FRONTIER SI

YEAR IN SUMMARY 2021–22

We know where.

ACKNOWLEDGEMENTS

FrontierSI would like to make the following acknowledgements:

- Māori as tangata whenua and Treaty of Waitangi partners in Aotearoa New Zealand.
- Australian Aboriginal and Torres Strait Islander peoples as the traditional custodians of the land across Australia where our services are located. We also pay our respects to Elders past and present.
- Image contributions by the broader FrontierSI team and the spatial information research community.

FrontierSI would like to acknowledge its Partners for their ongoing support and collaboration:

Core Partners

- Australian Geospatial Intelligence Organisation, Department of Defence
- Curtin University
- Department of Resources, Queensland
- Geoscience Australia
- NSW Department of Customer Service, Spatial Services
- Queensland University of Technology
- RMIT University
- University of Canterbury

Support Partners

- Land Information New Zealand
- University of New South Wales
- Department of Health, Western Australia

Industry Partners

- AAM Group
- Business Aspect
- HG Digital
- Fugro
- Geoscape Australia
- GHD
- Mercury Project Solutions
- NGIS Australia
- Omnilink
- Orbica
- Photomapping Services
- Position ++
- Position Partners
- Spatial Vision
- The Industrial Sciences Group
- Symbios

All currency is quoted in Australian dollars ($AUD) unless otherwise stated.

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TABLE OF CONTENTS

VISION, PURPOSE AND VALUES 3

CEO'S MESSAGE 4

LOOKING FORWARD STRATEGIC PLAN 2022–2027 8

RESEARCH AND INNOVATION APPROACH 10

OUR IMPACT 12

1. Our Work 12
2. Earth Observation Development 15
3. FrontierSI – Leaders in Spatial 16

PEOPLE AND CULTURE 19

PROJECT DELIVERY 22

UTILISATION AND COMMERCIALISATION 27

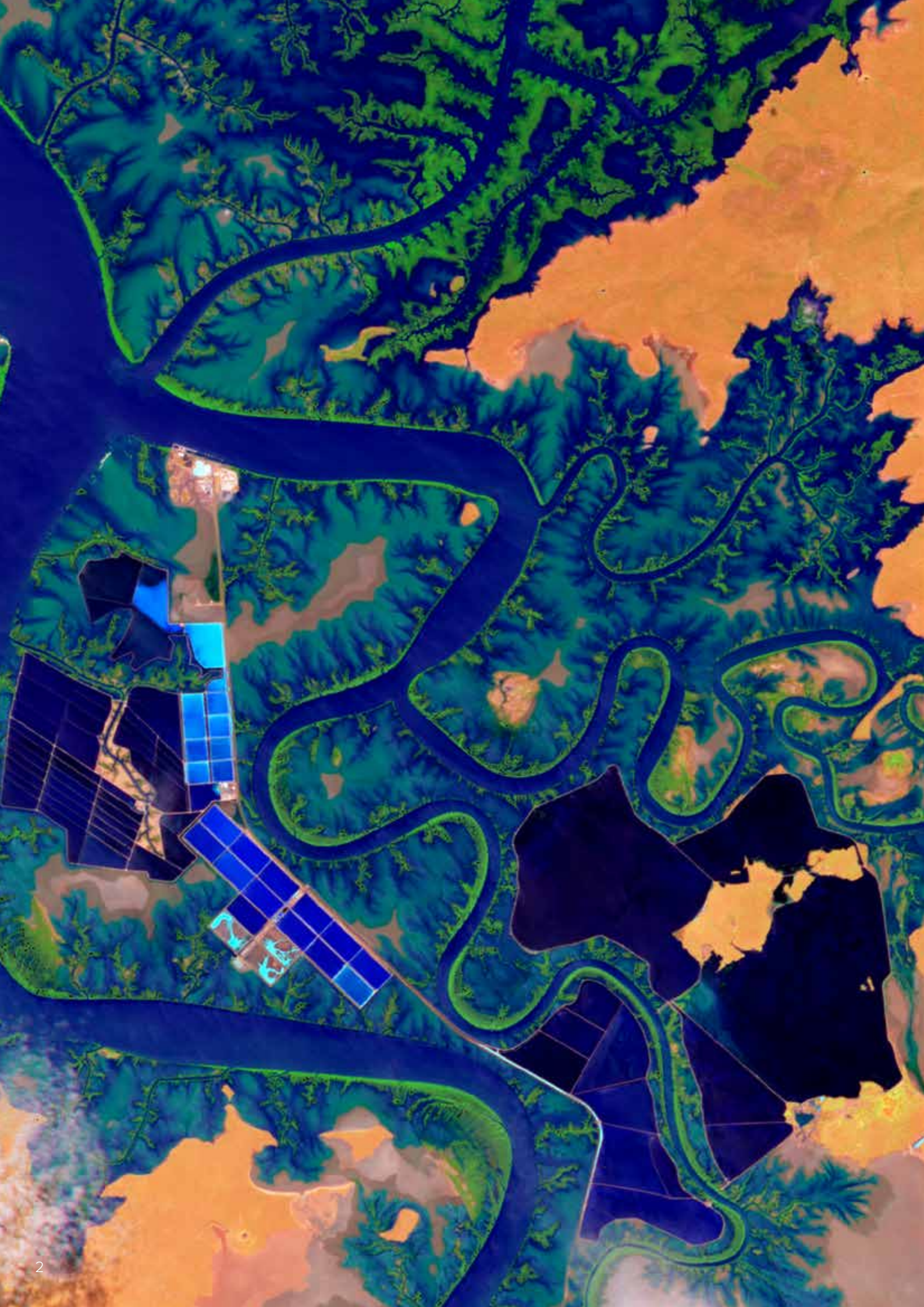
PARTNERSHIPS AND KEY STAKEHOLDERS 28

GOVERNANCE AND MANAGEMENT 32

COMMUNICATIONS 34

FINANCIALS 36

GLOSSARY 38



VISION, PURPOSE AND VALUES

Vision

To be the people of choice to lead transformational spatial research and innovation in Australia and New Zealand.

Purpose

To accelerate the space and spatial industries in Australia and New Zealand to deliver economic growth and improved environmental and social well-being.

Values

Our values are *collaboration, future focus, agility, integrity* and *communication*.

We are solutions driven, and achieve high quality outcomes through **collaboration**, being open minded and embracing inclusion, working together as a team internally, and with our partners and clients.

We are **future-focused**, looking at "what's next": from tapping into the most promising technologies, to new application areas to ensure we deliver.

We respond to our partner's needs with **agility**, being flexible and deploying teams and effort as needed, to adapt to our rapidly changing environment.

We work with **integrity**, we do what we say, we are professional and respectful of others.

We **communicate** and share information effectively, we listen first, seek to understand other perspectives, and simplify complex concepts into understandable stories.

CEO'S MESSAGE

It is with pleasure that I present to you the FrontierSI Annual Report for the 2021-22 financial year, in which we continued to collaborate extensively with our partners and the space and spatial industry.

I am pleased to report that FrontierSI had an impactful year, building a solid base of outcomes and results with our partners. Significantly, we progressed the development of several ground-breaking initiatives which provided users with better spatial data, we continued to build innovative capability within our partner network, we ran novel testbed projects demonstrating pioneering use of new spatial technologies, we published several sector-leading reports on broadening the use of spatial information, and we partnered more extensively with the space industry.

In the wake of the global pandemic and the significant amount of digital transformation that has occurred since, FrontierSI has refreshed its company vison and purpose and developed a new strategy. We remain a partner-focussed research and innovation organisation and have refined our five year vision to become *the lead social enterprise in Australia and New Zealand driving location-based innovation*. To achieve this, we will focus on the application of spatial to key industry sectors, whilst continuing to build a stronger role in spatial innovation and advisory and assist government and industry in growing the Australian and New Zealand space industries.

The requirement to better integrate data for improved decision making is needed more than ever. There are several significant challenges we all face, whether mitigating the impacts of climate change on our health, infrastructure and natural environment, ensuring information, food or manufacturing based supply chains, monitoring environmental change, or ensuring national security. These challenges require a spatial component as part of the solution and require collaboration on a global scale.

Through the new strategy we will continue to address the research and innovation needs of our partners, we will broaden the use of spatial data in industry and the community, enable the growth of the space and spatial industries and the optimised use of data throughout, all while achieving our renewed purpose 'to anticipate and solve large problems using our space and spatial expertise'. Importantly, FrontierSI will continue to invest with its partners in areas which aim to grow industry capability and address shared problems. As a not-for-profit social enterprise we gauge our success through the achievements of our partners and the social, environmental and economic impact that results.

Throughout 2021-22, we worked to grow the space and spatial industry through:

Industry advocacy

We continued, with a select group of industry advocates, to develop the Space and Spatial Industry Growth Roadmap 2030 which sets out to address how to improve the use of space-based information flows to narrow the gaps in solving fundamental problems including global climate change, global security, environmental management, and economic productivity. A paper is scheduled to be released in early 2023.

Providing input to the Australian Government's *Developing Australia's Space Industry Inquiry*

Following a detailed written submission to the federal government, FrontierSI presented and emphasised a national strategy, leadership, and cohesive industry

> *The requirement to better integrate data for improved decision making is a key priority."*
>
> Graeme Kernich, CEO

development with particular emphasis on addressing national challenges through targeted space missions.

We advocated the use of our geographic position and skills to build capability and trusted data services.

We were integral in the release of industry focused reports which set out opportunities for Earth observation data infrastructure in driving growth and improvement within key industries. The reports aim to assist companies to better understand how investment in Earth observation can effectively drive business returns through reducing risk, increasing operational efficiency, improving reporting, and help businesses transition towards low-emission models.

Road mapping opportunities through collaboration

In collaboration with several partners, FrontierSI explored and fostered links between the Vietnamese and Australian spatial industries and highlighted opportunities for collaboration between the United Kingdom and Australia in Earth observation.

FrontierSI also collaborated with the European Association of Remote Sensing Companies (EARSC) on a project in the Australian agriculture and maritime industries, with the aim of building increased collaboration between the European and Australian industries.

Novel tool development to improve the impact of spatial information

FrontierSI continued to influence the AusSeabed initiative through the development and implementation of the AusSeabed Survey Coordination Tool.

AusSeabed is a national seabed mapping coordination program delivering an open-source repository and associated software interface enabling end users to plan surveys and then check the quality of their

acquired seabed data. The tool is now routinely being used for seabed survey planning.

FrontierSI has continued to partner with Digital Earth Africa to leverage the Open Data Cube and machine learning expertise work from Digital Earth Australia and apply it to crop type mapping in Africa. For example, in collaboration with the Food and Agriculture Organisation of the United Nations, in Zambia the use of digital infrastructure in combination with field data collected by the Regional Centre for Mapping of Resources for Development developed a reproducible algorithm for crop type classification to shape decisions in Africa.

FrontierSI's long term collaboration with Geoscience Australia reached a significant milestone, with the public release of an alpha version of Geoscience Australia's Ginan software. Ginan allows users to utilise open-source software to provide real-time corrections to positioning data from Global Navigation Satellite System (GNSS) constellations. Ginan can facilitate 3-to-5-centimetre location accuracy for industry users with suitable GNSS receivers and internet coverage.

FrontierSI launched Slate Analytics, an automated property valuation company founded with the University of NSW (UNSW). Slate Analytics combines FrontierSI's expertise in spatial data innovation, collaborative project delivery and technology translation with UNSW's world leading research on data science and cities. The resulting toolkit now combines spatial data, artificial intelligence, and advanced analytics to better calculate property valuations across Australia's residential property market. Slate Analytics received investment from PEXA, who then became majority shareholder.

The 3D facial analysis open-source platform, Cliniface went from strength to strength. Cliniface provides functionality for a multitude of applications and research projects including: assisting with rare disease diagnosis; assessing the efficacy of medical treatments; surgical planning; screening for Foetal Alcohol Spectrum Disorder; understanding the severity of breathing obstruction in new born babies; investigating how facial features correlate with Autism Spectrum Disorder; and quantifying the face shape of Aboriginal Australians. Cliniface is now being used by clinicians, researchers, and commercial organisations across the globe, has been downloaded more than 3,500 times, and resulted in collaborations with more than eight organisations across four continents co-developing multiple aspects of 3D facial analysis through various research projects.

Novel pilots and innovations to improve outcomes

We completed the first round of trials to demonstrate applications of precise positioning using 5G in agriculture, augmented reality, and drone flight. For the first time using 5G networks as the basis of a near-real-time precise positioning system, we tested new

positioning capabilities for precision crop-spraying, unmanned aircraft control system integration, and augmented reality.

The SmartSatCRC SIG Water pilot project (Satellite Telecommunications IoT-enabled Automatic Ground Water Collection and Aggregation) resulted in the development of an end-to-end solution for transmitting and aggregating automatically collected information from groundwater bores across rural and regional South Australia, with a focus on environmental water monitoring.

In collaboration with Geoscience Australia and CSIRO, we hosted the *Australia – South East Asia Climate Smart Innovation Hack 2022* which aimed to bring Australian spatial practitioners and South East Asian counterparts together, to explore opportunities for the development of new products and services.

We commenced an innovation initiative with Queensland's Department of Transport and Main Roads – TMR Spatial Labs to demonstrate the use of artificial intelligence/machine learning innovation within government.

And we completed a successful round of AGO Labs (Australian Geospatial Intelligence Organisation), which addresses AGO challenges through the demonstration of new industry capability via short-term projects with Australian and New Zealand-based companies. AGO Labs Challenge Topics focus on machine learning and analytics challenges for producing automated imagery analysis.

These achievements highlight the power of working together to address identified challenges. None of this could have been achieved without remarkable and talented people. I want to particularly thank the FrontierSI staff and board, our partners and our collaborators for their efforts and enthusiasm throughout the past year. I am optimistic about the potential of spatial information to be applied to the challenges we face today and especially look forward to continuing to work with our partners in the coming year.

Graeme.

Graeme Kernich, Chief Executive Officer

LOOKING FORWARD STRATEGIC PLAN 2022-2027

In 2021-22 following an external operating model review and extensive consultation with our Board, partners and staff, we refreshed our Vision and Purpose with a renewed focus on greater impact and sustainability.

Vision

To be the lead social enterprise in Australia and New Zealand driving location-based innovation.

Purpose

To anticipate and solve big problems using our space and spatial expertise.

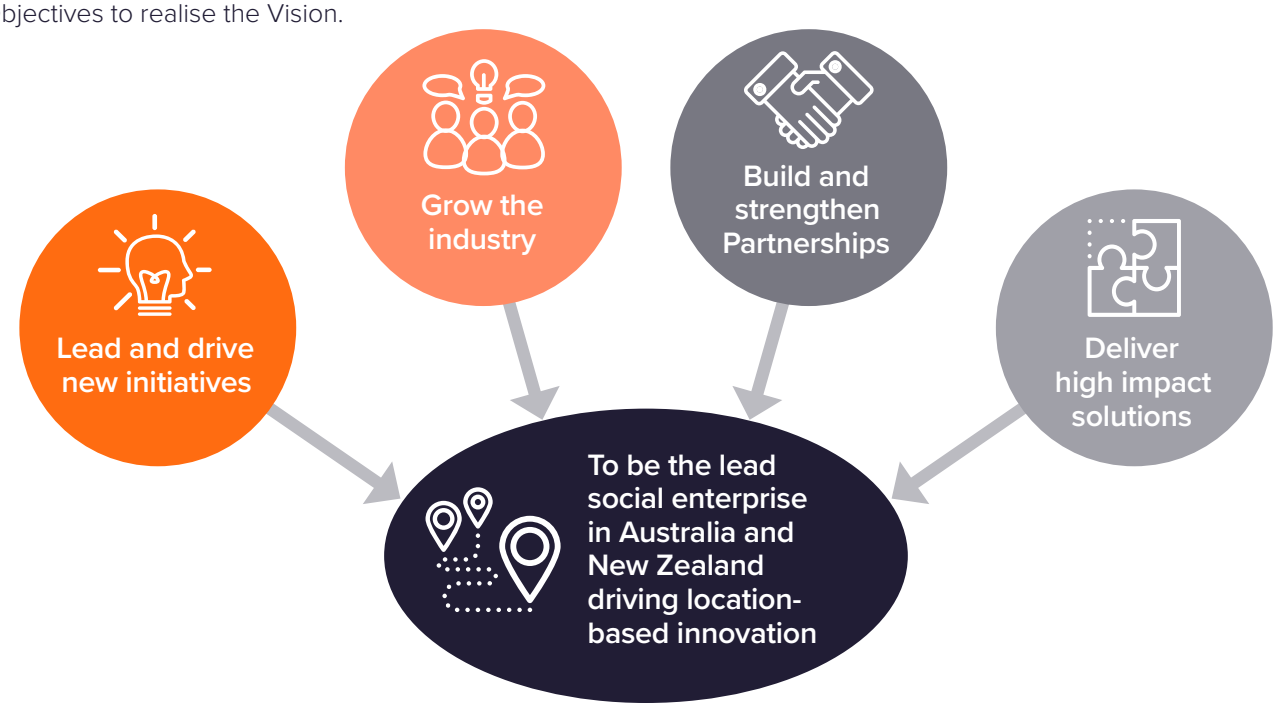
As we now look to implement our new strategy alongside our partners we will continue to:

- Be a **research and innovation organisation** which defines formulates and delivers services within our technical expertise areas of space, positioning, geodesy, analytics and spatial infrastructures.
- Build a strong reputation and track record in the **development and delivery of multi-disciplinary research and innovation initiatives** through industry-government-university collaborations.
- **Solve partner challenges**. We would not have existed without the foresight of our partners. FrontierSI is predicated on solving partner challenges and is strongly aligned to contributing to the delivery of partner strategies.
- Have **strong relationships** and be a **trusted advisor** to Government and the Space and Spatial sectors developed through successful research and innovation initiatives over many years.
- Consider collaboration our core skillset. We bring the right teams together and are **experts with strong industry networks**. We draw on the expertise and capabilities of our university and industry partners to provide the complex and varied skills required to solve identified problems.
- **Act impartially**. This impartiality is tightly guarded and demonstrates our ability to advise openly about risks associated with various products, solutions and vendors without preferencing any proprietary solution.
- Co-fund and **invest in industry development** activities with our partners.

We are passionate and **committed** to the better use of space and spatial technologies to drive a more sustainable economy, environment and society.

Strategic Goals

High level intentions that will help define the Objectives to realise the Vision.



RESEARCH AND INNOVATION APPROACH

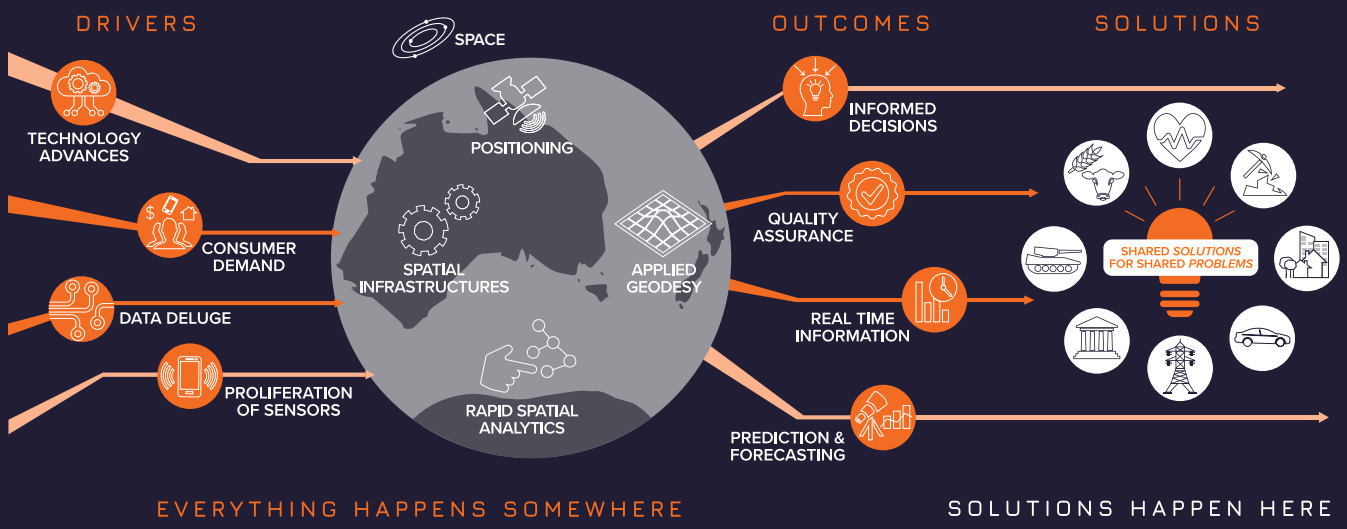
FrontierSI works in four core expertise areas:

Positioning and Applied Geodesy
with the aim of improving location services

Spatial Infrastructures
focussing on increasing data accessibility and improving service delivery

Data Analytics
with the goal of improving decisions through automation, and delivering applied solutions across a range of industries, often with improvement to government services as a focus

Space
Focusing on space mission ideation and design through expert advisory services, industry, and community engagement



FrontierSI provides a connection point and collaborative model for our partners to access, develop and apply space and spatial research development and innovation project outcomes into impactful solutions. We provide our partners with the research services, expertise, and technology to improve operations and implement innovative solutions. Our services and capabilities include:

Project Facilitation

Responsively facilitating the formulation and delivery of complex projects which require collaboration between organisations. This draws upon our ability to connect drivers and insights from different organisations, extensive networks internationally and our expertise in delivering multi sectoral and multi-partner projects. This includes our ability to create, manage and monitor quality outsourcing and subcontracting services which enhance solution delivery. Through our outsourcing capabilities, FrontierSI offers efficient and effective access to a highly specialised and expert resource base. The scalability through our networks vastly enhances our ability to deliver the required solutions and business outcomes.

Collaborative Applied Research

We have 19 years' experience in creating and managing collaborative teams of academic, private sector and government professionals to solve challenging innovation and R&D spatial problems of varying scales. We help to breakdown organisational, jurisdictional, and technology silos to deliver results and realise value for all project stakeholders. We have staff accredited in a variety of project management approaches to ensure that the right approach is used for each problem. Often these are large scale, complex, multi-jurisdictional initiatives. Our projects range from deep technical research through to proof-of-concepts and demonstrators.

Advisory Services

Through our inhouse expertise as well as industry and university partnerships, we provide independent and trusted expert advice in space and spatial industry strategy, business strategy, data and spatial infrastructures strategy, innovation programs, technology due diligence, industry and technology trends, mission design, new markets assessment and economic analysis.

Industry Engagement and Outreach

We conduct workshops, reviews and industry consultations across both technology and end user markets to uncover new strategic insights and directions for our partners. We have co-organised national and international business networking events and business exchanges. These extensive outreach efforts raise awareness of new technologies and their potential benefits, leading to the increased adoption of space and spatial technology and funding of new large-scale initiatives. Our global linkages and networks beyond ANZ connect our partners to leading global research and innovation.

Technology Development

We bring ideas to life, straddle the divide between cutting edge research and commercially scalable solutions to bring our partners' ideas to market. We help our industry and government partners navigate the constantly changing digital environment by rapidly prototyping new ideas to explore feasibility and strategic fit. We join forces with our partners to provide an innovative, competitive edge in project bids. We play at the leading edge of technology, providing expertise in design, development, prototyping, and testing. We also offer software development capabilities and technical Geographic Information System (GIS) services.

Professional Training

We provide training, capacity building, up-skilling, and professional development courses directly and through our partners. Through our research we deliver postgraduate and postdoctoral education and training.

1. Our Work

Value Australia – a commercialisation success story

Value Australia (VA) was an innovative collaborative project addressing the challenges of the valuation of land and property which is used to collect land tax, inform infrastructure investment and lending for homes, along with modelling insurance risk and investment returns. Integrating research, significant data assets and using state-of-the-art analytics and artificial intelligence, VA delivered secure digital valuation models and tools covering a broad range of land and property types across Australia and overseas. It is an efficient and accurate land and property valuation product.

VA built on two years of pilot work across metropolitan Sydney and Brisbane through the award-winning RAISE project which developed a range of Automated Valuations Models (AVMs). VA produced a national suite of data and software products, and pilot work also allowed users to rapidly test the impact of new infrastructure development to determine the potential land valuation changes of this infrastructure within minutes. Multiple scenarios can be rapidly created and compared, further-allowing decision makers to validate consulting reports.

Following the success of Value Australia, we were thrilled to announce that we had successfully facilitated a new strategic commercial partnership with PEXA Group Limited (ASX:PXA) who took a 70% stake in Slate Analytics, a company founded by FrontierSI and UNSW Sydney, to commercialise the Value Australia outcomes. Slate Analytics would therefore deliver a data-driven toolkit calculating property valuations for urban development.

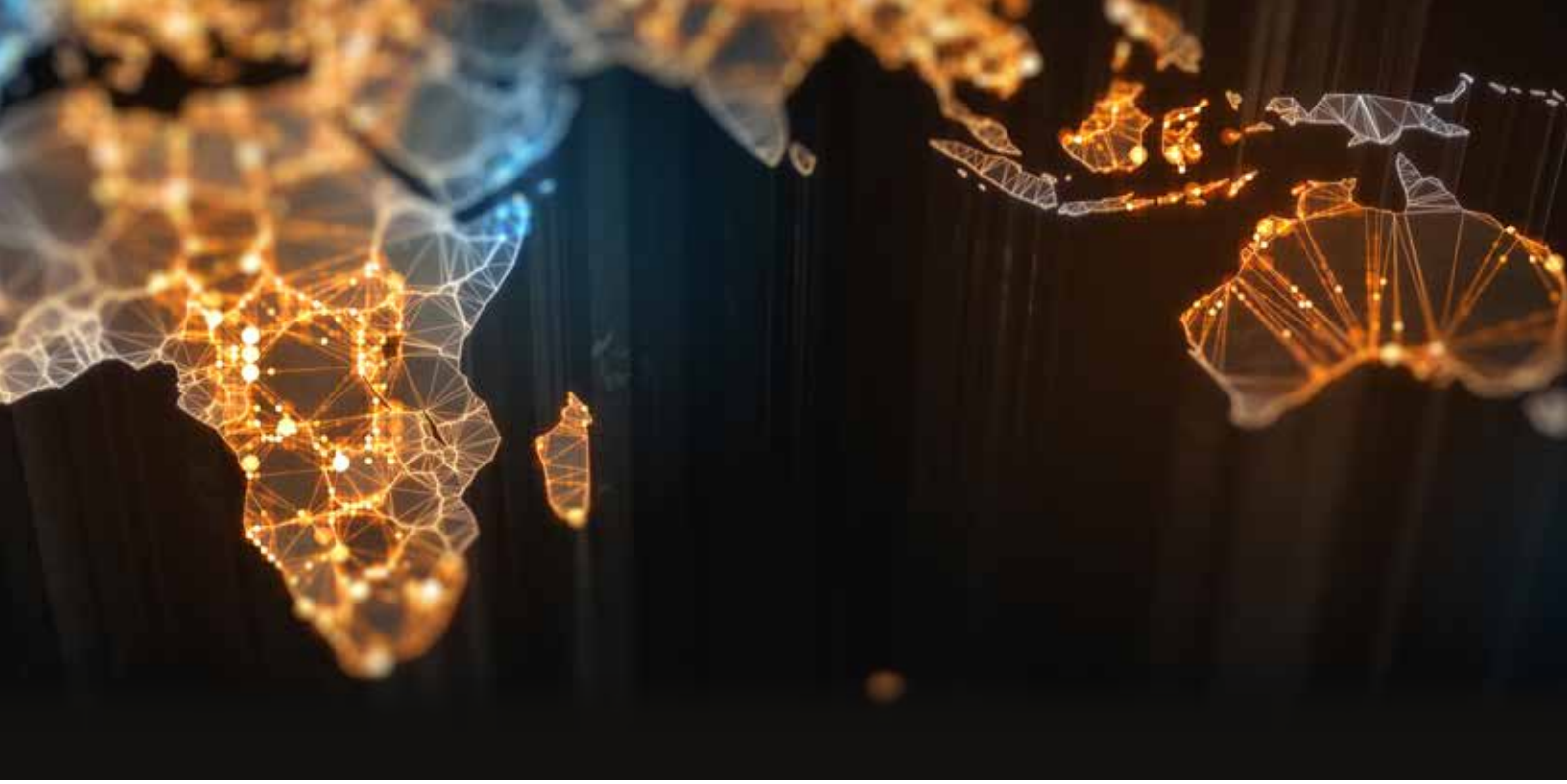
The toolkit allows urban planners and policymakers to explore the effect of new infrastructure and changes to planning controls on surrounding property values, which would further facilitate data-driven solutions to support better city planning.

Through our capabilities and proven experience in establishing a culture of innovation and delivering ideas from R&D through to full-scale commercialisation for its partners, FrontierSI helped unlock immense value for the property industry. The digital toolkit uses big data, artificial intelligence, and advanced analytics to calculate property valuations across Australia's residential property market. Its interactive scenario capability represents an industry-first for planning support systems.

The commercial partnership brought together FrontierSI's specialisation in spatial mapping, complex project delivery and commercial activation, UNSW's leading research on data science and the future of our cities, and PEXA's expertise in data and digital property settlements to deliver a world-class platform. This outcome has allowed FrontierSI to sustainably invest in much needed game-changing solutions in the space and spatial industries.

The partnership with PEXA and UNSW is another example of where FrontierSI has provided the leadership, connections, collaboration ecosystem and expertise to develop industry capability and translate research into an innovative solution. These outcomes were supported through the Federal Government Cooperative Research Centre Project grants, with the successful research collaboration led by FrontierSI along with UNSW, Commonwelath Bank, NSW Government, Liverpool Council and Omnilink.

> ***Through Slate Analytics, FrontierSI and UNSW have realised our vision of bringing cutting edge AI and technology into the property valuation products and services space. The investment by PEXA will be critical to furthering this vision and expanding the impact that this capability will have for Australia and beyond."***
>
> Graeme Kernich, CEO, FronterSI



Digital Earth Africa

Digital Earth Africa (DE Africa) is a satellite Earth observation platform providing access to analysis ready data across the African continent. The DE Africa establishment team from Geoscience Australia engaged FrontierSI and partner NGIS to run an Industry Engagement Program and to assist with developing training resources for the Capacity Development Program of DE Africa. Both programs aimed to enable Africans to use DE Africa to create opportunities for priority areas of the African continent, from simply identifying water resources for greater access to clean water, through to the regular mapping of food crops. Successful engagement, uptake of training materials and activation of industry through the Industry Engagement and Capacity Development Programs, promotes sustainable solutions and innovation across Africa, implemented by the African people.

The *Industry Engagement Program* aimed to understand current barriers and opportunities for industry in using DE Africa and to establish an engagement plan. FrontierSI, NGIS, members of the DE Africa Establishment Team and COOi Studios interviewed 40 private sector companies, and the insights gathered were further explored in a small group workshop to understand the needs of industry when using the DE Africa platform.

One of the critical needs identified was the additional capacity development of staff via the provision of training resources, facilitated by the complementary DE Africa program for Capacity Development. The knowledge gained from the industry program has since been used to develop an ongoing plan for engagement to enable Earth observation (EO) adoption across Africa and to build the end-user demand for DE Africa from private and public organisations. The industry engagement program completed interviews across 13 countries including South Africa, Kenya, Ghana, Uganda, Morocco, Gabon, Ethiopia, and Mauritius.

The *Capacity Development Program* strategy was developed by ITC at the University of Twente in the Netherlands, in consultation with the DE Africa Establishment Team and DE Africa Implementing Partners. The strategy identified 10 strategic pathways to promote capacity development, including a Train-the-Trainers program that would upskill staff from Implementing Partners and enable them to conduct End-User training. A team of experts from ITC, the DE Africa Establishment team, FrontierSI and NGIS collaborated to ensure the Train-the-Trainers program covered both educational and technical elements.

The DE Africa programs encompass all 54 African countries, with a particular focus on markets in food security and water.

Land Unit Classification System for Rural Valuation project (LUCS)

The Land Unit Classification System for Rural Valuation project (LUCS) sought to assist valuation of rural properties in NSW by providing a consistent framework for land descriptions and assessment. The project was commissioned by the Valuer General NSW in collaboration with Spatial Services NSW, implemented by FrontierSI and CarbonLink.

Inspired by a GIS-based valuation framework developed by Office of the NZ Valuer General, which considered three factors, slope, land cover and area, the NSW Valuer General identified a need to develop a more detailed spatial solution to account for the wide range of rural land use across NSW. The LUCS project considers additional attributes of land such as soil fertility, vegetation density and land use, resulting in an in-depth classification system reflecting the complex patterns of agricultural properties and practices encountered by valuers.

While the goal of the project was relatively straight forward, many of the concepts required to generate the desired results had not been attempted before. There was also no reference framework for property characterisation that could guide the design of LUCS. This introduced significant uncertainties based on the initial assumptions at project inception regarding scope, technical options and approach to design and stakeholder engagement. Adding to the complexity was the need to cater for vastly different rural landscapes, from the east coast to the rangelands in the far west of NSW, from northern tablelands to the riverine lands in the south.

An agile approach was used to define the classification system, led by the valuers themselves. Many iterations of the system were delivered, initially using a prototype developed through close consultation with a small reference group of valuers, followed by continual improvement of the system in response to consultation with the broader valuer profession. The key objective was to deliver a classification system that reflected the logic used by the valuers themselves when valuing property. State-wide datasets then needed to be identified and interpreted to reflect and support that decision process.

LUCS sought to reduce the risk of inconsistent valuations while still requiring the professional judgement of a valuer. It provides the valuer with the ability to determine the individual classifications of a sale property and attribute a value to each part, then using that information, valuers can apply evidence of value for specific land classes to similar land classes of other properties in determining their value. The level of objection to land values is expected to reduce as the Valuer General can demonstrate to land owners an evidence-based approach to determining the value on individual land classes. Where an objection is lodged, the valuer undertaking the objection review will be using the same classification approach and therefore there is less likelihood that values would be amended solely based on a different interpretation of the land class.

Any on-ground variations can be recorded against the respective classes. Not only will the entire LUCS database and recorded variations form an annual auditable base for easier dispute resolution, but it would also provide the evidence for future improvements of the algorithms and choice of input data to finetune the LUCS map and property reports. Being a useful benchmark for investment decisions, it is expected that LUCS will continue to be improved as more accurate and higher precision data become available and accessed directly by other government departments via the state's data portal as a key spatial layer in planning and development decisions. The demand for quality improvement in LUCS will also drive improvement in quality and methods of collection of the input datasets.

5G Precise Positioning Innovation Trials

FrontierSI led the 5G Industry test bed project using the Optus network to demonstrate the economic benefits of precise positioning. The project delivered a world first demonstration of 5G's precise positioning capabilities and showcased the benefits to a myriad of small business across Australia. The trial was part of an overall project funded by the Commonwealth Government and demonstrated applications of precise positioning using 5G agriculture, augmented reality, and drone flight.

In collaboration with our project partners Position Partners, Optus, and Ericsson, a critical component of the trial was completed which looked at enabling Beyond Visual Line of Sight (BVLOS) drone medical delivery flights using SkyLink UTM micro services and cloud platform. Through improved transmission technology, 5G delivered increased bandwidth and high-speed data streaming, alongside new features included in 3GPP releases, allowing delivery of high-accuracy positioning to 5G connected devices, unlocking a plethora of commercial and consumer opportunities, and helping to realise significant benefits to Australia.

Transport and Main Roads (TMR) Spatial Labs

The TMR Spatial Analytics Labs program 2022 (TMR Spatial Labs), delivered by FrontierSI, was created to help Queensland Transport and Main Roads (TMR) engage with industry and academia to explore novel approaches to using Artificial Intelligence/Machine Learning (AI/ML) for automated imagery analysis and product generation, including object classification.

The program harnessed industry and academic AI/ML capabilities to extract insights from airborne, drone and vehicle mounted remote sensing data to address critical challenges and gaps in Queensland's future 'single integrated smart transport network accessible to everyone'. It built strategic partnerships, supported R&D, demonstrated new technologies, and accelerated capability and entrepreneurship across the Queensland transport, AI and spatial sectors.

The program consisted of short-term capability demonstrator/research projects with Queensland and Australian organisations and universities and aimed to improve TMR's access to timely, efficient, accurate, and sustainable data and insights that support state-wide planning and decision-making, and enable future focused smart, connected and autonomous infrastructure, networks and vehicles.

2. Earth Observation Development

In collaboration with Geoscience Australia, FrontierSI released two industry reports which roadmapped expanded use of Earth observation technologies in industry, with further reports scheduled for release in the next financial year.

Mining & METS

Australia's mining and Mining Equipment, Technology and Services sector (the 'mining and METS sector') is progressing towards its Industry 4.0 objectives of digital transformation and automation. Earth observation (EO) technology and insights will play an essential role in this evolution, and increased adoption of EO data and services within the sector raises both opportunities and challenges.

The report identified the mining and METS sector's critical business problems, its operational lifecycle, and its diverse user groups — informing both technology and mining companies of how EO can drive innovation in the sector.

Finance & Insurance

The Finance and Insurance industries are significant contributors to Australia's economy and are currently facing increasing challenges impacting business as usual operations. Climate risk reporting, sustainable finance, and environmental and social governance are of high priority to shareholders and Australian regulators. FrontierSI and Digital Earth Australia co-authored and released a report titled *Investing in the Benefits of Earth Observation* and highlighted why there are vast opportunities for EO data in driving growth and improvement within these industries.

3. FrontierSI – Leaders in Spatial

Delivering value to our Partner network and the broader space and spatial community remains our highest priority. We continue to take a leadership role in building capability through our involvement in committees, conferences, and industry webinars and workshops.

Over the past 12 months, FrontierSI made significant contributions to the space and spatial sectors including:

- Presented our recommendations to the Parliamentary Committee of the Australian Government's Inquiry: *Developing Australia's Space Industry*. Following our submission earlier in the year, FrontierSI emphasised national strategy leadership, and a coordinated and cohesive industry development. The resulting report provided a blueprint for government to better shape policy and legislation to unlock growth in the Australian space sector.
- Continued our involvement with the 2030 Space and Spatial Working Groups where a space and spatial industry growth roadmap is being developed to identify industry growth opportunities and propose actions to grow the space and spatial sectors.

- Hosted 'Learning in action' as part of 2021 Digital Twin Week.
- We were awarded one of five collaborative research projects funded under the UK-Australia Space Bridge framework. The project *Cal/Val Space Bridge: An Earth Observation Partnership* investigates the important topic of assurance of future Earth Observation data.
- Our continued involvement in progressing the Space, Spatial & Surveying Diversity Leadership Network (SSS-DLN), an initiative in response to the 2026 Spatial Industry Transformation and Growth Agenda, bringing together leadership from business, government, and education to provide visible advocacy for diversity and inclusion within the space, spatial and surveying sectors.
- We shared our experience and insight on our role as a communicator between stakeholders and collaborators, enhancing information sharing and the promotion of the spatial data and infrastructures nationally and internationally. Held at the World Bank Virtual Knowledge Exchange on the United Nations Committee of Experts, on Global Geospatial Information Management, Integrated Geospatial Information Framework.
- In partnership with RMIT University, Geoscience Australia, and Otago University, FrontierSI co-authored and published a paper on multi-GNSS precise positioning for Android-based smartphones highlighting that choice of smartphone configuration can affect the positioning performance even in a zero-baseline setup.
- Thought leadership piece authored by FrontierSI and published in AusIMM, the resources sector peak body. The article was designed to help the mining sector understand that they can benefit from, and adopt, space technology in a variety of ways.
- FrontierSI reports released on the opportunities for Earth observation in the Finance and Insurance, and the Mining and METS industries, which are currently facing increasing challenges impacting business as usual operations.
- FrontierSI staff played a crucial role in contributing to the space and spatial industry:
  - Committee Member – Earth Observation Australia.
  - Responsible for several Open Data Cube workshops.
  - Member of the leadership team developing of the Space and Spatial Industry Roadmap 2030 (yet to be released).
  - Member of the Smart Cities Council Digital Twin Working Group.
  - Member of the SSSI Digital Twin Working Group.
  - Presenting at numerous events including Locate22 Conference, Earth Observation Australia Conference, SmartSat CRC Conference.
  - Roshni Sharma recognised in Geospatial World's '50 Rising Stars' edition, and Caitlin Adams recognised as one of the '2022 Leading Women in ML4EO (Machine Learning for Earth Observation)'.

SSSI Asia Pacific Spatial Excellence Awards (APSEA)

We also applaud the hard working and talented FrontierSI Partners and staff who were recognised for their achievements in creating high impact outcomes at the APSEAs – a long-standing premier event in the spatial industry's calendar. Previous years have seen an excellent standard of competition across individuals, and private, public, and academic sector organisations vying for the prestigious recognition.

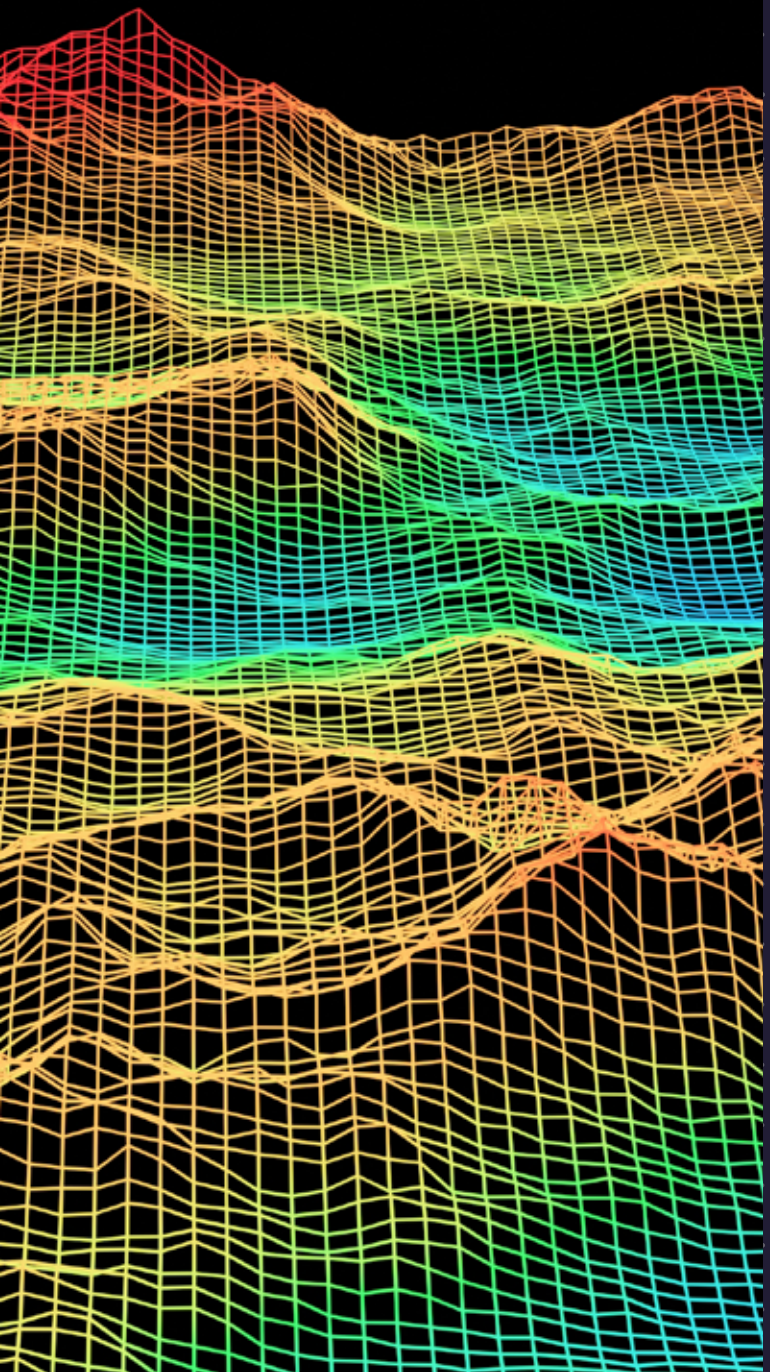
FrontierSI and partner, Orbica, together with Department of Environment, Land, Water and Planning were recognised for their stellar efforts on the Vicmap Vegetation initiative, presented with the Victorian award for 'Environment and Sustainability'. The widely applauded project, led by FrontierSI, refreshed the state-wide Vicmap Vegetation dataset, and in a Victorian-first, a machine learning feature extraction process was combined with aerial imagery and elevation data to extract and classify vegetation resulting in three new products: a tree extent, tree density and a tree ledger.

Additional APSEA Partner recognitions included:

- West Australian Department of Health receiving the 'Community Impact' award for their COVID-19 dashboards.
- NSW Department of Customer Service receiving the Innovation Award (Medium to Large Business) for their work on the Cadastre NSW project.
- QUT for their involvement in ReefCloud, receiving the Environment and Sustainability Award.
- NGIS, in partnership with Winyama, receiving the Workforce Development & Inclusion Award, and overall JK Barrie Award for 'IMW on Demand'.
- NGIS receiving the International Partnership Award for their work on the GEO Google Earth Engine Program.

IN MEMORIAM

During the year we lost **Will Featherstone** who was highly valued and regarded by the FrontierSI community. Will was a geodesist at Curtin University and one of the world's leading experts on Geoid models. His world class research and work has left a lasting impact, particularly through his PhD students and postdocs, who now form a large part of the geodetic capability that Australia relies on.



The appointment of **Patricia Sturgess** (bottom left) in the role of Chief Operating Officer in January 2022, rounded out the Executive team of four including **Graeme Kernich** (Chief Executive Officer) (top right), **Kate Williams** (Chief Business Officer) (top left) and **Phil Delaney** (Deputy CEO).

PEOPLE AND CULTURE

As a service-based organisation our staff are critical. Staff health and well being has been our top priority as we faced the ongoing challenges posed by COVID-19.

Ongoing initiatives such as flexible working conditions, Employee Assistance Program support, and team-based activities to promote social connection and health, have been maintained and are planned to be a permanent feature of how we operate and support our staff. Pleasingly, not only has a high staff retention rate been maintained, we have also attracted a number of new, high calibre staff to our organisation ending the year with 34 full time and part-time staff.

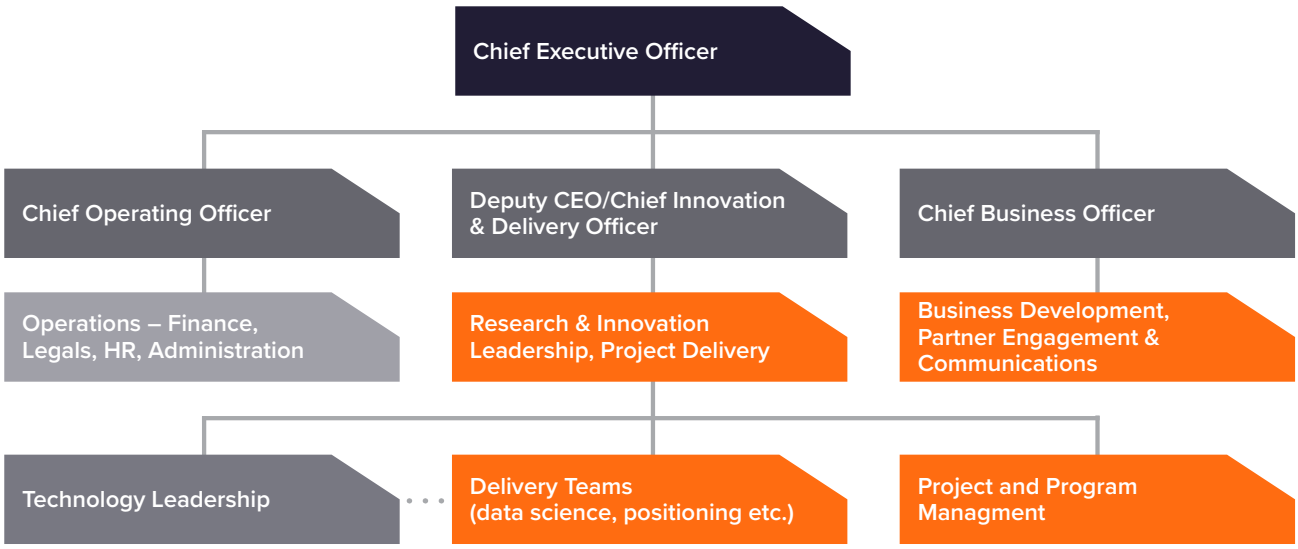
FrontierSI formally operates within a functional structure divided into three key areas:

- **Business Development/Partner Engagement**
- **Operations and Internal Development**
- **Innovation and Project Delivery**

Business development/ partner engagement staff are employed across Australia (Melbourne, Perth, Brisbane) and New Zealand (Christchurch). In addition, senior FrontierSI staff contribute to business development through a range of networking and outreach activities. A Communications Manager is employed to deliver communications and marketing activities via a variety of mediums, working in collaboration with the Business Development team to drive opportunities and enhance our brand.

Specialist science and engineering expertise in our space and spatial discipline areas are a valuable arm of our organisational structure. These discipline leaders provide FrontierSI with insights into industry trends and program related issues and can be seconded at a strategic level to provide input into evaluation of new initiatives.

In-house staff specialist geospatial capability and service delivery has been progressively built to fulfil the anticipated service delivery requirements on current and future projects. Maintaining an internal core capability ensures corporate knowledge is not lost over time. FrontierSI will also scale resourcing via securing capability within partners, and where specialist capability is needed beyond the partner base, via external providers.



- **Four member executive** combining operational skills, industry experience, and leadership.
- **Three functions** covering Operations, Business Development and Partnerships, and Project Research, Innovation and Delivery.
- Continual growth in project delivery requires a **scalable delivery structure** focused on technology leadership, project and program management, and a range of delivery teams themed around specific technical capabilities.

55% MALE

45% FEMALE

84% RETENTION RATE

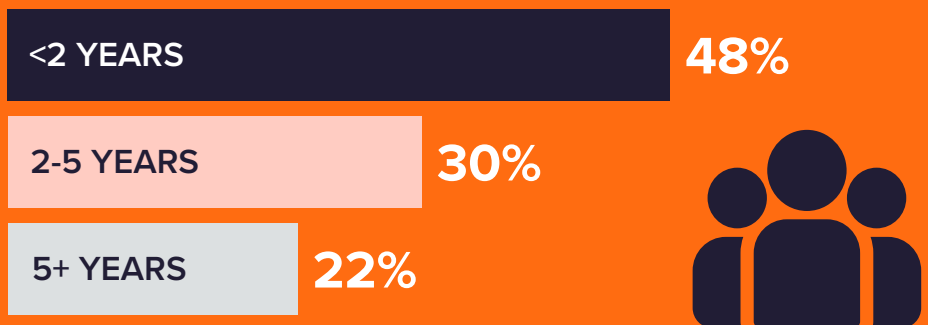
67% FULL TIME

33% PART TIME

STAFF LOCATION

27% STAFF WITH MASTERS QUALIFICATIONS

STAFF TENURE (YEARS)



33% STAFF WITH PhD QUALIFICATIONS

FrontierSI is a progressive organisation that takes diversity and inclusion seriously."

This is the best place I have ever worked for inclusiveness, culture, belonging, and ensuring the staff have a voice."

Diversity and Inclusion

FrontierSI is dedicated to an enduring, organisation wide commitment to diversity, equity and inclusion. Our commitment to D&I is underpinned by our belief that a diverse and inclusive workforce is necessary to drive innovation, foster creativity, and guide business excellence. Our activities in D&I are aligned with our organisational values and strategic objectives and drive towards our ambition to attract and retain the best people to our organisation.

In 2021 – 2022 our commitment to D&I has been demonstrated by various means, including:

- Establishment of a staff-led D&I committee.
- Conducting the inaugural FrontierSI staff inclusion and belonging survey.
- Adopting policies and initiatives which align with our commitment.
- Engaging expert external facilitators to conduct D&I workshops for our staff.
- Establishing a paid internship program to provide work experience opportunities to students who may traditionally face barriers to entering the industry.
- Implementation and trialling of initiatives from the 2026 Agenda Diversity and Inclusion Action Plan.
- Promoting the SSSDLN Accord and the results of the Space, Surveying and Surveying Diversity Leadership Network (SSSDLN) Inclusion@Work Report.
- Supporting our internal champions who are industry leaders in this area.

> *"I'm so pleased that we have incredible women with scientific backgrounds in our organisation, and that it feels normal. Thank you for hiring incredible women."*

We have tracked our progress by benchmarking the state of diversity within our workforce against that within the sector and having achieved an industry leadership position in relation to pay parity, gender equality and flexible work practices.

Spatial Sector[1]	FrontierSI in 2021-22
Gender pay gaps in key roles	Average hourly rate **pay parity** achieved in 2021-22
25% Female representation	**45%** Female employees Leadership – **Executive 50%** Female and **Board 43%**
17% of private sector organisations with a gender equality or flexibility strategy	Flexible working arrangements in place **33%** staff work part time
17% of workforce > 55 yrs	**12%** employees > 55 yrs
Limited evidence of employees from non-Anglo and indigenous backgrounds and employees with disability	**36%** of employees with origins other than Australia with **7** countries represented Support and employment of persons with disability

We are also proud of our internal leaders in D&I who have contributed to D&I initiatives within our workplace, our industry and more broadly. These include:

- Roshni Sharma, who is currently Co-Convenor of the Space, Spatial & Surveying Diversity Leadership Network (SSSDLN) and has represented FrontierSI at several events including a D&I panel at the Locate22 conference and presenting a keynote on 'Power, Privilege and Data' at the 2022 Spatial Information Day, as well as being part of the FrontierSI and SmartSatCRC DE&I committees.
- Jia-Urnn Lee, who spoke at the Women in STEM event at ANU as part of National Science Week, 2022 and has been profiled by Space Australia through their 'Women in Space' initiative.
- Laura Spelbrink, who is the current Chair of the FrontierSI D&I committee and has represented FrontierSI at the 2022 Chief Executive Women Summit and through the CSIRO STEM Professionals in Schools program.
- Jasmine Muir, member of the Technical Advisory Committee for Australian Spatial Analytics (a social enterprise creating geospatial work for people with Autism Spectrum Disorder).
- Kate Williams, SSSI mentor and regular presenter and advocate on STEM and D&I issues across other sectors.

PROJECT DELIVERY

In 2021-22, FrontierSI led, formulated, brokered, and delivered solutions with government, industry, and university partners within a portfolio of 71 projects. 36 Projects were completed, 31 new projects commenced and FrontierSI began 2022-23 with an active project portfolio of 39 projects with cumulative funding value in excess of $21M.

FrontierSI exists to solve partner challenges and our portfolio reflects the deep level of engagement we have with our partner network. Our projects engaged 59 project partners, with each of our university and government partners involved in multiple initiatives. Maintaining alignment with partner and stakeholder strategies and initiatives across our project portfolio is an ongoing priority, both in assessing the activities to pursue and in determining how we deliver.

Positioning and Geodesy Project Portfolio

Project Title	Key Sectors	Status	Collaborators
Precise GNSS positioning with smartphones	Government	Completed	Geoscience Australia, RMIT, Otago University
Prototyping of satellite laser ranging (SLR) capabilities for Ginan	Government	Completed	Geoscience Australia, Industrial Sciences group
Precision Timing for Space-Based Applications – Utilisation Study	Space and Spatial	Completed	SmartSat CRC, RMIT
Geospatial Reference Frame for United Arab Emirates (UAE)	Government	Commenced and Completed	Spatial Vision, UAE
AGIG GNSS Data Integration	Infrastructure	Commenced and Completed	Australian Gas Infrastructure Group (AGIG)
Developing a practical and comprehensive approach to crustal deformation modelling in support of Australia's time-dependent reference frame	Government	Completed	DELWP, Spatial Services NSW, Geoscience Australia, LINZ, Curtin University, Position Plus Plus
Ongoing Development of the Multi GNSS Analysis Centre Software	Government	Ongoing	Geoscience Australia
Ionospheric modelling for the Analysis Centre Software and National Positioning Infrastructure	Government	Ongoing	Geoscience Australia
Provision of SBAS Specialist Research & Technical Capability	Government	Commenced	Geoscience Australia
Calibration of Signal Power, and their utilisation from ground tracking networks for constellation monitoring	Government	Ongoing	Geoscience Australia, University of Tasmania
Positioning Australia – Accelerating Industry Adoption	Whole of Economy	Ongoing	Geoscience Australia, Curtin University, Positioning Insights
Ginarn QA Demo	Government	Commenced	Geoscience Australia
5G Precise Positioning Testbed	Whole of Economy	Commenced	Geoscience Australia, Positioning Partners, Optus, Ericsson, Acil Allan
Developing low earth orbit GNSS data analysis capability for Ginan	Government	Commenced	Geoscience Australia
A scoping study and 'gap' analysis for the development of a national hydroid model ("AUSHYDROID")	Government	Ongoing	AGO, Curtin University, Geoscience Australia, Bureau of Meteorology, West Australian Dept of Transport

Data Analytics Portfolio

Project Title	Key Sectors	Status	Collaborators
Vicmap Machine Learning Feature Extraction Phase 2	Government	Completed	DELWP, Orbica
Earth Observation Analytics Solutions: Know the Market to Grow the Market	Space and Spatial	Completed	Geoscience Australia, SmartSat CRC
Australian Geospatial Intelligence Organisation (AGO) Analytics Labs 2020	Government	Completed	AGO
Digital Earth Africa Industry Engagement	Government	Completed	Geoscience Australia, NGIS
Knowledge gaps and opportunities for earth observation tools in mine-rehabilitation at the property scale	Resources	Completed	SmartSat CRC
Stocktake and capability analysis of spatial information technology and data coordination for State of the Environment reporting	Government	Completed	DELWP
New Zealand Earth Observation Scoping Study	Government	Completed	LINZ
Indigenous Earth observation	Space and Spatial	Completed	SmartSat CRC
Cliniface Stage 3 – Integrating, Enhancing and Scaling 3D-FAST for local and international impact	Health	Commenced and Completed	Takeda, Curtin University, SingHealth
Open Data Cube Documentation	Government	Commenced and Completed	Geoscience Australia
Earth Observations for Farm Scale Carbon Accounts	Agriculture and Natural Resources	Commenced and Completed	La Trobe University
WA Vegetation Extent and Change Scoping	Government	Commenced and Completed	NGIS, Department of Water and Environmental Regulation
ConnectEO Euopean B2B Connections	Space and Spatial	Commenced and Completed	European Union
Digital Earth Africa Notebook Uplift	Government	Completed	Geoscience Australia, DEAfrica
NSW Riverlines Toolkit Modification & Training	Agriculture and Natural Resources	Completed	Spatial Services NSW
QA4Imagery	Government	Completed	Spatial Services NSW, DELWP, Minerals Research Institute of Western Australia,
Geological Survey QLD Industry Report Text Conversion	Resources	Commenced and Completed	Queensland Department of Resources, QUT
STAC Browser Improvements	Government	Commenced and Completed	Radiant Earth Foundation

Data Analytics Portfolio *continued*

Project Title	Key Sectors	Status	Collaborators
Land Use Classification System for Rural Valuation	Built Environment	Completed	Spatial Services NSW, NSW Office of the Value – General
SatCom IoT-enabled Automatic Ground Water Collection and Aggregation Pilot (SIG Water)	Environment	Completed	NGIS, UniSA, Myriota, SmartSat CRC
AusEnHealth Digital Twin – Scoping Study & Conceptual POC	Health	Completed	QUT, DoH WA, NGIS, AURIN, EPA VIC, University of Queensland TERN
Provision of Market Research for continuation of DEA Industry Strategy	Government	Ongoing	Geoscience Australia
AusSeabed Data Hub Component Development	Government	Ongoing	Geoscience Australia
Cliniface, The Answer Machine (Pilbara Faces Stage 2)	Government	Ongoing	Curtin University, Perth Children's Hospital
The Australian Housing Data Analytics Platform Work	Built Environment	Ongoing	University of NSW
Cliniface – Landmarking the Extreme	Health	Commenced	Child and Adolescent Heath Service, Curtin
Vietnam Earth Observations Market Study	Space and Spatial	Commenced	Symbios
Land Cover for Digital Earth Africa and UN FAO	Environment	Commenced	Geoscience Australia, UN FAO
Enabling Crop Analytics at Scale in Africa	Environment	Commenced	Geoscience Australia, Tetratech
QLD TMR Labs	Government	Commenced	QLD TMR
Cliniface Takada Protocol Phase 1	Health	Commenced	Curtin University, Takeda, SingHealth
UK GRIP Agroclimate Study	Government	Commenced	Symbios
Open Data Cube Training and Business Engagement for South East Asia	Government	Commenced	Geoscience Australia, Symbios
QLD Gravity Scoping Study	Resources	Commenced	Queensland Department of Resources
ConnectEO European Trade Mission	Government	Commenced	EARSC
WA Bayesian Health Insights	Health	Commenced	WA DoH, QUT
Value Australia – Sharpening our land and property decisions with Artificial Intelligence	Built Environment	Completed	Spatial Services NSW, UNSW, QUT, Omnilink, Commonwealth Bank, Liverpool Council
Prioritising GDV inspection using ensemble models and near real-time monitoring	Environment	Ongoing	Geoscience Australia, Curtin, Roy Hill, BHP, Rio Tinto, FMG, DWER, Atlas Iron, DBCA

Spatial Infrastructures Portfolio

Project Title	Key Sectors	Status	Collaborators
Architectural Review of the NSW Government Spatial Portal	Government	Completed	Spatial Services NSW, QUT, Business Aspect
Digital Twin Specialist Research and Technical Capability	Government	Completed	NSW Spatial Services
Towards the Cadastre QLD. Transformation Program Through a Digital 3D Cadastre Demonstrator	Government	Commenced and Completed	Queensland Department of Resources
Liveable City Digital Twin Pilot: Analytics for agile decision making	Built Environment	Ongoing	Spatial Services NSW, UNSW
Towards a National Digital Twin for Flood Resilience in New Zealand	Environment	Ongoing	LINZ, University of Canterbury
Development of a Public Health Atlas for WA	Health	Ongoing	WA Health, Spatial Vision
Van Kirap Portal Demonstrator	Environment	Ongoing	NGIS, CSIRO
QLD Data and Future Economic Opportunities Strategy	Government	Commenced	Queensland Department of Resources

Space Portfolio

Project Title	Key Sectors	Status	Collaborators
Next Generation Testbed Design for Earth Observation	Space and Spatial	Completed	SmartSat CRC
Calibration and validation of remote sensing imagery sensors and data	Space and Spatial	Completed	Geoscience Australia
SmartSat CRC Industry Activation	Space and Spatial	Commenced and Completed	SmartSat CRC
Smartsat Capability Lead Aquawatch	Space and Spatial	Commenced and Completed	SmartSat CRC
A Proof of Concept and feasibility study utilising space technologies to advance the aquaculture markets in Western Australia remote and regional areas (OysterQual)	Agriculture and Natural Resources	Ongoing	SmartSat CRC, Curtin University, Maxima Pearling, Geoplex
UK Space Bridge – CalVal	Space and Spatial	Commenced	Symbios, SmartSat CRC
Technical Feasibility and Implementation Plan for an Australian Data Quality and Integrity Monitoring Facility	Space and Spatial	Commenced	Geoscience Australia, ANU
National Space Missions Scoping	Space and Spatial	Commenced	UNSW, Space Agency

UTILISATION AND COMMERCIALISATION

The successful commercialisation of the Value Australia outcomes highlights that effective management and utilisation of IP is fundamental to achieving the objectives set out in FrontierSI's Strategic Plan. The management of IP is guided by the following practices:

- Facilitation of rapid uptake (and capability) by end-users and stakeholders for national benefit.
- Innovative use of IP including all FrontierSI Core Partners having a licence to use IP for internal research purposes.
- Endeavouring to make prior decisions about the commercial potential of investments in IP from research. Where an impact maximising an outcome of public good is sought or where there was no commercial uptake (and no national security or privacy issues) then the IP will be placed into the public domain.
- Operating an end-user uptake pathway with an emphasis on partnering SMEs and government organisations, supported by research providers. Appropriate consideration is also given to the needs of corporate participants.

PARTNERSHIPS AND KEY STAKEHOLDERS

Partnerships

FrontierSI would not exist without its partners. Our model for ongoing sustainability is predicated on solving partner challenges by drawing on the expertise of our university and industry partners. Our fundamental role is in providing the brokering and coordination function ensuring the best teams come together to deliver impactful and sustainable outcomes.

'The AGO Labs program, coordinated through FrontierSI, is a great initiative to better engage and work with industry. We really enjoyed this opportunity to collaborate on this innovative research project. We found that all the challenge topics were interesting and required innovative state-of-the-art research-based solutions. This program helped us build a strong relationship with AGO and FrontierSI and opened up new avenues for future collaborations.'

NGIS

We responded to partner requests to provide more opportunities for networking by introducing the *Connect, Share and Learn Series* which will continue with a fresh focus in 2022-23. Our partner managers and technical staff provided support to government partners through strategic and technical advice and worked with our delivery partners to formulate and deliver impactful projects.

Our partner management team have also undertaken a thorough review of FrontierSI's partner model in consultation with government, university, and industry support partners. This has culminated in a revised partner model that will see us continue to strengthen our ecosystem and partner network focusing on growing mutually beneficial relationships, reviewing our industry and university partner mix to meet anticipated future demand, and advancing deep and sustaining relationships with end user sectors. This will assist us in meeting our growth targets, enabling us to deliver greater benefits for our partners and increase our impact more broadly.

Some important key principles will be carried over to the revised partner model including:

- FrontierSI will remain a partner-driven/social enterprise organisation
- FrontierSI will remain a not-for-profit organisation
- Operating surplus will continue to be re-invested into collaborative initiatives with partners.

It has been a pleasure collaborating with partners, assisting partners, advising partners and learning from partners and we look forward to another successful year ahead.

The Epidemiology Directorate has been extremely happy with the partnership and are keen to broaden the engagement to other parts of the Department. FrontierSI have been very valuable in connecting us to expertise and other organisations that have enabled us to formulate projects that have delivered on our Operational Plan. We are particularly happy with FrontierSI's assistance in our Strategy refresh."

WA Department of Health

We are proud and grateful to have maintained a solid partner base in 2021-22 and we attribute this mutually beneficial success to our strong and deep relationships which have been built over time through strong partner engagement.

FrontierSI would like to acknowledge its Partners for their ongoing support and collaboration >

The partnership with FrontierSI was critical in realising UNSW's research commercialisation agenda in line with the national strategy to increase university and industry collaborations."

University of NSW (UNSW)

Core Partners

NSW Government Spatial Services

Australian Government Geoscience Australia

UC University of Canterbury

QUT

Queensland Government

Australian Government Department of Defence

Curtin University

RMIT University

Support Partners

Land Information New Zealand Toitū te whenua

UNSW Australia

Government of Western Australia Department of Health

Industry Support Partners

FUGRO

PHOTOMAPPING

HG Digital

Symbios

Spatial Vision

ISG The Industrial Sciences Group

MERCURY PROJECT SOLUTIONS

GHD

ORBICA LOCATION. DATA. CONNECTIVITY.

ngis people partnership success

POSiTiON+

Position Partners Shaping New Dimensions

Geoscape

OMNILINK LINKING PEOPLE AND INFORMATION

BUSINESS ASPECT

AAM A WOOLPERT COMPANY

Key Stakeholders & Collaborators

Success comes when teams across disciplinary, organisational, cultural, and international boundaries work together. We are solutions-driven and achieve high quality outcomes through collaboration.

AMIRA Global

Status: Memorandum of Understanding

Amira is an independent global not-for-profit organisation representing members from the resources industry seeking to enhance, sustain and deliver transformational research and development, innovation and implementation to the benefit of society.

ANZLIC (The Australia-New Zealand Land Information Council)

Status: Spatial Organisation (Research & Innovation Collaborator)

ANZLIC (The Spatial Information Council) is the peak intergovernmental body in Australia and New Zealand providing leadership on all aspects of spatial service delivery and information. ANZLIC is a key stakeholder for FrontierSI. Half of ANZLIC's members are FrontierSI partners, and FrontierSI's strategy is highly aligned with the 2020-24 ANZLIC strategy.

AusSeabed

Status: Program Collaborator

AusSeabed is a national seabed mapping coordination program aimed at improving the awareness, coverage, quality, discoverability, and accessibility of seabed mapping data through coordination and collaboration in the Australian region.

Australian Space Agency

Status: Joint Statement of Strategic Intent and Cooperation

The Australian Space Agency and FrontierSI share the goal of developing a globally respected Australian space industry to deliver the benefits for Australians that will flow from the advancement of the space and spatial sectors. FrontierSI has a critical role making the information from space usable for downstream industry sectors including the agriculture, health, mining, built infrastructure, transport, energy, defence, and environmental sectors.

CRC for Developing Northern Australia

Status: Member

The Cooperative Research Centre for Developing Northern Australia (CRCNA) is investing funds over ten years to support industry-led research collaborations to develop new technologies, products and services which address industry issues in Northern Australia.

Earth Observation Australia

Status: Member

Earth Observation Australia aims provide a national base for regular communication and coordination of Earth observation data collection, distribution, access, product and service development and delivery and calibration and validation activities across all relevant federal and state government agencies, research agencies, universities, private sector and non-government organisations.

European Association of Remote Sensing Companies (EARSC)

Status: Strategic relationship through Memorandum of Understanding

EARSC and FrontierSI are cooperating on the promotion of Earth observation (EO) technology use and in supporting collaboration and exchange between companies in Europe and Australia which offer EO-related products and services.

Group on Earth Observations

Status: Participating Organisation

FrontierSI has been an active member of the Group on Earth Observations (GEO) Community since 2017 through our participating organisation status. GEO is a partnership of more than 100 national governments and more than 100 participating organisations that envisions a future where decisions and actions for the benefit of humankind are informed by coordinated, comprehensive and sustained Earth observations. The GEO community focuses on three global priority engagement areas: the United Nations 2030 Agenda for Sustainable Development, the Paris Agreement, and the Sendai Framework for Disaster Risk Reduction.

ICSM

Status: Research and Innovation Collaborator

The Intergovernmental Committee on Surveying and Mapping (ICSM) was established in 1988 and membership is comprised of senior representatives of surveying and mapping agencies. In 2002, ICSM became a Standing Committee of ANZLIC – the Australian and New Zealand Spatial Information Council. ICSM's core function is to coordinate and promote the development and maintenance of key national spatial data including geodetic, topographic, cadastral, street addressing, tides and sea level, and geographical names.

Open Geospatial Consortium

Status: Memorandum of Understanding and OGC member

In 2020, FrontierSI re-signed a Memorandum of Understanding with the global not-for-profit geospatial organisation, Open Geospatial Consortium (OGC). The OGC community creates free, publicly available geospatial standards that enable new technologies. OGC and FrontierSI are committed to connecting communities and technology within and across domains. OGC and FrontierSI work together on joint activities to reach out, innovate and educate at national, regional and international levels.

SIBA GITA

Status: Stakeholder

SIBA|GITA is the peak body representing the Spatial Industry. SIBA|GITA is a unified network throughout Australasia, working together to build a more innovative, entrepreneurial and prosperous Australia.

Smart Cities Council

Status: Australian Innovation Partner

FrontierSI ratified a strategic partnership with Smart Cities Council (Australia/New Zealand) as an Australian Innovation Partner, in June 2020. They are a network of leading companies advised by top universities, laboratories and standards bodies.

SmartSat CRC

Status: Strategic Partnership (as Core Participant)

FrontierSI is a core partner of the SmartSat CRC where we apply our expertise to strengthen the connection between space and spatial and establish a demand-driven, thriving space industry.

SmartSat CRC comprises some of our industry partners and involves some of our key university partners RMIT, Curtin University, QUT and UNSW.

SSSI

Status: Stakeholder

The Surveying & Spatial Sciences Institute (SSSI) is the national peak body catering for professionals who make up the spatial information industry throughout Australia and New Zealand. SSSI gives a voice to members of the spatial science community in both the national and international arena.

UNGGIM – Private Sector Network

Status: Founding Member

The value and utility of geospatial information in society and the world economy has been recognised by the United Nations through the establishment of the United Nations Global Geospatial Information Management (UN-GGIM). Through CRCSI, FrontierSI became a founding member in the UNGGIM-PSN in 2016.

2026 Spatial Industry Transformation and Growth Agenda

Status: Coordinator and Participant

FrontierSI (formerly the CRC for Spatial Information) together with SIBA/GITA led the development and implementation of the 2026 Spatial Industry Transformation and Growth Agenda, which aims to transform and realise the potential of the local spatial industry and see it recognised as an underpinning element of the Australian digital economy.

2030 Space and Spatial Industry Roadmap

Status: Participant in the Strategic Steering Committee and Working Group

The Space and Spatial Industries are both classified as emerging industries and are both growing substantially faster than the national economy. An opportunity exists to coordinate the collaboration of these mutually dependent industry sectors, develop the synergies between them and substantially accelerate the growth of these industries and create thousands of new, high value jobs.

GOVERNANCE AND MANAGEMENT

Spatial Information Systems Research Limited (SISR), trading as FrontierSI is an unlisted public company limited by guarantee.

SISR has status as a not-for-profit charitable organisation under Subdivision 50-B of the Income Tax Assessment Act 1998 and section 123E of the Fringe Benefits Tax Assessment Act 1986.

FrontierSI's partners contribute to organisational governance through participation in a nomination and appointment process of the skills-based Board who is responsible for the governance and operations of FrontierSI. Within a governance framework which is supported by a four Board Committee structure, the seven-member Board is comprised of a mix of independent and representative members including an independent Chair and a Managing Director in the CEO, with Executive support for Board and Committees provided by the COO who is the appointed Company Secretary.

Board focus remains the welfare of FrontierSI staff as well as the progression of longer-term strategic initiatives at a pace commensurate with business and key stakeholder priorities. At the end of 2021-22 FrontierSI is four years into initial five-year partner agreements. An external review of the business strategy and operating model was undertaken with a view to ensuring that FrontierSI continues to provide value to its partners and is positioned for sustainable growth. This has formed the basis of the new Vision and Purpose statements as well as the Strategic Goals and Business Plan.

IN MEMORIAM

FrontierSI was saddened by the loss of Bruce Thompson in October 2021.

Bruce was Executive Director Spatial Services, NSW Department of Customer Service, one of FrontierSI's core partners, and was a valued and respected Board member of FrontierSI. He was a leader in the Spatial Industry in Australia for three decades, and his leadership had an enormous impact on FrontierSI and the spatial industry.

Many of the government spatial innovations today would not exist without his foresight and boldness. His impact on the spatial industry, particularly at NSW DCS Spatial Services, and DELWP, will be enduring. He made many lasting contributions, from Victoria's nation-leading implementation of a fully operational CORS network, known as VicMap Position – GPSNet, through to initiating collaborative work on data cubes, which after 10 years, several iterations, innovations, and champions, became Digital Earth Australia at Geoscience Australia. His most recent legacy was in developing the vision and support for the NSW Spatial Digital Twin which will deliver benefits to government, industry and the community of NSW. And as a leader, Bruce worked to ensure that there was a national vision for Digital Twins which will have significant and lasting flow on-effects to other states, and the Commonwealth.

2021-22 Board & Committee Meetings

	Board		Finance, Risk and Audit Committee		Strategy & New Initiatives Committee		Remuneration Committee		Nominations Committee	
Number of meetings held	12		3		1		1		1	
	Eligible	Attended	Eligible	Attended	Eligible	Attended	Eligible	Attended	Eligible	Attended
Bruce Thompson	1	1								
Chris Thomas	12	11	3	3	1	1			1	1
Gillian Sparkes	12	12			1	1	1	1	1	1
Graeme Kernich	12	12			1	1				
Michelle McLean	12	12	3	3			1	1	1	1
Paul Farrell	12	12			1	1				
Wendy Lawson	12	10								
Steve Jacoby***	4	3			1	1				
James Johnson	5	4			1	1				
Wayne Poole*			3	3						
Melanie Plumb (CS)**	10	9	3	3	1	1	1	1	1	1

Notes: **Wayne Poole, Senior Manager, Strategic Modelling, Business Advisory @ Core Partner RMIT is a member of FRAC.*
***Melanie Plumb is the appointed Company Secretary. ***Steve Jacoby – appointed to the Board on 8 March 2022 and resigned on 22 June 2022.*

FrontierSI Board

GILLIAN SPARKES
Chair
(Independent)

CHRIS THOMAS
Deputy Chair
(Independent)

MICHELLE MCLEAN
(Independent)

JAMES JOHNSON
Government Partner representative

WENDY LAWSON
(University Partner Representative)

PAUL FARRELL
(Industry Partner Representative)

GRAEME KERNICH
CEO & Managing Director

MELANIE PLUMB
Company Secretary

COMMUNICATIONS

The Communication Purpose

The purpose of FrontierSI communication is to:

1. Convey an accurate sense of what FrontierSI is doing, and by whom, to our partners and stakeholders.
2. Promote FrontierSI, our Partners, our outputs and our benefits to the wider community building a sense of the novel and foundation spatial research we conduct that leads to improved social and economic wellbeing across Australia and New Zealand.
3. Reinforce a sense of pride and achievement in the work we do. The content focus of our communication is based on three core areas:
   - Project impacts, outcomes, applications, and adoption of new technologies
   - Conveying opportunities for our partners to participate in research and innovation activities in our program areas
   - Celebrating the achievements of our collaborative partnerships.

We aim to tell our stories in a practical impactful way to our partners, government, and the private sector. Our conversations beyond the immediate spatial community will seek to grow the spatial value chain by substantially increasing the impact of our activities and those of our Partners.

6.7K
UNIQUE OPENS FOR NEWSLETTER

133K
IMPRESSIONS

2K+
FOLLOWERS

45.1K
IMPRESSIONS

1.4K
FOLLOWERS

2021-22 Snapshot

FrontierSI continued its approach of building and strengthening its brand during a post-pandemic year. The pandemic reinforced what we already knew: that we would continue to communicate in very local and precise terms, target specific audiences based on their circumstances and what is most relevant to them. That meant truly understanding the situation on the ground, sector by sector.

Digital transformation accelerated overnight. This, in turn, sent our audience expectations on a steep rise regarding what value we could add. We used a more digital experience to engage our partners (workshops, webinars, social media, direct marketing, published reports and articles) so we could further continue creating a position of thought leadership. The space and spatial audience expects so much more than just a seamless digital transaction.

Social media, direct marketing and several media initiatives continued to play critical roles and prove to be the most effective platforms to communicate our success stories. And the results speak for themselves.

Our communications efforts were rewarded with exceptional results on social media including **surpassing 2000 followers on LinkedIn** – which has now become our primary voice to industry – with **more than 600 new followers** gained in the financial year and **over 130,000 impressions**; and **over 1400 followers** and **more than 45,000 impressions on Twitter.**

Our newsletter also played a crucial role in communicating our thought leadership position, reaching **in excess of 2,500 subscribers** across 11 published issues throughout the year producing an average of 28% total opens, well above the industry average of 18% and a cumulative result of close to **7,000 unique opens**.

A selection of our most read and engaged success stories included FrontierSI's involvement in:

- RMIT's Victorian Space Industry Hub launch
- 5G Innovation Initiative – Industry Test-bed Project launch
- Mining & Mets Report launch
- Finance & Insurance Report launch
- DEA collaboration with GINAN launch

> ***"We use communications to increase our reach, promote our partner activities and successes, and to build a stronger collective brand"***

- UK-Australia Space Bridge collaborative research funding announcement
- EARSC collaboration with ConnectEO
- Queensland Department of Transport and Main Roads collaboration with TMR Spatial Labs initiative
- Collaboration on Vietnamese and Australian geospatial industries research
- Our lead involvement in Locate22 and several partner success updates
- FrontierSI's submission to the Inquiry into Developing Australia's Space Industry
- The global exposure of 3D facial analysis open-source platform, Cliniface
- Ginan launch – the first Australian-developed open source software providing real-time corrections to positioning data
- SmartCities Council Digital Twin Week 2021

The FrontierSI team collaborating at Locate22

FINANCIALS

FrontierSI remains in a sound financial position and delivered a favourable result to the budget in 2021-22, ending the year with an operating surplus of $32k against a budgeted deficit of $755k.

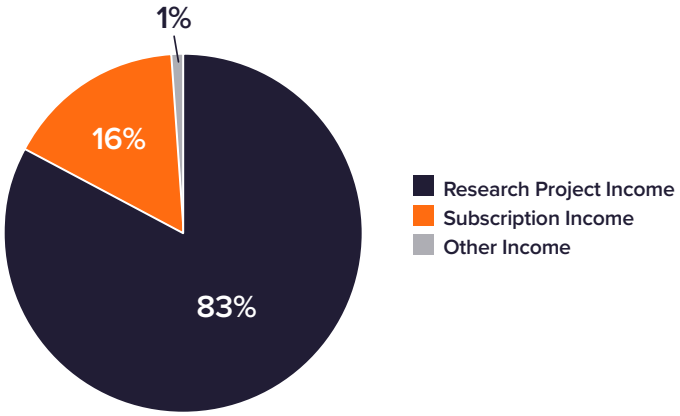
This favourable variance was driven by expenditure savings in projects with delays experienced in contracting and commencement of new projects, rephasing of project delivery, lower than anticipated expenditure on new projects and through savings in operating costs.

2021-22 Financial Year Highlights:

- **Growth from previous year income of 9% ($10.1M is 2021-22 vs $9.25M in 2020-21)**
- **Maintained operational expenditure at < 25% of total spend for 2021-22**
- **Finished 2021-22 with Net Equity of $7.4M including $5.9M of funds in reserve.**

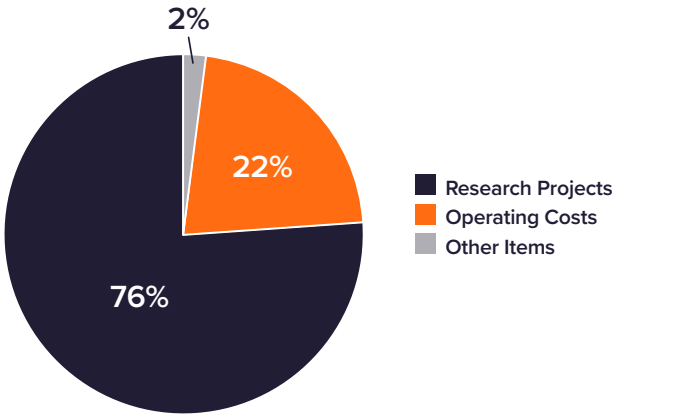
2021-22 Income

Research Project Income	$8.4M
Subscription Income	$1.6M
Other Income	$0.1M
Total Income	**$10.1M**
Budget	***$10.0M***



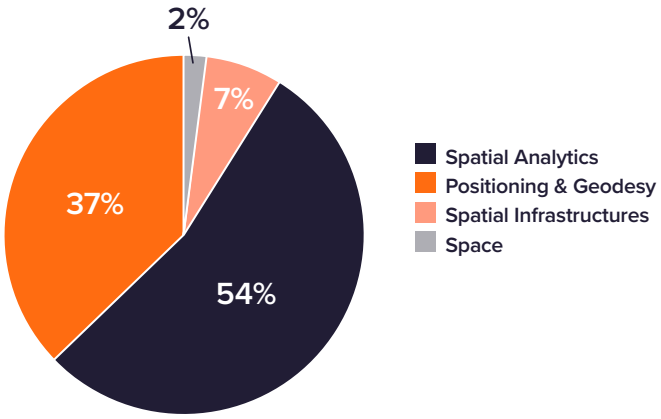
2021-22 Expenditure

Research Projects	$7.6M
Operating Costs	$2.2M
Other Expenditure	$0.2M
Total Expenditure	**$10.0M**
Budget	***$10.75M***



2021-22 Project Portfolio Allocation

Spatial Analytics	$4.1M
Positioning & Geodesy	$2.8M
Spatial Infrastructures	$0.5M
Space	$0.2M
Total Expenditure	**$7.6M**



GLOSSARY

FrontierSI Partners	
AGO	The Australian Geospatial-Intelligence Organisation, Department of Defence
RMIT	RMIT University
Curtin	Curtin University
UC	University of Canterbury
GA	Geoscience Australia
UNSW	University of New South Wales
DELWP Vic	Department of Environment, Land, Water & Planning, Victoria
DOH WA	Department of Health, Western Australia
LINZ	Land Information New Zealand
Spatial Services NSW	Spatial Services, Department of Customer Service, NSW
QDR	Department of Resources, Queensland

Project Partners, Collaborators and Technical Terms	
ACS	Analysis Centre Software
AGIG	Australian Gas Infrastructure Group
AI/ML	Artificial Intelligence/Machine Learning
ANZLIC	Australia & New Zealand Spatial Information Council
APEC	Asia-Pacific Economic Cooperation
APSEA	Asia Pacific Spatial Excellence Awards
AURIN	Australian Urban Research Infrastructure Network
AusCalVal	Australia Calibration and Validation project
AusEnHealth	Australian Environmental Health
AusHYDROID	A scoping study and 'gap' analysis for the development of a national hydroid model
CEO	Chief Executive Officer
Cliniface	3D facial visualisation, measurement and analysis software
COVID-19	Coronavirus infectious disease caused by the SARS-CoV-2 virus.
CSIRO	Commonwealth Scientific and Industrial Research Organisation
D&I	Diversity and Inclusion
DELWP	Department of Environment, Land, Water & Planning, Victoria
DEM	Digital Elevation Model
DEW	Department for Environment and Water South Australia
DFAT	Department of Foreign Affairs and Trade, Australia
Digital Twin	Virtual representation that serves as the real-time digital counterpart of a physical object or process
EARSC	European Association of Remote Sensing Companies
EO	Earth Observation
EPA Victoria	Environmental Protection Agency Victoria
FSDF	Foundation Spatial Data Framework
FTE	Full Time Equivalent
GDAL	Geospatial Data Abstraction Library
GDP	Gross Domestic Product
GEO Week	Group on Earth Observations Intergovernmental Summit

Ginan	The Geoscience Australia Positioning Toolkit formerly known as ACS (Analysis Centre Software)
GIS	Geographic Information System
GITA	Geospatial Information and Technology Association
GNSS	Global Navigation Satellite Systems
IoT	Internet of Things
LEO	Low Earth Orbit
LINZ	Land Information New Zealand
METS	Mining Equipment & Technology Services
Nano-Satcom	Nano-satellite telecommunications
NIWAR	National Institute of Water and Atmospheric Research Limited NZ
NPIC	National Positioning Infrastructure Capability
ODC	Open Data Cube
OEH	Office of Environment and Heritage NSW
OGC	Open Geospatial Consortium
OysterQual	A Proof of Concept and feasibility study utilising space technologies to advance the aquaculture markets in Western Australia remote and regional areas
PEA	Parameter Estimation Algorithm
POC	Proof of Concept
POD	Precise Orbit Determination
PPP	Precise Point Positioning
QA	Quality Assurance
QC	Quality Control
QUT	Queensland University of Technology
QZSS	Quasi-Zenith Satellite System
RAISE	Rapid Analytics Interactive Scenario Explorer
RLT	River Lines Toolkit
SBAS	Satellite-Based Augmentation System
SCRs	Satellite Cross-Calibration Radiometers
SCT	Survey Coordination Tool
SIBA	Spatial Industries Business Association
SigWater	SATCOM IOT-Enabled Automatic Ground Water Collection and Aggregation Pilot
SISR	Spatial Information Systems Research Ltd
SME	Small to Medium Size Enterprise
SPREP	Secretariat of the Pacific Regional Environment Programme
SSS-DLN	Space, Spatial & Surveying Diversity Leadership Network
SSSI	Surveying & Spatial Sciences Institute
TERN	Terrestrial Ecosystem Research Network
UAV	Unmanned Aerial Vehicle
UM	University of Melbourne
VanKIRAP	Operational version of a web-based Climate Information Services Portal for Vanuatu

WE EXIST TO BRING THE BEST PEOPLE TOGETHER TO SOLVE THE MOST COMPLEX PROBLEMS.

FRONTIER SI

We know where.

frontiersi.com.au