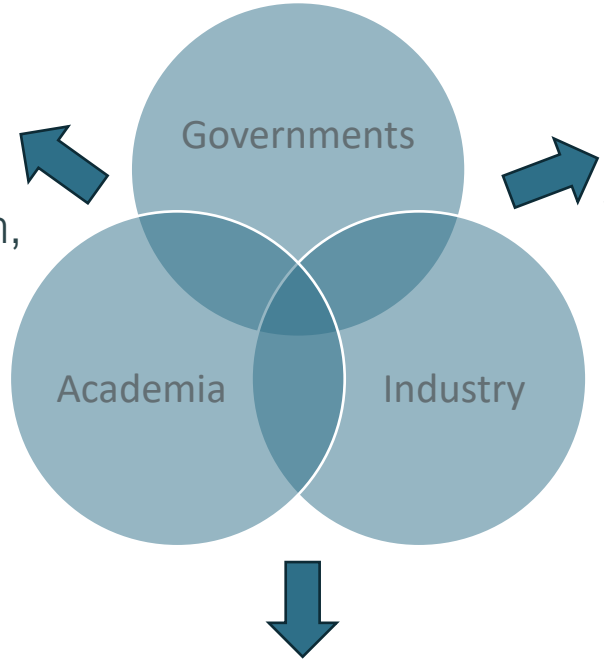


STR200AUS – Mount Stromlo, Australian Capital Territory

Mobilising Stakeholders

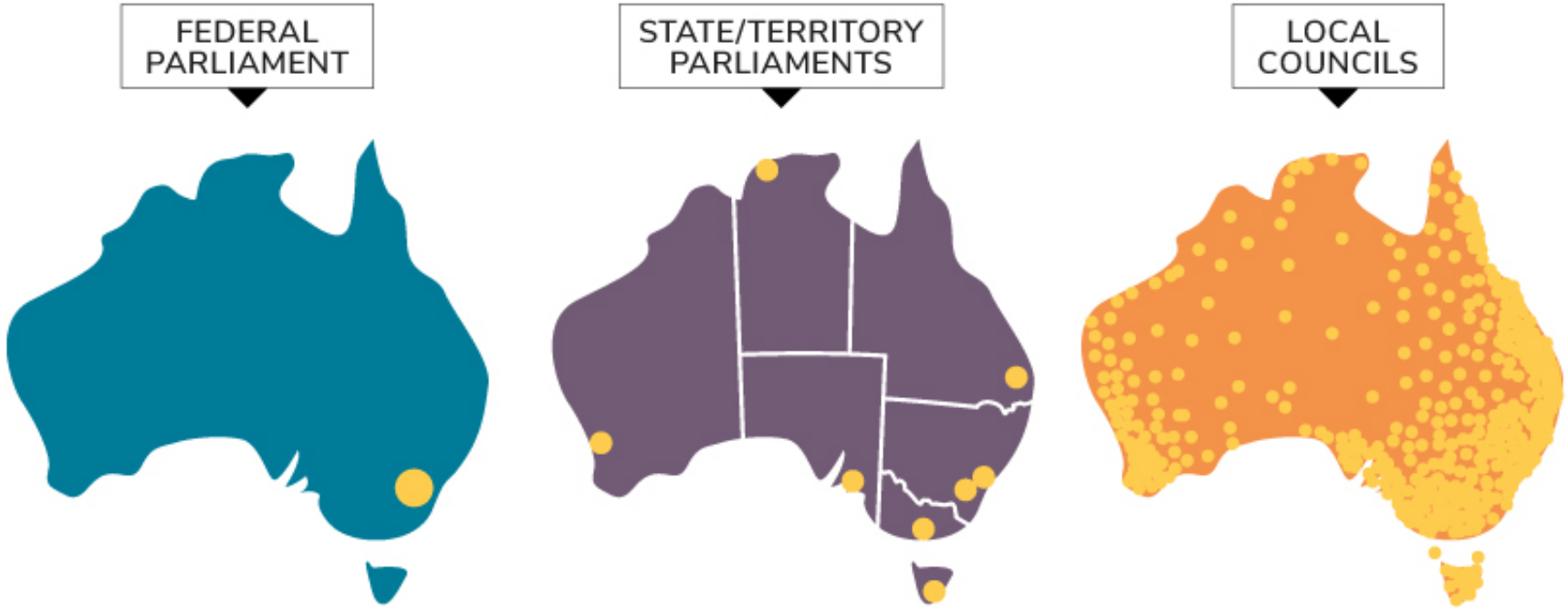
GNSS infrastructure
Other geodetic infrastructure
Global Geodetic Observing System, ITRF



Positioning services
Geospatial services

Innovation, technology & standards

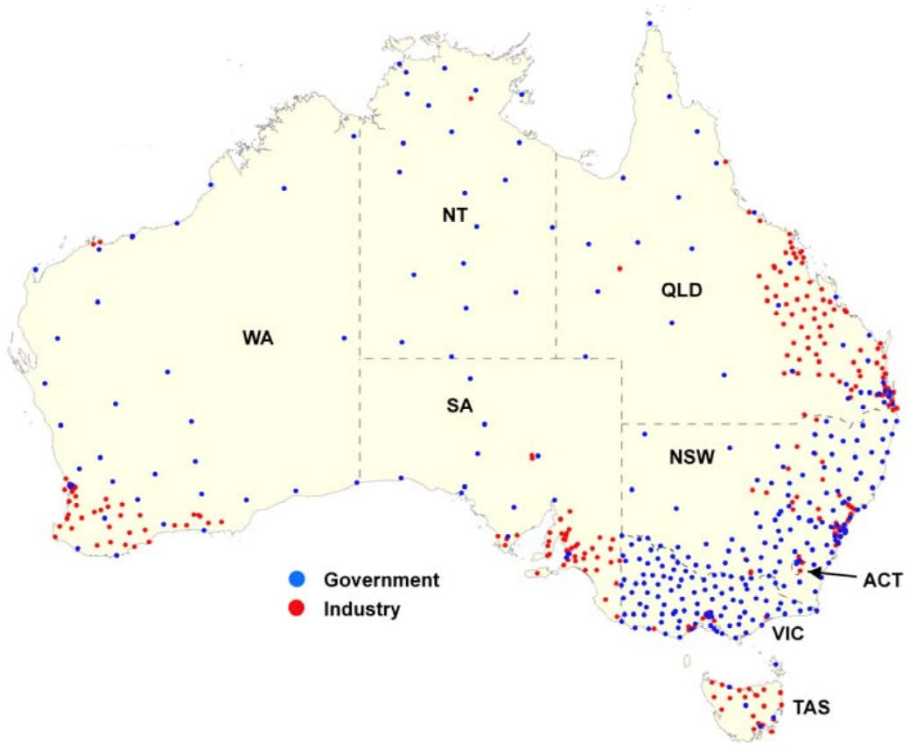
Government stakeholders



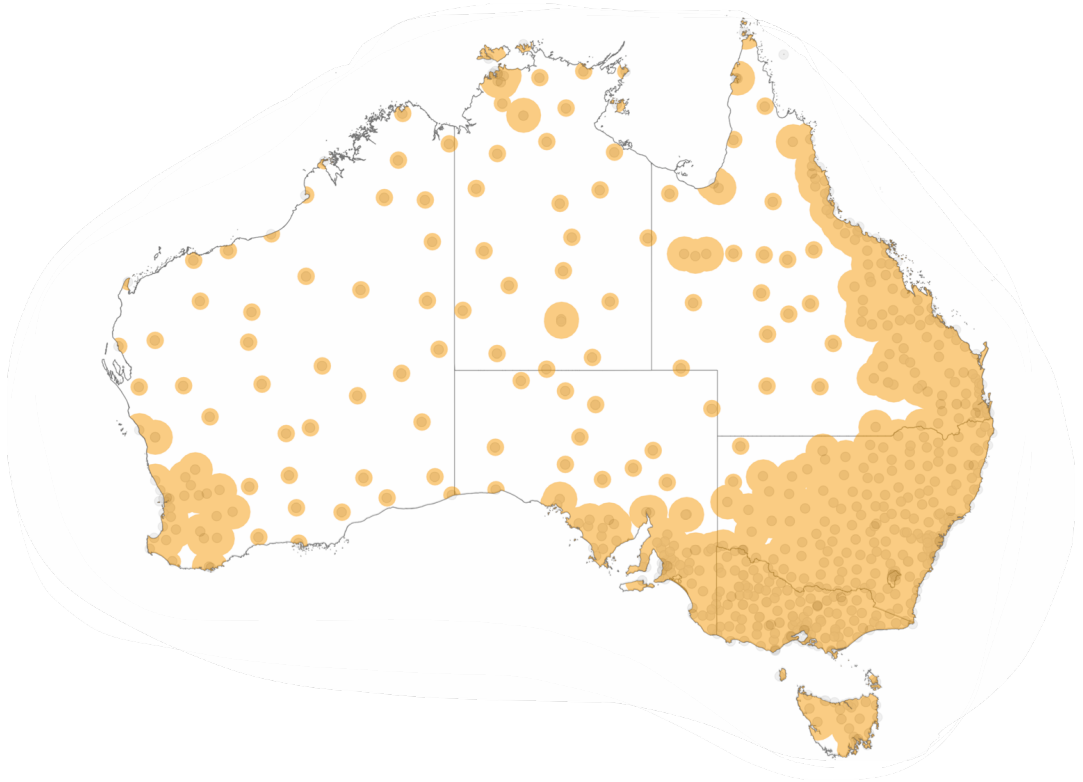
PNT Working Group

ANZLIC
The Intergovernmental Committee on Surveying and Mapping (ICSM)

Bringing stakeholders together: challenges and opportunities



Before NPIC* (2014)



NPIC (2024)

Before NPIC map is courtesy of Hausler, G. 2014. "National Positioning Infrastructure: Technical, Institutional and Economic Criteria for Coordinating Access to Australia's GNSS CORS Infrastructure." PhD thesis, University of Melbourne.

Value of National Positioning Infrastructure Capability

A **unified** approach to the management of the nation's positioning infrastructure to ensure **consistent**, **fit-for-purpose** data.

- ✓ **Underpins Australia's geospatial fabric**
  - define and deliver the national datum
- ✓ **Supports research and encourages innovation**
  - free and open data, products and services
- ✓ **A platform for Australian business**
  - strengthening the positioning sector in Australia

COCO00AUS – Cocos Islands, Western Australia

Slow, slow, quick-quick, slow

- 2006 AuScope (academic) $16m to uplift & expand Australia's geodetic infrastructure

- 2012
  - National Positioning Infrastructure Plan '*Instantaneous, reliable and fit for purpose positioning and timing services anywhere, anytime across the Australian landscape and its maritime jurisdictions'*
  - ANZLIC National Positioning Infrastructure policy *'..underpins the referencing and application of the majority of spatial data'*
  - National Satellite Utilisation Policy
- 2014 NPI in ICSM roadmap
- 2016 $12m funding Test Bed
- 2017-2020 Test Bed operational
- 2018 *Better GPS for Industry* policy
- 2023 Additional funding under Landsat policy

Business case

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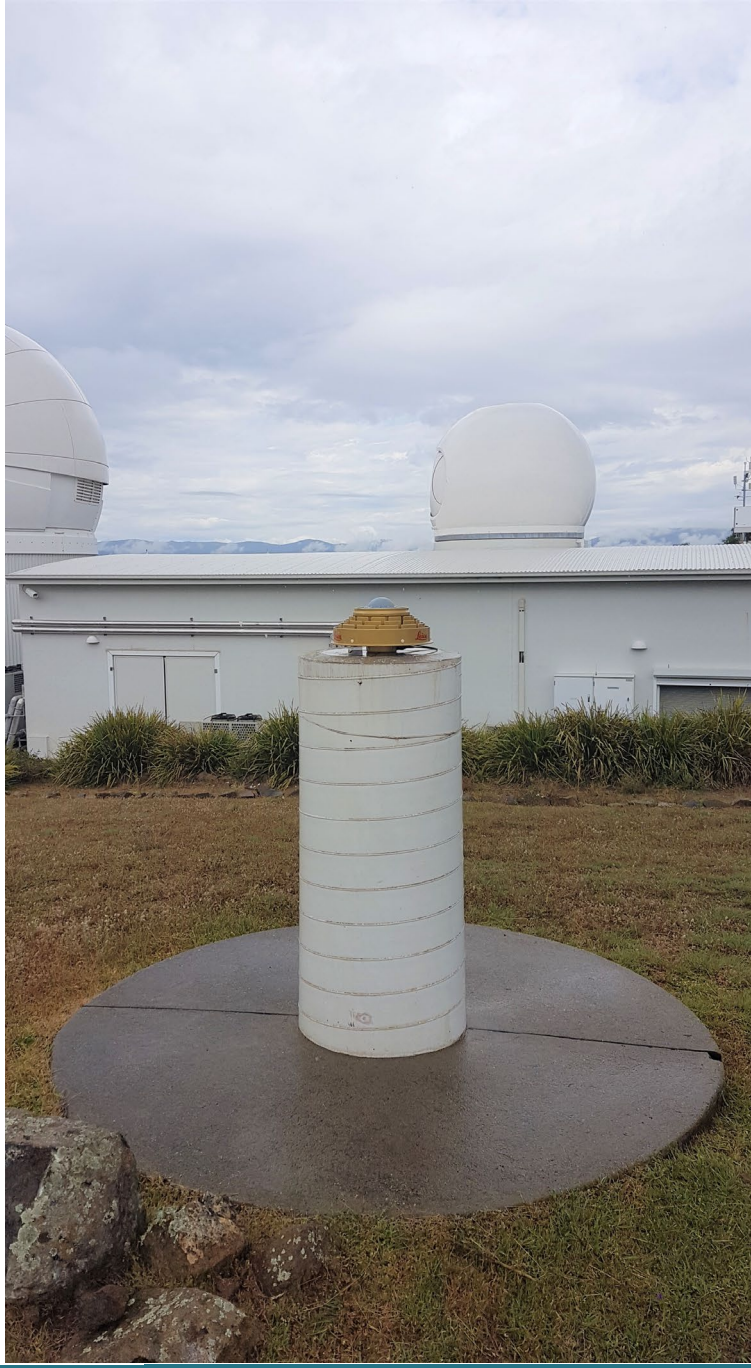

STR200AUS – Mount Stromlo, Australian Capital Territory

Australian Government
Geoscience Australia

Positioning Australia

Further information

Web ga.gov.au/positioning

Email Martine.Woolf@ga.gov.au