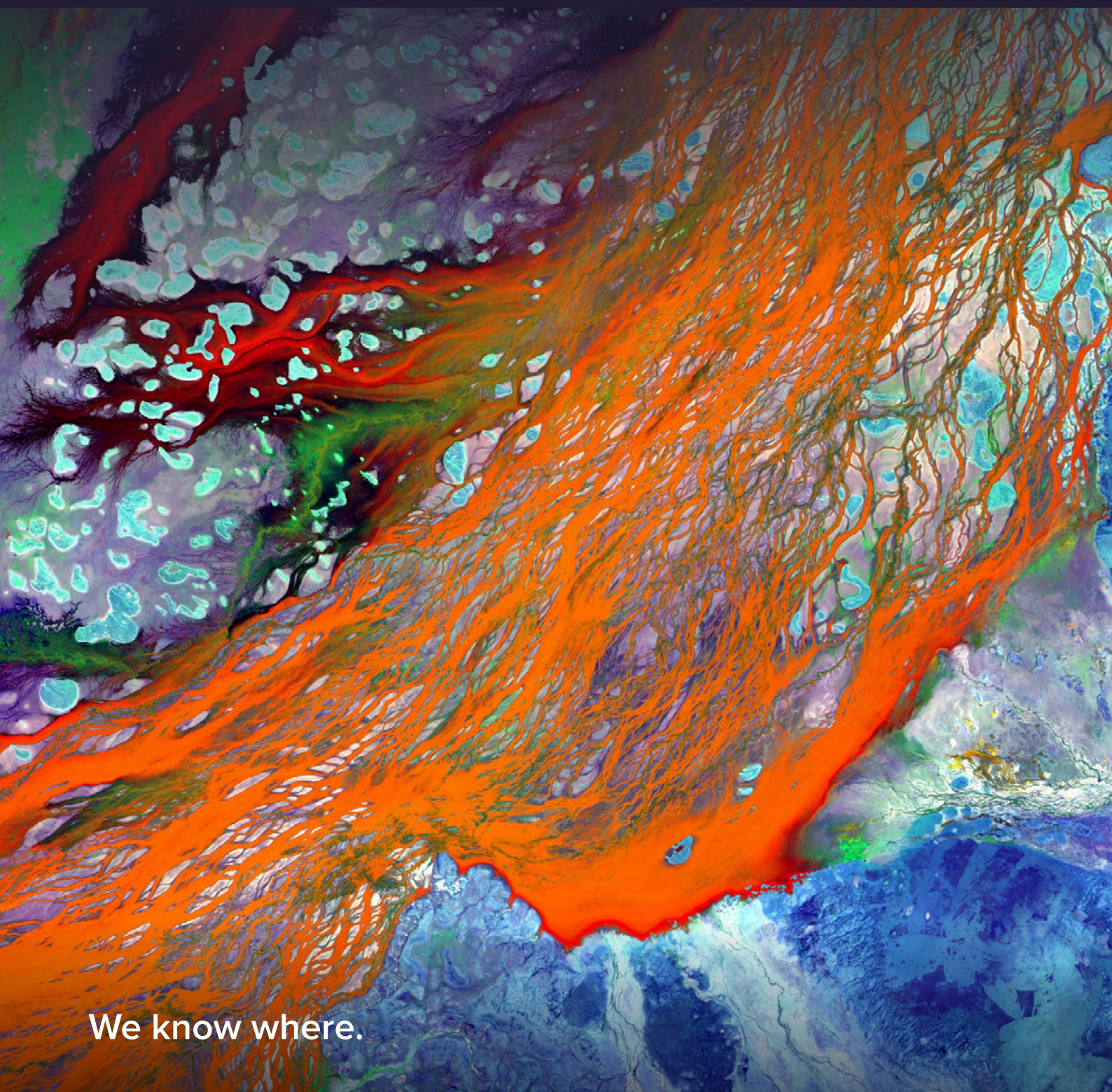


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YEAR IN SUMMARY 2020-21



We know where.

ACKNOWLEDGMENTS

FrontierSI would like to make the following acknowledgments:

- 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.
- Geoscience Australia
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- TERN for image supplied on page 14

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
- Department of Environment, Land, Water and Planning, Victoria

Industry Partners

- AAM Group
- Business Aspect
- Data Farming
- eSpatial
- Fugro
- Geoscape
- GHD
- Mercury Project Solutions
- NGIS Australia
- Omnilink
- Orbica
- Photomapping Services
- Position ++
- Position Partners
- Spatial Vision
- The Industrial Sciences Group
- Traverse

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VISION, MISSION & PURPOSE

Purpose

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

Vision

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

Mission

To provide the connection point, partnerships, trusted collaborative model and expertise to deliver high impact solutions to complex, multi stakeholder challenges.

Values

We value **collaboration**, **future focus**, **agility**, **integrity**, and **communication**.

We are solutions driven, and achieve high quality outcomes through **collaboration**, being open minded, 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 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

I would like to reflect on what has been a challenging year as we continued to adjust our lives and working environment to manage through COVID-19. I want to thank our partners, colleagues, staff, and board, for their support and flexibility in operating in these changing circumstances. Through this, FrontierSI has grown in terms of its project portfolio, size and partnerships. This last 18 months has also reinforced what is important. For FrontierSI, this has been about focussing on flexibility, building strong teams, maintaining trusted relationships, being present and engaged with our partners, and continuing to deliver value and impact.

I have been continually impressed by the many initiatives undertaken by our university, government, and industry partners to reframe and re-organise their operations in response to COVID-19. For FrontierSI, a focus has been on the continuing digital transformation and development of Digital Twins, and the value that will be unlocked once data and system interoperability and governance frameworks are improved. FrontierSI has had many highlights, and throughout this year, several space and spatial initiatives were announced or took important steps forward.

We have



Actively worked to strengthen Industry-Government links and further develop the industry and technology:

- FrontierSI was a strong contributor to the working group and steering committee for the **2030 Space and Spatial Industry Growth Roadmap**, working with many of our partners and key industry bodies such as the Spatial Industries Business Association, the Surveying and Spatial Sciences Institute and

Space Industry Association of Australia. The Roadmap is being developed to identify growth opportunities and propose actions to grow the space and spatial sectors. The space and spatial industries are poised for substantial growth and in combination, they will realise enormous benefits that would otherwise not be possible. Optimising this integration opportunity will create competitive advantage, greatly strengthen sovereignty, defence and security, and play a key role in managing our environment and improving our social well-being.

- The **Australian Housing Data Analytics Platform**, which facilitates research in housing supply, affordability and diversity supporting policy was led by FrontierSI partner, University of New South Wales. The initiative builds on previous and current work with FrontierSI and our partners, and continues to develop a strong policy and decision-making capability within Australia's \$7 trillion housing market.
- The **AGO Labs Program** went from strength to strength with the announcement of its continuation by The Hon. Melissa Price MP, Minister for Defence, in partnership with the Australian Geospatial-Intelligence Organisation (AGO). The primary focus of the program has been to address AGO capability challenges through a small number of short-term, innovative industry projects, with a focus on machine learning and analytics for automated imagery analysis and product generation. FrontierSI announced the three successful participants for Round 1 of the program – Orbica, NGIS and Xerra.



Continued to grow the impact of spatial data and technologies in key sectors:

- In collaboration with Geoscience Australia, we released the *Digital Earth Australia – Harvesting the benefits of Earth observation* report which sets out ideas to help accelerate growth and uptake

of space based technologies. Australia is at a major acceleration point in the development and provisioning of fundamental, next generation **Earth observation** data services and insights across the agriculture sector.

- We strengthened collaborations to actively contribute to the growth of the **Digital Twins** use cases, co-funding three projects: (1) The AusEnHealth initiative with partners QUT, NGIS and WA Department of Health and support from EPA Victoria, AURIN and the Terrestrial Ecosystem Research Network (TERN). (2) A New Zealand flood resilience initiative with partners University of Canterbury and LINZ and stakeholder National Institute of Water and Atmospheric Research (NIWAR), and (3) a liveable cities pilot with partners Spatial Services NSW, QDR and UNSW, and stakeholder AURIN.
- We released the **AusCalVal: Establishing Australia as a Global Leader in Delivering Quality Assured Satellite Earth Observation Data Report**, commissioned by Geoscience Australia in consultation with the Australian Space Agency, Bureau of Meteorology, and CSIRO which formed part of a series of studies undertaken in support of the development of the Australian Space Agency's Earth Observations from Space Technology Roadmap.
- In partnership with Meat and Livestock Australia and FrontierSI Partner, Geoscape, we released two reports on determining a realistic **National Definition of Agricultural Property**, and an associated draft data model, to enable future creation of a national agricultural property dataset.



We have continued to promote the use of open data and frameworks:

- FrontierSI co-hosted the **4th Annual Open Data Cube (ODC) Conference** in partnership with Geoscience Australia and Digital Earth Africa, an open-source geospatial data management and analysis software project that helps harness the power of satellite data.

- FrontierSI joined as a silver sponsor to the sustainable **GDAL initiative** with several organisations contributing resources to its success including Google, Microsoft and ESRI. Our support of this foundation technology, like that of several others in the geospatial community, will contribute towards growing the geospatial ecosystem.



We have grown:

- We exceeded our prior year income (\$9.25M v \$8.0M) and enter 2021-22 with an active project portfolio of 40 projects with a cumulative funding value in excess of \$20M (+\$3M from prior year) .

Despite the challenges associated with COVID-19, I am grateful to work with committed staff, partners, and supporters, as the number of large initiatives before us and the space and spatial industry, become increasingly significant and impactful. The need for connections and stronger engagement between industry, government and universities has never been more acute, with all of us seeking ways to improve the way we collaborate to do business.

Collective strategic prioritisation of our shared challenges and having agreed approaches for the use of our finite resources is critical. If we are to stabilize our economies and improve environmental and social well-being, the ways in which we combine multidisciplinary research and innovation approaches and technologies to develop and implement the right solutions needs strong decision-making frameworks and leadership. Getting this mix right is essential for future success.

Graeme Kernich
Chief Executive Officer

STRATEGIC PLAN UPDATE 2020-2023

In 2019-20, while maintaining a strategic framework for FrontierSI to grow and consolidate as a self-sustaining organisation, and in consultation with our Board, partner base and staff, we refreshed the strategy to better articulate our purpose and the key elements which will drive business sustainability in a COVID impacted world, much changed from 12 months prior. Our Strategy on a page and an update on progress made toward achieving our strategic objectives follow.

FrontierSI Strategy 2020-2023

OUR VISION	To be the people of choice to lead transformational spatial research and innovation in Australia and New Zealand.				
OUR MISSION	To provide the connection point, partnerships, trusted collaborative model and expertise to deliver high impact solutions to complex, multi stakeholder challenges.				
GOALS	Be thought leaders in the spatial industry to drive game changing initiatives for economic growth, improved environmental and social well-being	Deliver high impact spatial solutions to complex problems	Drive adoption of spatial outcomes by and for our partners	Build and sustain strategic and enduring partnerships	Attract and retain the best people
STRATEGIC INITIATIVES	1. Thought Leadership	2. High Impact	3. Adoption	4. Enduring Partnerships	5. The Best People
	1.1 Initiate a Thought Leadership initiative that improves the Foundation Spatial Data Framework (FSDF) workflows 1.2 Play a leadership role in the development and implementation of 2030 space and spatial Roadmap 1.3 Lead partner-based Digital Twin activities which champion the use of spatial data and innovative technologies to address multi-regional and cross-sectoral challenges	2.1 Develop and assist the implementation of positioning and geodesy focussed research and innovation 2.2 Drive new industry-government-university capabilities in data analytics and earth observation 2.3 Identify priority research and innovation areas for co-investment 2.4 Review, improve and apply effective strategies to communicate our impact	3.1 Facilitate adoption of Positioning Australia/ SBAS 3.2 Operationalise our property-based initiatives 3.3 Accelerate adoption of EO based products and services 3.4 Maximise opportunities for adoption of research developed with Partners	4.1 Facilitate new significant strategic initiatives that deliver value and high impact for our partners 4.2 Strategically build and strengthen national and international partnerships 4.3 Deliver effective partner management practices to ensure partner satisfaction and retention 4.4 Formalise and strengthen FrontierSI end-user networks	5.1 Strengthen culture and reinforce FrontierSI values 5.2 Provide internal leadership and professional development opportunities
MODEL	FrontierSI is a social enterprise, with a partner-based business model which is predicated on the pursuit of not for profit, public good objectives. Through the brokering and delivery of partner-based projects, funds are generated to reinvest in initiatives that deliver economic growth and improved environmental and social well-being.				
WHAT SUCCESS LOOKS LIKE IN 2023	1. Satisfied partners and deep, enduring partnerships 2. A sustainable FrontierSI which is generating surpluses for re-investment in initiatives with public good outcomes 3. Strong track record of social, economic, and environmental impact and value through developing and delivering large scale research and innovation initiatives. 4. Contribution to significant infrastructure development, the provision of better government services and industry growth. 5. Our reputation as the best people to broker and deliver collaborative spatial solutions.				

THOUGHT LEADERSHIP

FrontierSI led and contributed to several **thought leadership events** throughout the year, albeit with a different focus to that originally envisaged. A highlight was co-hosting the 4th Annual Open Data Cube (ODC) Conference in partnership with Geoscience Australia and Digital Earth Africa. The 4-day online conference and hackathon attended by over 500 delegates provided a forum to promote ODC objectives to increase the value and impact of global Earth observation satellite data by providing an open and freely accessible exploitation architecture.

FrontierSI has **maintained an active role** with representation at working group and Steering Committee level in development of the 2030 Space and Spatial Industry Growth Roadmap which is now due for release in 2021-22.

FrontierSI has **co-funded three Digital Twin pilot projects** with partners and stakeholders which commenced in 2020-21 and are progressing well. A joint forum for all project stakeholders was held in May 2021 to share learnings and development.

FrontierSI **contributed to** the Smart Cities Council Australia and New Zealand Digital Twin Blueprint to inform development, influence action and investment in Digital Twin within the natural and built environment in Australia and New Zealand.

HIGH IMPACT

In collaboration with Geoscience Australia **significant progress was made across the Ginan suite of projects**, including achievement of a major milestone in the release by Geoscience Australia of Ginan 1.0 Alpha, providing a GNSS analysis toolkit to improve the state of the art of precise point positioning, and in parallel commencing development of an operational version of Ginan.

In addition to continuing to provide technical advice to the SBAS Testbed we **confirmed funding** for a 2-year SmartSat CRC funded deformation modelling project in collaboration with partners GA, DELWP DCS and Curtin which will utilise space-based SAR measurements to create and maintain a state-wide surface deformation model.

We have **maintained a strong research focussed data analytics portfolio** aimed at improving data workflows in collaboration with multiple partners across several applications. Outcomes have included improved estimation of River Lines, Quality Assurance of LiDAR, Machine Learning based feature extraction, improved cadastral accuracy and the use of distributed ledger technology in planning workflows.

There has been an **enhanced effort to communicate** FrontierSI's impact via various channels including via social media, on our website and in the production of a suite of presentation materials for use in public forums. Collaborative successes have been celebrated via APSEA and PLA awards recognise effort and impact of previous work.

ADOPTION

Plans to **develop Value Australia as a commercial opportunity** are on track with negotiations progressing well with key partners and alternate commercial options being considered.

Adoption of **EO based products and services** in Australia were furthered through the release of EO mining and Agriculture reports.

Innovative collaborations which allow us to more flexibly ensure our outcomes can be used have been strengthened (eg OGC, SSANZ, EARS, GEO) and we have continued to develop and maintain our suite of internal and specialist resources to ensure they can be mobilised to add specialist expertise and capability where needed.

ENDURING PARTNERSHIPS

We strengthened our engagement with **SmartSat CRC** with development of tangible opportunities to improve FrontierSI's space based activities and opportunity flow to our own partner base.

We contributed to the progress of the **Space & Spatial Industry Growth Roadmap**, and enhanced role in relation to SSCANZ (through the release of their Digital Twin Blueprint), GEO through ODC conference and DE Africa.

In continuing to utilise our **comprehensive partner engagement framework**, partner engagement plans including an annual review process was undertaken with all Core and Support Partners and regular meetings held with all key stakeholders.

THE BEST PEOPLE

Health and wellbeing activities as well as a 'work remotely' culture and process tools were a continued focus in 2020-21 as well as formalising ongoing flexibility in working arrangements and reinforcement of effective work-life balance practises. We benchmarked 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 have an intention of continuing to drive initiatives and policies which maintain and enhance our reputation as an employer of choice.

Staff have been encouraged and supported in pursuing various **industry leadership and advisory opportunities** and our staff are sought after and contribute to a number of committees, conferences, and industry webinars and workshops. We are also proud to support our staff who have been recognised and offered external leadership development opportunities. In 2020-21 a focus on empowering staff to develop new project ideas led to several new funded projects being initiated.

RESEARCH & INNOVATION APPROACH

FrontierSI works in three 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.



FrontierSI provides a connection point and collaborative model for our partners to access, develop and apply 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 18 years' experience in creating and managing collaborative teams of academic, private sector and government professionals to solve challenging innovation and

“

The **AGO Labs** programme, coordinated through FrontierSI, is a fantastic example of how the public sector can engage with industry in a meaningful and collaborative way. This programme is another fantastic example of FrontierSI bringing the best minds in the public and private sector together to deliver world leading results for the benefit of all Australian people.

Rory Donnelly, EO Data Science Manager, NGIS.

”



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 in-house expertise, as well as industry and university partnerships, we provide independent and trusted expert advice in spatial industry strategy, business strategy, data and spatial infrastructures strategy, innovation programs, technology due diligence, industry and technology trends, new markets assessment and economic analysis. We offer software development capabilities and technical Geographic Information System (GIS) services.

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 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 software 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.

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.

OUR IMPACT

Improving government industry collaboration

AGO Analytics Labs

The Australian Geospatial-Intelligence Organisation (AGO) deals with sensitive and classified problems in the Australian Department of Defence, and as a result, the range of companies and professionals they can access is much smaller than the broader pool available in the market, often making it challenging for AGO to work with new organisations. Understanding these challenges has led to FrontierSI working with AGO to develop the Analytics Labs Innovation Program (AGO Labs).

The primary focus of the ongoing program is to address AGO capability challenges through a small number of short-term industry projects, with a focus on machine learning and analytics for producing automated imagery analysis, including automated object classification. Following an open call to Australian private industry and universities, four of the most novel approaches to the challenges were selected to deliver innovative challenge responses as a series of short projects. The four projects and their enabling activities included:

- Featured Unsupervised (organisation: Ozius). Ozius' Deep Insight AI approach demonstrated advanced decision-making capabilities by the rapid detection of change types and labelling of anomalous anthropogenic and environmental features across large areas.

- Low-cost Object Identification Models (organisations: Urbis and the Australian Institute of Machine Learning, University of Adelaide). This project demonstrated efficiencies in object detection in the machine learning training process, particularly focused on rare features.

- Low-cost Object Identification Models (organisation: Microsoft Australia). Microsoft deployed a novel perspective in generating synthetic data sets which both dramatically reduce the requirement for real training data and improve the efficacy of machine learning models faster, cheaper, and more accurately than relying on generic data sets.

- Beautiful Contours (organisations: Geospatial Intelligence and Maxar Technologies). This project aimed to automate the complex task of creating cartographic quality contours from diverse elevation datasets in near real time, suitable to meet the needs of operational users anywhere on the globe.

Through the successful conduct of four technology showcase projects, AGO Labs demonstrated that Australian industry possesses both technologies and capabilities that can assist AGO in solving existing defence challenges as well as identifying new challenges. The pilot program was highly successful and an expanded second phase was launched at the end of 2020 for seven challenge topics across two rounds.





Better water management using IoT

SigWater

Satellite Telecommunications IoT-enabled Automatic Ground Water Collection and Aggregation Pilot (SIG Water)

Like most Australian state & territory authorities, the South Australian Department for Environment and Water (DEW) is responsible for the operation and management of an extensive network of groundwater monitoring bores. Currently, only 6% of DEW's 3500 bores are instrumented, and bore observation information is generally collected infrequently by field-visits, often only a few times a year.

There is therefore a need to increase the frequency and spatial distribution of monitoring and provide automated data collection to service the growing data requirements for effective groundwater resource management, whilst remaining within realistic budgets for monitoring related costs.

SigWater is an industry collaboration between the SmartSat CRC, FrontierSI, NGIS, the South Australian Department for Environment and Water, Myriota and the University of South Australia, to develop a pilot

system to demonstrate the use of an *Internet-of-Things* (IoT) and low-cost *nano-satellite* telecommunications (nano-satcom's) as an end-to-end means to transmit and aggregate, in near real time, automatically collected information from groundwater bores.

The project includes evaluating, procuring, integrating, and deploying both sensors and telemetry transmission devices in experimental sites in the field and operating these for 12-months. The system is being evaluated South Australia, including the South-East region, the Great Artesian Basin and the Eyre Peninsula. Although the focus of the project is on the system as a means for data collection, the data results will also provide insight into how the information can be used in a groundwater management context.

The outcomes will not only have an impact on groundwater management in Australia but can also have broad global applications and present additional international opportunities. Central to this are Satellite and Internet-of-Things (IoT) approaches, the capability of providing increased volume and variety of monitoring data, more frequently with greater spatial density, less time-lag for collection and at a lower-cost than equivalent current approaches.



Digital Twins

Digital Twins are a powerful tool to better understand our physical environment. The value of digital twins is amplified through more accurate and accessible spatial data. In alignment with our government partners, enabling Digital Twins is a key focus area for FrontierSI. The spatial industry has led Digital Twin use case development and we're seeing the emergence of new research, technological advances in 3D data acquisition and analytics, the growth in advisory and consulting, and the growing range of partnerships between government and industry organisations that continue to advance the developing ecosystem of Digital Twins.

FrontierSI and our partners are contributing to Digital Twins through improving standards and interoperability of data supply chains, providing better location information for property and related data sets, and developing and interlinking cross-jurisdictional and cross-sectorial partnerships.

We are actively contributing to the implementation and research of Digital Twins across a range of domains, and co-funding three collaborative projects:

A national Digital Twin for flood resilience in New Zealand,

Led by the University of Canterbury (UC), developing a digital twin to test the specifications required for a New Zealand flood resilience digital twin and implement it for selected urban areas. It is modeling the three waters (drinking, waste, and storm), flood mitigation and other infrastructure, to facilitate detailed, standardised risk assessments at the national scale,

at a lower cost and more rapidly. Partners include Land Information New Zealand (LINZ) and the New Zealand National Institute of Water and Atmospheric Research.

The AusEnHealth project

Led by the Queensland University of Technology (QUT), which developed a national spatially enabled data infrastructure to allow access, analysis and visualisation of environmental health data and analytics. This work is in conjunction with partners QUT, NGIS and WA Department of Health (DOH WA) and support from EPA Victoria, AURIN and the Terrestrial Ecosystem Research Network (TERN).

The Liveable City Digital Twin Pilot

Led by University of New South Wales (UNSW), which is developing analytics to explore how human behaviour changes as a function of complex environmental and physical conditions in the built environment. It is a collaboration with NSW Department of Customer Service (Spatial Services NSW), QLD Department of Natural Resources (QDR), Mines and Energy, Data61, Astrolabe and AURIN.

Throughout the year, our team also actively participated in several Digital Twin initiatives, including Digital Twin Week 2021, an initiative of Smart Cities Council ANZ which facilitated a series of webinars and workshops focused on exchanges, showcases and announcements on major Digital Twin policy and practice updates from government and industry leaders across Australia and New Zealand. FrontierSI also had an active role developing the Smart Cities Council ANZ Digital Twin Blueprint, volunteering our time to create this important document.

FrontierSI – Leaders in Spatial

Delivering value involves more than leading and delivering new initiatives for FrontierSI. Our high calibre team are sharing and contributing their knowledge and expertise in a range of forums for the benefit of the broader space and spatial community. Over the past 12 months, FrontierSI staff have played critical industry roles contributing to a number of committees, conferences, and industry webinars and workshops including:

- FrontierSI Chair Gillian Sparkes' and CEO Graeme Kernich's contribution to the 2030 Space and Spatial Roadmap development, on the Committee and Working Group respectively, with the roadmap to identify industry growth opportunities and propose actions to grow the space and spatial sectors.
- The appointment of our Deputy CEO, Phil Delaney, to the AURIN Scientific Advisory Committee, which provides e-Infrastructure and expert e-Research support for urban, regional, and social science researchers in academia, government, and industry.
- Our Chief Business Officer, Kate Williams, acting as Co Convener of Locate21 – Australia's premier spatial and surveying conference providing attendees with a unique opportunity to learn about the latest trends and applications in geospatial technologies.
- Graeme Kernich presenting on spatially enabled Digital Twins to the SmartSatCRC at a Digital Twins workshop, which included participants from Partners RMIT, Curtin University, QUT and UNSW.
- Our leadership role in the Space, Spatial & Surveying Diversity Leadership Network (SSS-DLN), with Roshni Sharma as current Co-Convener and Eva Rodriguez Rodriguez as former Co-Convener. This initiative, in response to the 2026 Spatial Industry Transformation and Growth Agenda, brings together leadership from business, government, and education to provide visible advocacy for diversity and inclusion within the space, spatial and surveying sectors.
- Eva Rodriguez Rodriguez was named one of 60 leading women in Australian science — a 'superstar of STEM.' Founded in 2017 and run by Science and Technology Australia (STA), the two year programme 'supports and upskills women working in the sector to communicate with influence and share their passion for STEM with the Australian community.'
- FrontierSI presentations at a World Geospatial Industry Council discussion with FrontierSI partners AAM Group and Spatial Vision on the emerging models for public-private-partnerships for geospatial data and infrastructures.
- Several FrontierSI staff presentations at partner-based events, notably SICON 2020, the spatial information conference hosted by Queensland's DNRME; and participation at the Victorian Spatial Showcase which demonstrated the progress in the development of government spatial services and technologies and the wider use of spatial information.

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.

National Awards

FrontierSI was joint recipient of the National SSSI Asia Pacific Spatial Excellence Awards *People & Community Award* for the Satellite-Based Augmentation System (SBAS) Test-bed Project, together with partners Geoscience Australia and Land Information New Zealand.

Furthermore, FrontierSI partners and collaborators individually recognised through the National APSEAs included:

- Dr Ivana Ivanova, Senior Lecturer at Curtin University & FrontierSI Research Fellow, for the Educational Development Award.

- Melissa Harris, A/Chief Executive of Land Use Victoria, Victorian Registrar of Titles and Deputy Chair of ANZLIC, for the Women's Leadership Award.
- Professor Allison Kealy, Acting Chief Research Officer & Program Director SmartSatCRC and Geospatial Science at RMIT University, for the Professional Eminence Award.

Regional Awards

FrontierSI Partners and collaborators who were recognised for their achievements and contributions to our industry included Australian Geospatial Intelligence Organisation, Australian Space Agency, Earth Observation Australia, Geoscience Australia, Land Information New Zealand, CSIRO, and Melbourne Water. FrontierSI was recognised for:

- ACT Award for *Spatial Enablement* for AGO Labs Program in partnership with Australian Geospatial Intelligence Organisation.
- ACT Award for *Innovation* for GEO Week 2019 Industry Track in partnership with Australian Space Agency, Earth Observation Australia, Geoscience Australia, and CSIRO.
- ACT Award for *People & Community* for the Satellite-Based Augmentation System (SBAS) Test-bed Project in partnership with Geoscience Australia and Land Information New Zealand.
- Victoria Award for *Spatial Enablement* for Vegetation Mapping in Catchments using machine learning in partnership with Melbourne Water.

FrontierSI partners and collaborators who were individually recognised through the regional APSEAs, including Wayne Patterson (SS NSW), Nic Donnelly (NSW), Craig Roberts (NSW), Ivana Ivanova (WA), Melissa Harris (Victoria), Roger Fraser (DELWP Vic), and Mark Shortis (Victoria).

Earth Observation

In collaboration with Geoscience Australia, we have released industry reports which roadmap expanded use of Earth observation technologies in industry.

Mining & METS

Earth observation (EO) technology and insights will play an essential role in the digital transformation and automation of the mining and Mining Equipment, Technology and Services (METS) sector, and increased adoption of EO data and services within the sector raises both opportunities and challenges. This report identifies the mining and METS sector's critical business problems, its operational lifecycle, and its diverse user group. It highlighted opportunities for the growth of EO in the sector included the expansion of adoption of existing EO technologies and services across the mining lifecycle, increased use of EO for greater digitisation and automation, and the potential for EO to deliver mining process efficiencies and reduce risk. Significant challenges include insufficient user maturity and confidence in the usability and accuracy of EO data, a lack of understanding of the limitations of EO and its impact on downstream processes, and a lack of communication on how EO can reduce risk and increase productivity.

Agriculture: Harvesting Benefits of EO

In Australia, the agriculture industry has grown by 20% over the past two decades, with much of the productivity growth having been fuelled by the adoption of innovations in science and technology.

Whereas agriculture has been an early adopter of many productivity-boosting new technologies, EO technologies remain underutilised across the industry. The report identified first steps to be taken in bridging the adoption divide, through provision of an overview of the agriculture sector, an assessment of the current state of EO in the sector, detailed profiles of critical EO users, and an expansion of some key value problems faced by the agriculture sector. It also presented current use cases of EO in the sector and described in language familiar to the producer the barriers to greater adoption, along with the problems to be solved.



AusCalVal

Satellite Earth observations and other forms of remote sensing contribute over \$543 billion to Asia-Pacific Economic Cooperation (APEC) economies and provide essential data to sectors representing approximately 75% of global GDP. Satellite data are critical for the basic functions of the Bureau of Meteorology with 95% of the observations used in weather, hydrological and ocean models sourced from about 30 international satellites, providing the foundation for all the services delivered by the Bureau, including services to defence, aviation, agriculture sectors and the public. The quality and accuracy of these services relies on satellite data of the highest quality possible.

Australia's EO application development capabilities are widely regarded as among the best in the world. Our reputation for scientific excellence, decades of experience and advantageous geographic location, along with the availability of in-country infrastructure, mean that Australia is positioned to globally lead in quality assurance of satellite EO data.

To augment ground-based quality assurance infrastructure, the development of a continuous series of Australian Satellite Cross-Calibration Radiometers (SCRs) was proposed. This space-based infrastructure aims to increase data accuracy and support Australia's international supply relationships, ensuring the long-term supply of critical Earth observation data streams for Australian programs. Investing in our sovereign capability through enhanced quality assurance infrastructure and development of a national smallsat program, helps build trust in EO data, mitigate long-term EO data supply risks, bolster our growing space sector, and create new job and skill opportunities.



FSDF – Foundation Spatial Data Framework
In 2019, ANZLIC (the Australia and New Zealand Spatial Information Council) added four new themes to the FSDF: **Buildings and Settlements; Population Distributions; Geology and Soils; and Physical Infrastructure**. This along with the challenges of transforming FSDF into 3D and 4D has led to a number of innovative projects.

NSW Machine Learning Building Extraction
NSW Spatial Services and FrontierSI worked together on a project to investigate new ways to create and maintain building data. NSW Spatial Services is the owner and custodian of the foundation spatial data themes of the NSW Foundation Spatial Data Framework (FSDF). The FSDF is the State's authoritative geographic information portfolio which underpins any other information and is used to support evidence-based decisions across government, industry, and the community.

The NSW Machine Learning Building Extraction project is the development algorithms to extract building footprints using machine learning from aerial imagery and LiDAR. The project was a collaboration between FrontierSI and the NSW Department of Finance, Services and Innovation, Spatial Services Division (DFS), RMIT, and Player Piano Data Analytics. The project helped deliver improvements to the second FSDF data theme *land parcel and property*.

This project investigated the problem of automatic building footprint extraction for NSW. It used 45,775 building footprints from a variety of archetype regions across NSW (rural, suburban, metropolitan, industrial) to validate that building outlines and features could be automatically extracted using a machine learning approach, and that the outputs were comparable or better than existing approaches and data products. The model was deployed as a tool for NSW to run across the state to generate building footprints with an accuracy close to human digitised footprints. The approach to building footprint extraction is efficient and repeatable, providing more timely, consistent, and accurate building footprint datasets at a fraction of the cost of human digitised footprints. Machine learning generated building footprints will also enable new and improved data analytics needs of customers by supplying time series spatial data, as well as supporting the development of smart cities and digital twins for NSW.

QA4Imagery

The acquisition of Unmanned Aerial Vehicle (UAV) imagery and photogrammetric products has proliferated in recent years, with a growing number of organisations across multiple sectors including government, mining, environmental management, and utilities, actively using UAVs as a cost effective, rapid option, to acquire this data. For these organisations there is a high risk that the supplied data will not be fit-for-purpose due to the proliferation of suppliers, and lack of data capture and processing transparency available to

“

FrontierSI has been a valuable source for QUT in identifying and promoting research opportunities in the special industry, establishing industry connections, and actively supporting the conversion of these opportunities into life projects. The FrontierSI QLD Partner Forum 2021 has been received with great interest and stimulated useful discussions in our communities.

Dr Richard Haas, Business Manager – Major Research Initiatives, Office of Research Services, QUT

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end users to mitigate the risks of poor capture. This project addressed the need for end users to easily define the required specifications and check the quality of data captured from UAV platforms or Aircraft. QA4Imagery, a collaboration between FrontierSI, the Victorian Department of Environment, Land, Water and Planning, ThinkSpatial, the Minerals Research Institute of Western Australia, and Australian UAV, is an easy-to-use, automated quality assurance tool to ensure fit-for-purpose imagery and photogrammetric products captured by UAV or aircraft. The project developed a simple online workflow, for both technical and non-technical users to manage UAV or Aircraft capture projects, to ensure the supplied data is fit-for-purpose. The outputs streamline the acquisition and QA process for end users of UAV or aircraft data to ensure products are fit-for-purpose and meet a minimum quality standard. It raises the quality of UAV or aircraft imagery data and ensures suppliers adopt a best practice process, and with greater user acceptance, raise the overall quality of data delivered by UAVs or aircraft. Not only will end users of the product benefit from confidence in using the fit-for-purpose data, suppliers will also benefit from operational efficiencies, product quality differentiation, and certainty related to product development and supply.

AusSeabed

AusSeabed, a national seabed mapping coordination program, is an open-source repository and associated software interface enabling end users to plan surveys

and check the quality of seabed data. Marine data has historically been difficult and expensive to acquire and access, and yet the expectations, value and capabilities associated with marine exploration, conservation and management are increasing with the advancement of new technologies. Quality marine data provides foundational information and new insights to guide policy and decision makers.

A partnership between Geoscience Australia, CSIRO, and the Australian Hydrographic Office, FrontierSI's involvement has been, and continues to be, to develop the Survey Coordination Tool (SCT) and several quality assurance check tools including QAX and Mate. The SCT supports the coordination of seabed data capture, improves standards of acquired data, increases data utilisation, improves data management, and builds expertise within the seabed mapping community. The quality assurance component will improve data accuracy, capture potential problems at source, and reduce the overall human time to quality control data.

The AusSeabed Data Hub simplifies the complex specification and quality assurance (QA) processes, becomes a workflow to streamline acquisition and QA, improves discoverability of existing or upcoming surveys, provides independent QA and standard reports, saves time and effort via QA/QC automation, and improves data quality and ensure fit-for-purpose data, enabling re-use.





Precise Positioning with Ginan

Precise positioning based on constellations of navigation satellites brings significant economic and social benefits to Australia. Precise positioning reduces fertiliser and chemical spray waste in agriculture. It improves the efficiency of operations in large mine sites. Precise positioning improves safety in aircraft operations and can even give added freedom of movement to vision impaired people.

The rationale behind the Ginan project is to develop the software toolkit and data products to allow everybody in Australia to enjoy the benefits of precise positioning through the creation of new services and products, and in doing so drive economic growth enhancing Australia's prosperity.

Ginan, formerly known as the Analysis Centre Software, was a project initiated by the CRCSI (now FrontierSI) back in 2015. Since then, a team from FrontierSI and Geoscience Australia has been working on the Ginan

toolkit, developing new GNSS analysis techniques to improve the state of the art of precise point positioning.

Precise Point Positioning (PPP) is an approach to very accurate position determination that uses sophisticated models to remove errors. These models include the precise orbits of GNSS satellites taking into account the "lumpiness" of the Earth, the pressure of sunlight and the movement of other celestial bodies. The models account for fluctuations in the Ionosphere and Troposphere, and even in the signal delays of the satellites themselves, commonly referred to as biases. By applying the corrections provided by the models, GNSS receivers can hone their calculated positions to an accuracy of a few centimetres.

Recently Ginan achieved a significant milestone with the release of Ginan 1.0 Alpha. The software toolkit has been made available for download from the Geoscience GitHub site under an open source licence.

The team will continue to develop Ginan and further enhance the capabilities of the toolkit to produce the target product which is an undifferenced, uncombined application with full ambiguity resolution that can produce PPP analysis products and correction data streams in real-time. Working concurrently is a team that will create an operational version of Ginan: one that will produce analysis products and make them available to the public as part of Geoscience Australia's existing positioning product portfolio.



PEOPLE & CULTURE

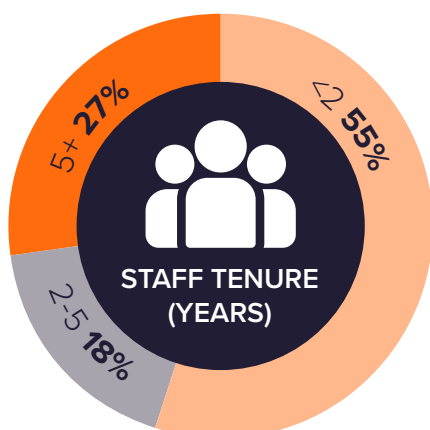
As a service-based organisation our staff are our biggest asset. The ongoing challenges posed by COVID-19 has meant a sustained focus on staff health and welfare as the top priority.

Initiatives implemented prior year such as flexible working conditions, employee assistance program support, and team-based activities to promote social connection and health, have been maintained and extended in 2020-21. 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 33 full time and part-time staff.

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

- Operations (finance, governance, communications, administration).
- Business Development/Partner Relations.
- Research and Innovation.

With a core employee base who broker, manage and deliver projects in collaboration with a much greater partner resource base, success is dependent on ensuring maintenance of a culture which encourages cross functional collaboration while maintaining a strong partner focus. The Executive team is supported by a management team with a broad range of technical skills and experience pertinent to, and commensurate with, the roles they fulfill.



The appointment of **Kate Williams** (top left) in the role of Chief Business Officer in August 2020, rounded out the Executive team of four including **Graeme Kernich** (Chief Executive Officer) (top right), **Melanie Plumb** (Chief Operating Officer) (bottom left) and **Phil Delaney** (Chief Innovation & Delivery Officer).



61% 39%
MALE TO FEMALE

73%



27%
FULLTIME PART-TIME



89%
RETENTION RATE



LOCATION
ACT 6 | NSW 2 | NZ 1
WA 3 | QLD 2 | VIC 19

36%

STAFF WITH PHD QUALIFICATIONS





FrontierSI has positioned itself as a national leader in bringing the Space and Spatial communities together. **SmartSat CRC** views FrontierSI as a key partner that is providing the right networks, expertise, and connections to close the loop between these important sectors for our nation. This is being materialised through the strong relationship between us and through engagement in the high-quality projects that FrontierSI is leading in the CRC.

Professor Andy Koronios, Chief Executive Officer & Managing Director, SmartSat CRC



Diversity and Inclusion

FrontierSI has continued to embrace a commitment to diversity and inclusion (D&I) truly believing that a diverse and inclusive workforce is necessary to drive innovation, foster creativity, and guide business excellence. For FrontierSI, we believe the benefits of getting D&I right for us to be:

- Better and faster decision making through a variety of different perspectives.
- Greater capacity for innovation and creative problem solving, including improved ability to adapt.
- Improved culture through higher employee engagement and reduced turnover.
- An enhanced brand which makes it easier to attract and retain top talent.

Commitment has been demonstrated via various means, including implementation and/or trialling of several initiatives from within the [2026 Agenda Diversity and Inclusion Action Plan](#), adopting policies and initiatives which align with our commitment, and supporting our internal champions who are industry leaders in this space.

Table 1. The State of Diversity in the Spatial Sector – FrontierSI Benchmarking

Spatial Sector ¹	FrontierSI in 2020-21
Gender pay gaps in key roles	Average hourly rate pay parity achieved in 2020-21
25% Female representation	39% 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 27% of staff work part time
17% of workforce > 55 yrs	9% of employees > 55 yrs
Limited evidence of employees from non-Anglo an indigenous backgrounds & employees with disability	Employees with origins from 11 different countries. Support and employment of persons with disability.

¹ 2026 Agenda Diversity and Inclusion Action Plan

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 – see table 1, and we head into 2021-22 with an intention of continuing to drive initiatives and policies which maintain and enhance our reputation as an employer of choice.

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:

- Eva Rodriguez Rodriguez who contributed to the development of the [2026 Agenda Diversity and Inclusion Action Plan](#) and has been Co-Convenor of the Space, Spatial & Surveying Diversity Leadership Network (SSS-DLN).
- Roshni Sharma who is currently Co-Convenor of the Space, Spatial & Surveying Diversity Leadership Network (SSS-DLN) and has been key in the development and recent release of the [Space, Spatial & Surveying Diversity Leadership Network Strategic Plan 2021-2025](#), and also runs the SSSI Mentoring programs as Chair of the SSSI National Young Professionals.
- Laura Spelbrink, one of three 2021 Women on Boards scholarship recipients jointly supported by the AusIMM and the Victorian Dept of Jobs, Precincts and Regions.
- Jasmine Muir, member of Earth Observation Australia, and lead on Theo Murphy mentorship in Space.
- Kate Williams, SSSI mentor, Locate Organising Committee and regular presenter and advocate on STEM and D&I issues across other sectors.
- Caitlin Adams, established several internal initiatives, the latest of which is an intern trial.

PROJECT DELIVERY

In 2020-21, FrontierSI led, formulated, brokered and delivered solutions with government, industry and university partners within a portfolio of 51 projects. 14 projects were completed, 24 new projects commenced and FrontierSI began 2021-22 with an active project portfolio of 40 projects with cumulative funding value in excess of \$20M.

FrontierSI exists to solve partner challenges and our portfolio reflects the deep level of engagement we have with each organisation within our partner network. Our projects engaged 149 project partners across 70 organisations, 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
QZSS Emergency Warning System	Emergency Management	Commenced & Completed	Geoscience Australia, RMIT, NSPS, Softbank, TTIP, UNSW, NSW SSG, NSW SES, NSW RFS, EMA
Precision Timing for Space-Based Applications – Utilisation Study	Space and Spatial	Commenced	SmartSat CRC, RMIT,
A scoping study and 'gap' analysis for the development of a national hydroid model ("AUSHYDROID")	Government	Commenced	Curtin University, AGO, Geoscience Australia, Bureau of Meteorology, Dept of Transport WA
Calibration of Signal Power, and their utilisation from ground tracking networks for constellation monitoring.	Government	Ongoing	Geoscience Australia
Developing a practical and comprehensive approach to crustal deformation modelling in support of Australia's time-dependent reference frame	Government	Completed	DELWP Vic, Spatial Services NSW, Geoscience Australia, LINZ, Position ++, Curtin University
Ionospheric modelling for the ACS and NPI	Government	Ongoing	Geoscience Australia, RMIT
Positioning Australia – Accelerating Industry Adoption	Whole of Economy	Ongoing	Geoscience Australia, ISG
Precise GNSS positioning with Smartphones	Government	Ongoing	Geoscience Australia, ISG, RMIT, Otago University
Prototyping of satellite laser ranging (SLR) capabilities into the ACS	Government	Ongoing	Geoscience Australia
Establishment of a Regional Satellite Based Augmentation System Testbed	Whole of Economy	Completed	Geoscience Australia, LINZ, RMIT, Buildvation, AMSA, Pilbara Ports Authority, GMV NSL, Aurizon, Rio Tinto, Chevron, Napier Port, ThingC Robotics, Scion Research, University of Adelaide.
Integrity Monitoring for the Multi-GNSS Analysis Centre Software	Government	Ongoing	Geoscience Australia, UNSW, RMIT, LINZ
Ongoing Development of the Multi GNSS Analysis Centre Software.	Government	Ongoing	Geoscience Australia
Provision of SBAS Specialist Research & Technical Capability	Whole of Economy	Ongoing	Geoscience Australia, LINZ

DATA ANALYTICS PORTFOLIO

Project Title	Key Sectors	Status	Collaborators
AusEnHealth Digital Twin – Scoping Study & Conceptual POC	Health	Commenced	QUT, DOH WA, NGIS, AURIN, EPA Vic, TERN
Australian Geospatial Intelligence Organisation (AGO) Analytics Labs 2020	Government	Commenced	AGO
Digital Earth Africa Industry Engagement	Government	Commenced	Geoscience Australia, NGIS
Cliniface, The Answer Machine (Pilbara Faces Stage 2)	Health	Commenced	Curtin University, NGIS, Perth Children's Hospital Foundation
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	Commenced	SmartSat CRC, Curtin University, Myriota, Geoplex, Geoscience Australia, Maxima Rock Oyster Company, WAAA
Knowledge gaps and opportunities for earth observation tools in mine-rehabilitation at the property scale	Mining	Commenced	SmartSat CRC, University of Queensland
The Australian Housing Data Analytics Platform Work	Built Environment	Commenced	UNSW
Stocktake and capability analysis of spatial information technology and data coordination for State of the Environment reporting.	Environment	Commenced and Completed	DELWP Vic
Next Generation Testbed Design for Earth Observation	Space and Spatial	Commenced	SmartSat CRC
Geographic information — Calibration and validation of remote sensing imagery sensors and data.	Government	Commenced and Completed	Geoscience Australia
New Zealand Earth Observation Scoping Study	Government	Commenced	LINZ, Symbios
Indigenous Earth observation	Environment	Commenced	SmartSat CRC, Winyama
SmartSat CRC Industry Activation	Space and Spatial	Commenced	SmartSat CRC
Value Australia – Sharpening our land and property decisions with Artificial Intelligence	Built Environment	Ongoing	UNSW, Commonwealth Bank of Australia, Officer of the Valuer General NSW, Omnilink, Liverpool City Council
AusSeabed Data Hub Component Development	Government, Agriculture & Natural Resources	Ongoing	Geoscience Australia
Digital Earth Africa Notebook Uplift	Government	Ongoing	Geoscience Australia, Digital Earth Africa, NGIS
NSW Riverlines Toolkit Modification & Training	Agriculture & Natural Resources	Ongoing	Spatial Services NSW, Spatial Vision

Project Title	Key Sectors	Status	Collaborators
Prioritising GDV inspection using ensemble models and near real-time monitoring	Resources	Ongoing	BHP, Rio Tinto, Fortescue Metals Group, Atlas Iron, Geoscience Australia, Curtin University, Roy Hill, Dept of Water & Environment Regulation, WA Biodiversity Science Institute, Dept of Biodiversity, Conservation and Attractions.
Provision of Market Research for continuation of DEA Industry Strategy	Whole of economy	Ongoing	Geoscience Australia
SmartSat CRC Project: Earth Observation Analytics Solutions: Know the Market to Grow the Market	Agriculture & Natural Resources	Ongoing	SmartSat CRC, Geoscience Australia
Vicmap Machine Learning Feature Extraction Phase 2	Government	Ongoing	DELWP Vic, Orbica
Cliniface Stage 3 – Integrating, Enhancing and Scaling 3D-FAST for local and international impact	Health	Ongoing	Curtin University, DOH WA, University of Sydney, Linear Clinical Research, Perth Children's Hospital
Learning Predictive Models for Urban Artificial Intelligence	Built Environment	Completed	UNSW, Urban Development Institute of Australia
QA4Imagery	Government	Ongoing	Spatial Services NSW, DELWP Vic, Minerals Research Institute of Western Australia,
Maintenance of the Bushfire and Natural Hazards CRC's Online Project Management System	Emergency Management	Ongoing	Bushfire and Natural Hazards CRC
Towards the Cadastre QLD. Transformation Program Through a Digital 3D Cadastre Demonstrator.	Government	Completed	QDR
Aligning the Vicmap Statewide DEM to Hydro and Contours	Government	Completed	DELWP Vic
Develop Methods for Automated Data Extraction into a Machine-Readable Database for Subsequent Data Query and Reporting.	Resources	Completed	QDR, QUT
Rare Diseases empowered – Multi-dimensional digital diagnosis and monitoring of rare diseases	Health	Completed	Sanofi, Curtin University, Telethon Kids Institute
Validation of 3D imagery for rare diseases for assurance for international database development and integration with platforms including Patient Archive [Cliniface IV]	Health	Completed	Curtin University, Perth Children's Hospital
Australian Geospatial Intelligence Organisation (AGO) Analytics Labs2	Government	Completed	AGO, Maxar, Digital Globe, Ozius, Urbis, AIML, Microsoft

SPATIAL INFRASTRUCTURES PORTFOLIO

Project Title	Key Sectors	Status	Collaborators
Liveable City Digital Twin Pilot: Analytics for agile decision making	Government	Commenced	UNSW, Spatial Services NSW, QDR, Australian Urban Research Infrastructure Network
Architectural Review of the NSW Government Spatial Portal	Government	Commenced and Completed	Spatial Services NSW, Business Aspect, QUT
Towards a National Digital Twin for Flood Resilience in New Zealand	Agriculture and Natural Resources	Commenced	University of Canterbury, LINZ, NIWAR
Digital Twin Specialist Research and Technical Capability	Government	Commenced	Spatial Services NSW
Development of a Public Health Atlas for WA	Health	Commenced	DOH WA, Spatial Vision
VanKIRAP portal development	Agriculture and Natural Resources	Commenced	CSIRO, NGIS
Improving the user experience and usability for users of the NSW government spatial hosting portal	Government	Commenced and Completed	Spatial Services NSW, Business Aspect, QUT



UTILISATION & COMMERCIALISATION

The 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 & 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.

Despite the challenging and changing operating environment we continued to experience due to the COVID-19 pandemic, we have ensured delivering value to our partners as well as the health and well-being of our staff and collaborators has remained the highest priority.

We are proud and grateful to have maintained a solid partner base in 2020-21 and we attribute this success to our strong and deep relationships which have been built over time through strong partner engagement.

Partner Engagement

Successful partner engagement is critical to ensuring a thriving research and innovation ecosystem. To ensure partner engagement is optimised, FrontierSI remain committed to maintaining strong communication through our well-developed partner engagement model.

The partner engagement model is implemented through multiple channels including assigned partner engagement managers who meet regularly with prime contacts to stay connected with existing projects, partner priorities and aligning effort to assist partners to deliver on their organisational strategies. We know through feedback from our

annual review of Core and Support Partners held in June 2021, that our communication is valued and contributing to high levels of satisfaction among partners. We achieved 100% satisfaction in these reviews which were used to ascertain a) level of satisfaction b) partner expectations, and c) future priorities for partners.

Key Stakeholders

Key relationships have also been maintained with all of Australia's leading spatial peak bodies:

- ANZLIC (Australia New Zealand Land Information Council) representing the government interests.
- SIBA/GITA (Spatial Industries Business Association and Geospatial Information Technology Association) representing the private sector interests.
- SSSI (Surveying and Spatial Sciences Institute) representing the spatial profession.

Formal connections have also been maintained with associated industry bodies and organisations, both domestically and internationally, where there is strategic alignment and benefit to be derived for FrontierSI and our partners, including:

- The ANZ Smart Cities Council
- The Australian Space Agency
- Open Geospatial Consortium (OGC)
- European Association of Remote Sensing Companies (EARSC)
- The Space Industry Association of Australia.

Core Partners



Support Partners



Industry Support Partners



GOVERNANCE & 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 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. There were no changes to Board membership in 2020-21, and three directors, Chris Thomas, Paul Farrell and Wendy Lawson were each appointed to a second term.

With the onset of COVID-19 in March 2020 Board focus turned to welfare of FrontierSI staff and near-term business stability an interim COVID-19 Business Plan was approved for the April to September 2020 period, and monthly Board meetings were held between March and September 2020 to closely monitor these issues. Concurrently, the Board focussed on progression of longer-term strategic initiatives at a pace commensurate with business and key stakeholder priorities.

At the end of 2020-21, FrontierSI is three years into initial five-year partner agreements. Accordingly, and with the business remaining in a solid position despite COVID-19 impacts, the Board determined it was timely to review the business operating model to ensure that FrontierSI continues to provide value to its partners and is positioned for sustainable growth. In April 2021, the Board commenced the process of commissioning an external review of FrontierSI's business strategy and operating model which will include as a key input, Partner views and ideas to ensure FrontierSI is set up for the next decade of operation. The review will be led by the Board with outcomes shared with Partners in late 2021.

2020-21 BOARD & COMMITTEE MEETINGS

	Board		Finance, Risk and Audit Committee		Strategy & New Initiatives Committee		Remuneration Committee	
	Eligible	Attended	Eligible	Attended	Eligible	Attended	Eligible	Attended
Bruce Thompson	9	6			5	2	1	1
Chris Thomas	9	9	4	4	5	5		
Gillian Sparkes	9	9			5	5	1	1
Graeme Kernich	9	9			5	5		
Michelle McLean	9	9	4	4			1	1
Paul Farrell	9	9			5	5		
Wendy Lawson	9	7						
Wayne Poole**			4	4				
Melanie Plumb***	9	9	4	4	5	5		

Notes: ** Wayne Poole, Senior Manager, Strategic Modelling, Business Advisory @ Core Partner RMIT is a member of FRAC

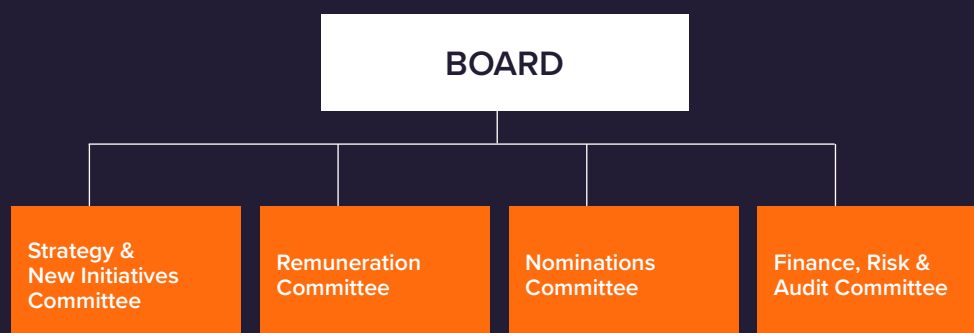
*** Chief Operating Officer Melanie Plumb is the appointed Company Secretary.

+ There were no Nominations Committee meetings held in 2020-21

FrontierSI Board



Melanie Plumb
Company Secretary



COMMUNICATIONS

The Communication Purpose

The purpose of our 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 our program areas
 - Celebrating the achievements of our collaborative partnerships.

We aim to tell our stories in a practical and impactful way to our government, academia, and private sector Partners. 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.

Profile Raising

Critical to FrontierSI's success is articulating our value to our partner network and an ever-expanding user community. The challenge is always in determining the most effective and efficient method to reach new users, seek them out, and actively communicate to differentiated needs. The requirement for connection and stronger engagement has never been more

important and acute as it is in the current global environment. In applying our efforts to the right activities, in the right proportion, we will broaden our community and their engagement levels, and ultimately increase the impact of our work for the benefit of Australia and New Zealand.

2020-21 Snapshot

2020-21 presented its own set of communications challenges. With COVID having **accelerated the adoption of the remote digital workplace**, it became evident that the main function of FrontierSI communications was to engage partners and staff and continue to create a position of thought leadership by developing and sharing industry-specific information. Our objective was to seek new methods and strategies to increase internal and external awareness of key online events including webinars and workshops and promote other topics of interest to the spatial community.

Our Communications efforts were rewarded by growing numbers on social media including **472 new followers** and over **69,000 impressions on LinkedIn**, and **over 100 new followers** and **more than 120,000 impressions on Twitter**.

Our monthly newsletter also garnered some strong results with 12 newsletters published regularly throughout the year producing an average of 30% total opens compared to the aerospace and professional services industry average of 18%, and a cumulative result of over **7,000 unique opens**.

Our approach ensured that industry and partner-facing communications remained consistent across all channels, and more importantly has strengthened FrontierSI's role as thought leaders within the spatial information and allied industries.



120K+
IMPRESSIONS
>100
NEW FOLLOWERS



69K+
IMPRESSIONS
472
NEW FOLLOWERS

FINANCIALS

FrontierSI remains in a sound financial position and delivered a favourable result to budget in 2020-21, ending the year with an operating surplus of \$0.7M against a budgeted deficit of \$1.2M.

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.

In relation to COVID-19 government stimulus payments, FrontierSI received \$0.3M in 2020-21.

2020-21 Income

Research Project Income	\$7.2M
Subscription Income	\$1.7M
Other Income	\$0.4M
Total Income	\$9.3M
Budget	\$9.7M

2020-21 Expenditure

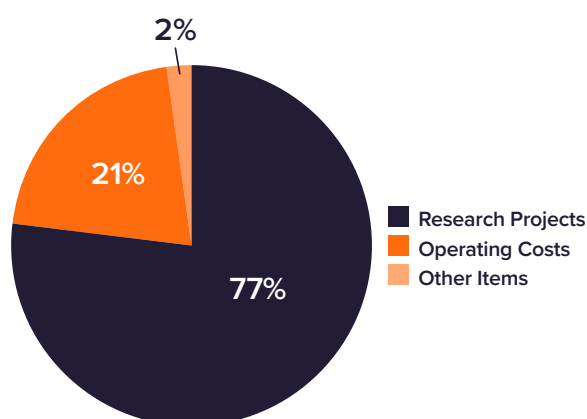
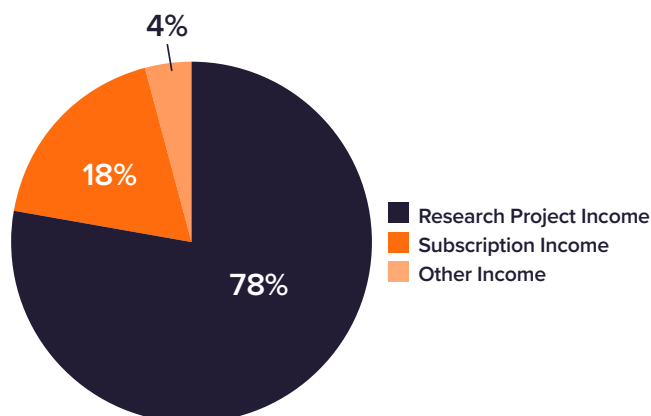
Research Projects	\$6.6M
Operating Costs	\$1.8M
Other Items	\$0.2M
Total Expenditure	\$8.6M
Budget	\$10.9M

2020-21 Program Allocation

Earth Observation & Analytics	\$3.8M
Positioning & Geodesy	\$2.1M
Spatial Infrastructures	\$0.7M
Total Expenditure	\$6.6M

2020-21 Financial Year Highlights:

- ✓ Growth from previous year income of 16% (\$9.25M in 2020-21 vs \$8.0M in 2019-20)
- ✓ Maintained operational expenditure at < 25% of total spend for 2020-21
- ✓ Finished 2020-21 with Net Equity of \$7.3M including \$5.9M of funds in reserve.



GLOSSARY

ACS	Analysis Centre Software
AGO	Australian Geospatial-Intelligence Organisation, Department of Defence
AI/ML	Artificial Intelligence/Machine Learning
AMSA	Australian Maritime Safety Authority
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 Vic	Department of Environment, Land, Water and Planning, Victoria
DEM	Digital Elevation Model
DEW	Department for Environment and Water South Australia
Digital Twin	Virtual representation that serves as the real-time digital counterpart of a physical object or process
DOH WA	Department of Health, Western Australia
EARSC	European Association of Remote Sensing Companies
EMA	Emergency Management Australia
EO	Earth Observation
EPA Victoria	Environmental Protection Agency Victoria
FSFD	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
ISG	The Industrial Sciences Group
LEO	Low Earth Orbiter
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
NSPS	National Space Policy Secretariat
NSW RFS	NSW Rural Fire Services
NSW SES	NSW State Emergency Service
NSW SSG	NSW Special Services Group
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
QDR	Department of Resources, Queensland
QUT	Queensland University of Technology
QZSS	Quasi-Zenith Satellite System
RAISE	Rapid Analytics Interactive Scenario Explorer
RLT	River Lines Toolkit
RMIT	RMIT University
SBAS	Satellite-Based Augmentation System
SCRs	Satellite Cross-Calibration Radiometers
SCT	Survey Coordination Tool
SIBA	Spatial Industries Business Association
SICON 2020	Social Innovation Conference 2020
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
Spatial Services NSW	Department of Customer Service NSW, Spatial Services
SSS-DLN	Space, Spatial & Surveying Diversity Leadership Network
SSSI	Surveying & Spatial Sciences Institute
TERN	Terrestrial Ecosystem Research Network
TTIP	Transatlantic Trade and Investment Partnership
UAV	Unmanned Aerial Vehicle
UM	University of Melbourne
UNSW	University of New South Wales
VanKIRAP	Operational version of a web-based Climate Information Services Portal for Vanuatu

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