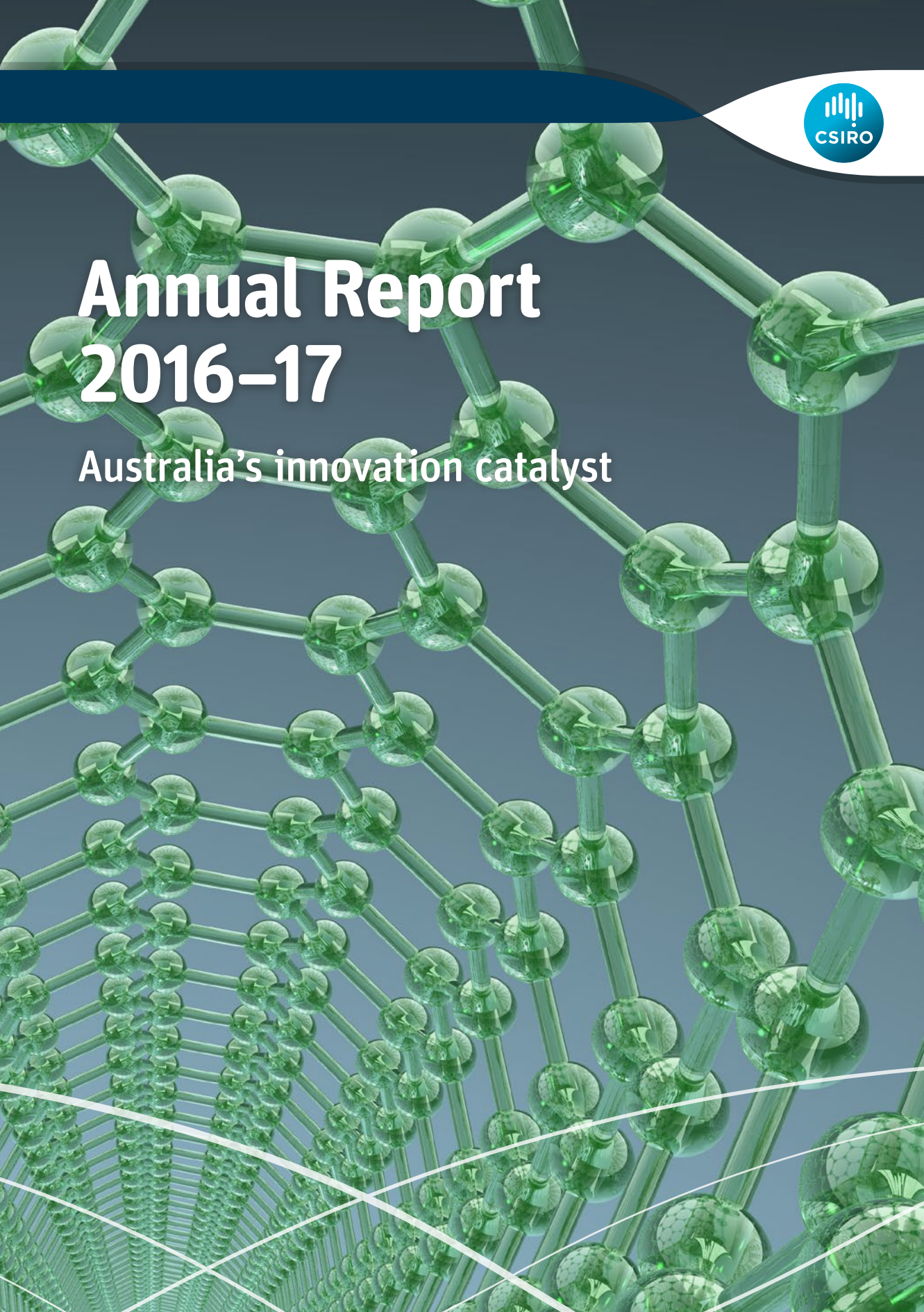


Annual Report 2016–17

Australia's innovation catalyst

CSIRO, in partnership with Deakin University, launched Australia's first carbon fibre production facility. Carbon fibre is a low weight product with high rigidity, tensile strength and chemical resistance that is used in aerospace, civil engineering, cars, health and the military. Successful collaborations like this demonstrate how the Australian research sector can accelerate research, lead innovation and expand job opportunities in the country.

About this report

This annual report is a summary of CSIRO's activities and financial position for the 12-month period ended 30 June 2017. In this report, unless otherwise stated, references to the 'organisation', 'we', 'us' and 'our' refer to CSIRO as a whole. In this report, references to a year are to the financial year ended 30 June 2017, unless otherwise stated. It is also available at: **www.csiro.au/annualreport2017**.

COVER: Nanomaterials, like the carbon nanotubes illustrustrated on the front cover, are extremely small chemicals, millionths of a millimetre in size. They come in many forms each with unique mechanical, electronic and optical properties. Through the development of new products and processes, nanotechnology will potentially contribute solutions to major challenges facing Australia in the electronic, energy and environmental sectors. Image: Amanda Barnard, Data61

www.csiro.au

CSIRO Head Office
Clunies Ross Street, Acton ACT 2601
GPO Box 1700, Canberra ACT 2601 Australia
T (02) 6276 6000 • **ABN** 41 687 119 230

1 September 2017

The Hon Arthur Sinodinos AO
Minister for Industry, Innovation and Science
Parliament House
CANBERRA ACT 2600

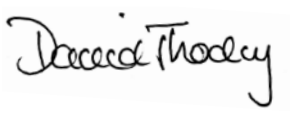
Australia's national science agency took strides forward on its Strategy 2020 through the year ending 30 June 2017. We have pleasure in submitting to you, for presentation to Parliament, the sixty-ninth Annual Report of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) that demonstrates the results and benefits delivered for industry, government and the community.

This report has been prepared in accordance with the *Science and Industry Research Act 1949*; section 46 of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act), and the *Public Governance, Performance and Accountability Rule 2014* (PGPA Rule). It was endorsed for presentation at the meeting of the CSIRO Board on 1 September 2017.

In addition to reviewing the excellent science, strong collaboration and breakthrough innovation performed at CSIRO, this annual report includes an overview of the investments made through the Science and Industry Endowment Fund, established under the *Science and Industry Endowment Act 1926*. It includes an overview from the Chief Executive of CSIRO as Trustee of the Fund, and a report by the Auditor-General on the accounts of the Fund.

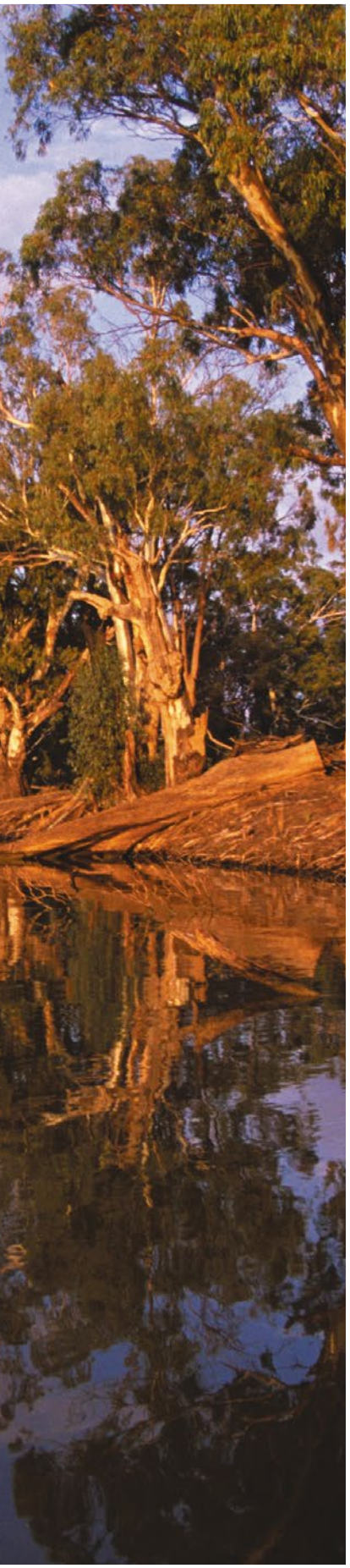
The Corporate Commonwealth Annual Reporting Rule requires we report any significant activities and changes that affected CSIRO's organisation or structure. During the reporting period, CSIRO established its first office in the United States, demonstrating its commitment to take Australian innovation to the world and return benefits and value to Australia. The office will build on CSIRO's existing partnerships and research in the US, creating a strategic hub to strengthen and grow new relationships and opportunities for the benefit of our science, our people, and our nation.

We commend this record of achievement to you.



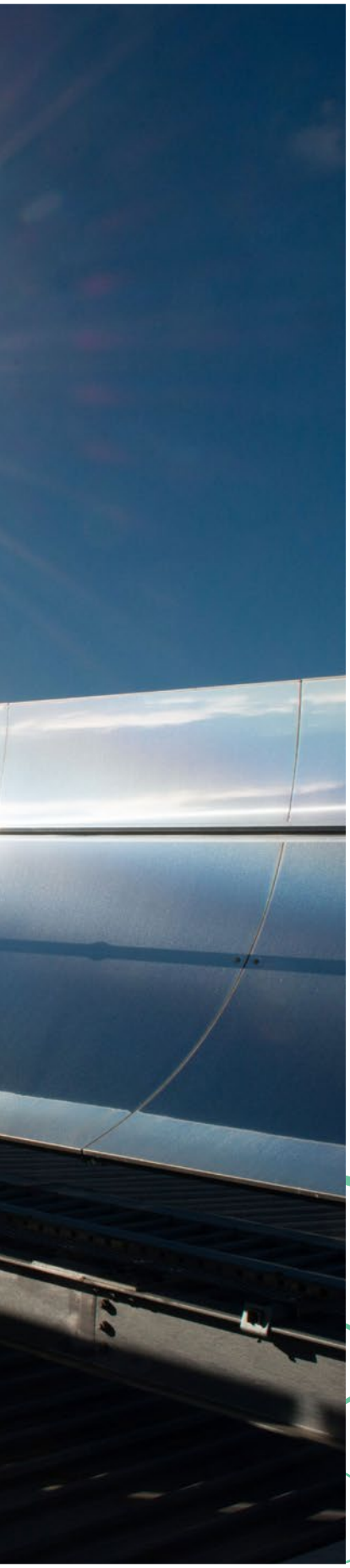
Mr David Thodey AO
Chairman of the CSIRO Board

Dr Larry Marshall
Chief Executive of the CSIRO



Contents

Solar troughs on top of Stockland Wendouree Shopping Centre in Ballarat, Victoria, capture heat that powers the centre's air conditioning system. Our cutting edge technology reduces the building energy demands and operating costs.



Part 1
Overview

Australia's CSIRO

For over a century, CSIRO has been pushing the boundaries of what's possible in science and technology to solve the nation's biggest challenges and seize the opportunities on the horizon.

More than 5,000 CSIRO experts across 59 locations turn science into solutions, working in partnership with government, industry, universities and the community.

We are at the forefront of world-class science; we are embedded across our national research system, and we are reaching out globally to extend the impact of Australian innovation and return benefits and value back home.

Our proud legacy invented fast Wi-Fi, Aerogard and polymer banknotes. Today we're helping to find the first gravitational waves in space, growing gluten-free grains and pioneering new renewable energy sources, just to name a few.

Our science and research is not just tackling today's challenges, it is preparing for tomorrow's. We partner with schools and universities to grow our national pipeline of science, technology, engineering and mathematics professionals. We are stewards of national facilities and collections that plumb the depths of our oceans and the reaches of our skies, and we partner with businesses of all sizes to bring science into their workplace from researcher placements to strategic forecasting and insights.

We believe in the power of science to transform our lives and secure our futures, and we realise that ambition every day.

Dr Bryan Lessard (also known as Bry the Fly Guy), visits the Daintree Rainforest National Park in Far North Queensland, in a quest to find new species of soldier fly for the Australian National Insect Collection. Soldier flies have not been studied in Australia for over 50 years, despite many being agriculturally important species.
Image: Youning Su.

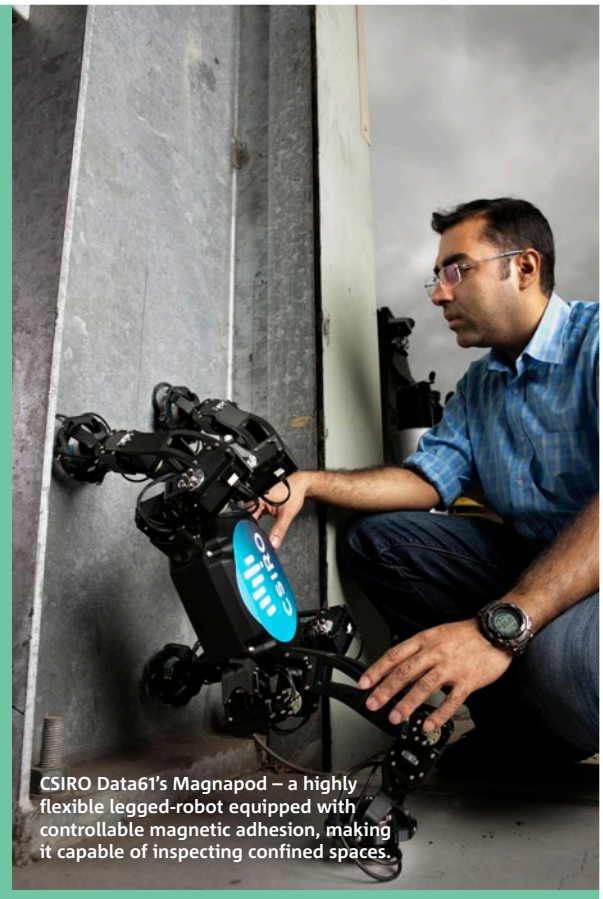
We are Australia's innovation catalyst

Australia must seize the opportunities of a rapidly changing world if it is to secure its future prosperity. An innovative, globally-competitive Australia needs a united innovation system – a vision CSIRO is uniquely placed to drive.

CSIRO's Strategy 2020 recognises Australia's single biggest opportunity: closing the gap between our research and industry. Our best ideas are being applied domestically, but also exported overseas, delivering benefit and economic returns elsewhere. Australia needs an innovation catalyst, and CSIRO is well placed to take this role and turn more of our world-class research into benefit for Australia.

By bringing together our unwavering commitment to brilliant science and national benefit, with partners across industry, government, the research sector and the community, CSIRO is a vibrant and integral part of securing Australia's future success and prosperity.

In order to achieve our vision and purpose, we are committed to:



CSIRO Data61's Magnapod – a highly flexible legged-robot equipped with controllable magnetic adhesion, making it capable of inspecting confined spaces.

Customer first

Creating deeper innovation relationships with our customers and prioritising the highest-value investments.

Collaboration hub

Integrating the best solutions for our customers, increasing our flexibility and enhancing Australia's innovation performance.

Global outlook, national benefit

Delivering connectivity to the global science, technology and innovation frontier as well as accessing new markets for Australian innovation.

Breakthrough innovation

Increasing our capability to help reinvent existing industries and create new industries for Australia and deliver public good.

Excellent science

Using breakthrough technology and knowledge and being a trusted advisor for Australia.

Deliver on commitments

Enhancing our agility, financial sustainability and capability to respond at the speed of business.

Inclusion, trust and respect

Fully enabling and supporting the innovation capacity of our creative people and teams to take risk and deliver to customers.

Health, safety and environment

Enhancing staff safety and wellbeing as we continue to move towards 'zero harm'.

Transforming today's challenges into tomorrow's opportunities

Our core research and focus areas extend from the depths of our oceans to the far reaches of our galaxy, as we turn science into solutions that tackle the biggest challenges facing our nation.

- AGRICULTURE AND FOOD
- DATA61
- ENERGY
- HEALTH AND BIOSECURITY
- LAND AND WATER
- MANUFACTURING
- MINERAL RESOURCES
- OCEANS AND ATMOSPHERE
- ASTRONOMY AND SPACE SCIENCE
- RESEARCH INFRASTRUCTURE
- RESEARCH COLLECTIONS
- EDUCATION
- PUBLISHING
- CONSULTING AND TESTING SERVICES
- ON INNOVATION
- GLOBAL

Two of our exploration geologists took a field trip to the Capricorn region of Western Australia to map and select samples that are being used to develop an exploration toolkit.

How we anticipate the future

Our Future Science Platforms (FSPs) are our vision for the future needs of our nation, helping to reinvent or create new industries. Work began on each of the six Future Science Platforms in July 2016.

ACTIVE INTEGRATED MATTER

Our goal is to lead ground-breaking advances at the interface between big data, materials, processing, sensors and autonomous science. With our partners we will work to drive the fourth wave of the industrial revolution, known as industry 4.0. The technology platform being developed is focused on providing the food, metals, robotics, chemicals and environmental sectors with the physical tools needed to strengthen Australian manufacturing and ensure preparedness for future commercial and environmental scenarios.

DIGISCAPE

We are developing the next generation digital technologies in big data analytics, artificial intelligence, data visualisation and sensor networks. With these advances, we will open up new partnerships, generate new revenue streams and manage risk and uncertainty in new ways. The mix of cutting edge science and technology, and integration of end-user experience and feedback, will transform our agricultural industries and environmental planning, policy and implementation.

DEEP EARTH IMAGING

Our goal is to improve our ability to find and exploit deep mineral resources. Deep Earth imaging technologies will help us more precisely image subsurface rock properties of vast and underexplored areas. Making the cover transparent will add significant value to the wealth of geological and geophysical data that already exists. It will reduce uncertainty associated with exploration, and further drilling and collection of geophysical data will be more efficient and less risky.

ENVIRONOMICS

We will integrate bioinformatics, genomics, and modelling to manage Australia's biodiversity to unlock new opportunities for science and industry. Australia's biodiversity provides a rich source of genetic materials for crop breeding, novel materials and processes that can give our industries an edge. Environomics will facilitate science-based management of our biodiversity, benefiting the environment and securing the future of industries such as tourism and our biological heritage for future generations.

PROBING BIOSYSTEMS

Our vision is to develop wearable or imbedded biological sensors that can continuously extract meaningful information about the health of the subject to allow timely intervention. The ability to interrogate living biological tissue has applications broader than human health. For example, we can track the biochemical health of livestock and companion animals, plants, and aquatic animals, and analyse in-vitro cell culture on a chip.

SYNTHETIC BIOLOGY

Our aim is to pursue breakthroughs in synthetic biology (SynBio). SynBio involves modelling, writing, and printing DNA code for designing and fabricating new biological parts, systems and machines, and re-designing existing natural biological systems. We will focus on new tools for Australian industries and address Australian problems, such as controlling invasive species, agricultural pests and disease agents. SynBio has potential applications in diverse areas: manufacturing, human health, agriculture, and protecting ecosystems.

Foreword by the Chairman

I am constantly amazed and impressed by the depth and breadth of CSIRO. I have had the pleasure of visiting many of our locations this year and met with many of our teams, our partners and our customers to gain an insight into the work we do. It is an honour to be entrusted as Chair of the Board to help steer our future direction across so many different fields, and this year has demonstrated what a significant impact we can have on the lives of all Australians.

This year we have been talking and listening more to our customers, and in new ways. For example, our Industry Roadmaps have directed some of our science into strategy, interrogating and identifying opportunities for Australian businesses to grow and outpace international peers, securing new pathways to prosperity for our nation. These initiatives are also opportunities for us to work more closely with our partners and customers to bring those aspirations to life with cutting-edge research and innovation. Our renewed customer focus is yielding strong returns, seeing our Net Promoter Score (NPS) jumping from +11 last year to +34 this year, and increasing on all indicators.

To ensure we continue to serve our customers we must continue to be focused on delivering world-class science. Deep research, empowered curiosity and bold vision are essential to the value CSIRO delivers to Australia and the world. This year the Board formed the new Science Excellence Committee to raise visibility of our growing scientific excellence, its connection to impact delivery, and CSIRO's role as an innovation catalyst in the national innovation system. The committee brings together a range of activities already performed across the organisation in monitoring and measuring our scientific performance, providing a unified view of our most important priorities. Outside of the Board, Dr Anita Hill is an outstanding advocate and representative as CSIRO's first Chief Scientist. Through her leadership, we look forward to progressing our excellence and impact aspirations for CSIRO and the nation in academic forums and working with the country's Chief Scientists.

We are also committed to investing in new science initiatives, so it is encouraging to see our science delivering economic returns to reinvest in research. We are committed to adding value through our science and research – intellectually, nationally, socially, environmentally, and economically. We are pleased that over this past year our equity portfolio has grown by $20.4 million to $69.8 million, reflecting new and additional investments in the breakthrough innovations of the future. Investments in companies like Chrysos Holding and Amfora support the translation and the deeper impact of our research into mineral discovery and oil from plants, respectively. In the new financial year, we are looking forward to the first investments of the CSIRO Innovation Fund[1], which is focused on taking more of Australia's great research from benchtop to buyer, returning value back into Australian science.

Just as our Innovation Fund has taken shape this year through establishing a highly experienced team of investment managers, so too have other initiatives funded under the Australian Government's National Innovation and Science Agenda (NISA). Our ON accelerator has now taken 135 teams comprising more than 500 people through its intensive, customer-focused programs, and signed up 30 partner universities as well as a range of other research institutions and government departments. It is an outstanding example of innovation being delivered to end-users through collaboration across the Australian innovation ecosystem. Similarly, our new business unit, Data61 has just celebrated 12 months since National ICT Australia (NICTA) joined CSIRO. It has become a vital, integrated part of CSIRO's unique multidisciplinary response to national challenges.

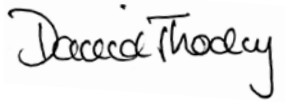
1 CSIRO Innovation Fund 1, LP.

This annual report is a thorough reflection of a busy and productive year, and its findings are replicated in this year's ACIL Allen report into the value of our work across the country. After considering a total of 28 case studies, it estimated that the work of CSIRO scientists contributes benefits of $3.2 billion per year to Australia – three times more than CSIRO's budget and four times more than our government funding. It also suggests that the full value of our total research portfolio would provide an estimated return of over 5:1 on investment. This is a strong endorsement of our unique and powerful contribution to the nation.

Of course, our outstanding people are the reason we are celebrating another successful year. This year, I am delighted to see the introduction of flexible working arrangements under our Balance initiative, and deeper planning and focus on increasing diversity at CSIRO through our first ever Reconciliation Action Plan and progress in our Science in Australia Gender Equity (SAGE) program. As I write this foreword, we are collating the results of our largest employee survey in many years, which will provide deep insights into how we all can create an even better CSIRO in which we can perform outstanding science and research. Last year's survey showed that we had made progress on becoming a more customer-focused organisation, and this year's survey indicates that we are heading in the right direction – but we all still have more to do.

The Board is constantly seeking the right balance across the wide diversity of research and partnerships at CSIRO. In fact, the diverse methodology of the ACIL Allen report show there is not a uniform way to measure the impact and benefit of all the varied work we do. If we hold true to our scientific integrity, listen to our customers, and continue to measure and build on the impact of our work, CSIRO will continue to grow its reputation as a world-class and invaluable part of Australia's future success and prosperity. It's been an honour to Chair the Board of such an iconic and invaluable organisation, driven by Australia's most talented people.

I would like to conclude by thanking the entire CSIRO team for their contribution and commitment over the last twelve months. I am encouraged by the progress we have made, and I am looking forward to working with you all to make sure that through great science, research and collaboration, we will create benefit for all Australians.



David Thodey AO
Chairman of the CSIRO Board

Chief Executive's report

Australia has some of the best minds in the world, and many of them are right here at CSIRO. But around the country, there is a bigger opportunity to work together to harness this brainpower for the benefit of our nation. I'm so proud to reflect on the past year and see the significant strides forward we've taken to bring more of our cutting-edge thinking together to solve our nation's biggest challenges as we deliver on our Strategy 2020.

COLLABORATION TO DRIVE INNOVATION

Our mission to become Australia's innovation catalyst is not just about our own brilliant science and customer-focused outcomes, but also about bringing together Team Australia's research talent and diverse business sectors to deliver tangible outcomes. In last year's annual report, I wrote that we stood on the shoulders of our great forebears in forging science's next legacy. Reflecting on this year, I think we've stood shoulder to shoulder with our partners as we forged stronger collaboration throughout the Australian innovation ecosystem.

Across CSIRO, our scientists have been transforming the face of research translation through our ON program, and by extension, fostering a strong and collaborative Australian innovation ecosystem. From an initial intake of a handful of great CSIRO concepts, we now have formal, signed partnerships with the Australian Nuclear Science and Technology Organisation, Defence Science and Technology Group, the Queensland Department of Agriculture and Fisheries, and 30 universities, including all Australian Technology Network and the Group of Eight universities. ON has taken 135 teams through customer-ready programs, with only 48 of those from CSIRO and the rest coming from our partner organisations. ON has delivered profound public good opportunities, from emissions reductions through FutureFeed, to protecting the Great Barrier Reef from sedimentary runoff and saving water with Transpirational, to helping farmers manage climate variability through YieldProphet, just to name a few.

The brilliant science at the heart of our organisation has been strengthened by greater collaboration as well. Our joint publications are up across nearly all metrics: the total number is up again, two per cent on last year; and we've increased collaborations with international organisations to 60 per cent of the total. This is even more impressive considering the rate of publications per CSIRO scientist is higher than previous years. Capping it off, this year we placed 18th in the Reuters list of Top Global Innovators, and in the top 20 of IEEE's (Institute of Electrical and Electronics Engineers) innovation index of all research institutions alongside Stanford and Massachusetts Institute of Technology.

We've also grown our global partnerships in key strategic regions this year. Our US office in San Mateo, California, is about to open its doors, creating new pathways for Australian research to enter the innovation-hungry US market. Our relationships in Chile are expanding into environmental partnerships. And in China, we've capped off a year of new contracts with the opening of our Centre for Southern Hemisphere Oceans Research, based in our new Climate Science Centre in Hobart. While the focus on key regions is new for CSIRO, the science at the heart of our partnerships builds on decades of expertise and world-class capability. This same reputation secured us long term research contracts with many valuable partners with international customers, including Boeing, Swisse and Cotton Seed Distributors.

INVESTING IN OUR FUTURE

To secure our future prosperity, we'll continue to invest in the breakthrough science of the future. Our investment in our Future Science Platforms increased to a total of $21 million in 2016–17, and will continue to grow each year until 2019–20. And we're planting the seeds that will yield funding to reinvest in our science, with active licences also up again this year.

From a business perspective, our results are even better than last year. Our external revenue is up again, both in dollar value and in share of our budget compared with appropriation. We delivered three out of five of our market roadmaps in collaboration with the Growth Centres – with the final two to be released by September – and they are guiding our science roadmaps to greater success by getting ahead of the nation's challenges and leveraging our unique multi-disciplinary capabilities to keep us globally competitive. The STEM+ Business Fellowship, funded by the Science and Industry Endowment Fund (SIEF), has added another 17 early career researchers to the cohort, working on over $5 million worth of projects in long-term collaborations with small-to-medium enterprise. More than 94 per cent of SIEF-funded projects involve collaborations with more than one partner organisation. Our external collaboration is up, and following reorganisation of our teams, the need for transferring our people across silos is down. Perhaps most important for our sustainability, our customers are showing their appreciation. Our Net Promoter Score (NPS) has leaped to +34.

None of this would have been possible if not for our people, so it's great to see the number of CSIRO people continuing last year's trend of growth – the first time we've achieved multi-year growth in people in a decade. In fact, if we continue to deliver we'll earn growth that hasn't been seen in over 20 years. We've also invested in our next generation of scientists, with sponsored postgraduates up 30 per cent this year. We continue to drive better ways of working together, strengthening our internal collaboration and fuelling next year's successes. Our CSIRO Connect workshops have reached people leaders in five states this financial year, and will roll out around the rest of the country before the end of 2017. The workshops connect our people to our strategy, share more about our achievements and drive a deeper understanding of the culture we are creating. Our Reconciliation Action Plan was formally launched last year, signalling a renewed and deeper commitment to the first people of our nation. And our Balance initiative is challenging cultural norms around how we work, giving our people more flexibility and creating the innovative workplaces of the future.

Driving this success is our solidly maintained world-class science, our culture of diversity and inclusion, a commitment to health and safety first, and always delivering on our commitments. These core values will see us continue to shine a beacon across the innovation ecosystem, bringing together partners from research, industry, government and the community, to solve our biggest national challenges and secure our future success and prosperity. But our strategy is just a clever idea without our people who bring it to life, so I thank each and every one of them.

Dr Larry Marshall
Chief Executive of the CSIRO

Highlights of 2016–17

COLLABORATING ON NATIONAL INNOVATION

$3.2 billion per year

the estimated present value of benefits across 28 impact case studies

>1,000

connections in the innovation community, through Data61 Ribit match-making platform

84%

of our publications were in collaboration with authors from other institutions

>$5 m

worth of projects of the STEM+ Business Program to place early-career researchers into long-term SME collaborations

9/10

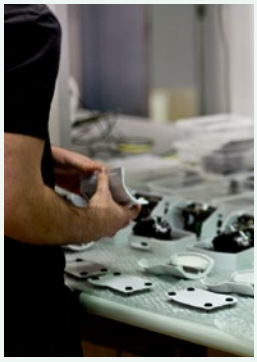
'Willingness to Recommend' score from participants in our entrepreneurial ON program

Supplier of the Year

Technology Award presented to CSIRO by Boeing

175

university participants supported by CSIRO ON Accelerator and ON Prime pre-accelerator programs



$25 m

injected into research and development through the SME Connect team facilitating over 155 research projects

>1,000

SMEs worked with CSIRO

$484 m

external revenue generated

OUR SCIENCE IMPACT

In partnership with CSIRO, the Cancer Therapeutics CRC (CTx) developed a **NEW CANCER DRUG** that is being taken to clinical trials. (pg 39)

The **FIRST DEDICATED SURVEY** of marine life and the geophysical features of the abyss from Tasmania to Queensland was undertaken on the RV *Investigator*, collecting almost 5,000 specimens. Over one third of the invertebrates collected are thought to be new species. (pg 58)

Our **ELECTRICITY NETWORK TRANSFORMATION ROADMAP** and associated work informed the Council of Australian Governments Energy Council's work on the future of the electricity system, as well as the Chief Scientist's Independent Review into the Future Security of the National Electricity Market. (pg 36)

Construction of the **AUSTRALIAN SKA PATHFINDER TELESCOPE** was finished. It commenced observations in October 2016 for a giant census of galaxies, called WALLABY, which is set to detect more than half a million galaxies. (pg 55)

We signed a **LONG-TERM RESEARCH DEVELOPMENT ALLIANCE** with Ridley Corporation to further Novacq™ technology research, which reduces Australian prawn farming reliance on fish meal for feeds and supports the preservation of global fish stocks. (pg 34)

The uptake of **STANDARDISED DIGITAL HEALTH INFRASTRUCTURE** across major hospitals and state health systems has enabled better outcomes for patients and a safer healthcare system. (pg 37)

Our **PHOTONASSAY TECHNOLOGY** that detects atoms of gold in real time will drastically improve mining efficiency and effectiveness. (pg 40)

Our **eREEFS MODELLING FRAMEWORK** simulates and predicts the physical state of the Great Barrier Reef and is being used to protect the health of the Reef by informing public policy and decision making. (pg 41)

CSIRO has developed a **WEB-BASED REPORTING TOOL** in collaboration with the Indonesian Government that identifies and ranks vessels at sea associated with illegal, unregulated and unreported fishing. (pg 13)

Fostering a safe, respectful environment for our people

- CSIRO launched its Reconciliation Action Plan to reflect our commitment to Aboriginal and Torres Strait Islander cultural knowledge in science. (pg 92)
- The Recordable Injury Frequency Rate dropped by 19 per cent this year, with an overall reduction of 44 per cent compared to our baseline in 2015. (pg 26)
- We developed an LGBTI network and strategy to provide support for staff who identify in these groups. (pg 91)
- We conducted roadshows and focus groups to engage our leaders in the SAGE program, and established the SAGE Self-Assessment Team, to rollout initiatives to complete CSIRO's submission for the Athena Swan Bronze Award. (pg 91)

Contributing to a sustainable future

- CSIRO's carbon emissions decreased by five per cent compared with 2015–16 and has reduced by 14 per cent over the last five years. (pg 86)
- More than 130,000 primary and secondary school students took part in our hands-on science education programs and over 30,000 people took part in community programs. (pg 42)
- We developed a draft sustainability framework to set new benchmarks in sustainable urban development for the Ginninderra Field Station, and we are working closely with our stakeholders to restore vegetation and identify and protect Indigenous heritage features. (pg 88)

Our global science impact

EUROPE

CSIRO participates in a number of projects that are part of Horizon 2020, the European Union's €77 billion, seven-year research and development funding program, ranging from plant science and ocean ecosystems to radio astronomy and the Internet of Things. CSIRO's European laboratory located in Montpellier, France, signed an agreement with Montpellier SupAgro to create two joint appointments on Biosecurity with a third commencing late in 2017.

NORTH AMERICA

In April 2017, Boeing named CSIRO as a 'Supplier of the Year'. Our relationship with Boeing is long-standing. Since 1989, we have collaborated on more than 170 projects. CSIRO's Data61 has partnered with Rockwell Collins and other collaborators on the US DARPA High Assurance Cyber Military Systems Program. Together, we have developed software to protect communication systems of unmanned aerial vehicles from targeted attacks. In September 2017, we opened an office in the US to build business opportunities for Australian research, build greater relationships with our North American academic peers and provide a springboard into US markets.

LATIN AMERICA

CSIRO Chile has delivered an Integrated Management System in the second biggest salmon production market in the world. CSIRO Chile has also performed advanced resource characterisation for more than ten different mining operations including companies with Australian interests, as well as building significant new capacity in priority areas such as resource modelling and mine planning expertise. In Brazil, CSIRO worked with local forestry companies to promote the development and application of models to improve decisions on plantation production, increase water-use efficiency and manage catchments and water resources.

SOUTH ASIA

CSIRO has been working with India's Institute of Microbial Technology in Chandigarh and the Australian biomedical company, Axxin, to develop a portable point-of-care diagnostic tool to detect Tuberculosis. This is done from urine samples without the need for laboratory analysis. With support from the Australia-India Strategic Research Fund, this work will help bring accurate diagnosis of Tuberculosis to remote communities in countries like India, Papua New Guinea and Indonesia.

AFRICA

In partnership with the Biosciences east and central Africa Hub (BecA) in Kenya, CSIRO is achieving development outcomes for Africa. The partnership spans multiple research projects delivered with 30 partners across seven countries (Burundi, Cameroon, the Democratic Republic of Congo, Kenya, South Sudan, Tanzania and Uganda) to improve food safety, nutrition, animal health and build the capability of African research organisations.

EAST ASIA

In December 2016, CSIRO signed an agreement with the Qingdao National Laboratory for Marine Science to establish the Centre for Southern Hemisphere Ocean Research, which will be part of the CSIRO Climate Science Centre. The National Astronomical Observatories of the Chinese Academy of Sciences teamed up with CSIRO engineers in the development of the world's largest single dish telescope, the 500-metre Aperture Spherical Radio Telescope. CSIRO partnered with Japan's Teijin Limited through its spin-off, The Healthy Grain, to commercialise BARLEYmax™ in Japan. To date, over 20 products with BARLEYmax™ have been released in Japan.

SOUTH-EAST ASIA

In collaboration with the Indonesian Government, CSIRO has developed a web-based reporting tool that identifies and ranks vessels at sea across the globe associated with illegal, unregulated and unreported fishing. These illegal practices harvest 26 million tonnes of fish each year worth approximately US$23 billion. CSIRO and the Malaysian non-government organisation, WorldFish, brought CSIRO's Novacq™ prawn feed additive to the Indian Ocean Region Association. The feed additive allows smallholder farmers to enrich local feed ingredients, increase productivity and reduce the unsustainable practices of using wild fish for fish feed.

PACIFIC

CSIRO has entered into a memorandum of understanding with AgResearch Ltd in New Zealand to collaborate across five joint agricultural areas.

A full list of CSIRO locations is available on page 161.

Elline Camilet partnered with Regina Coeli School as part of our STEM Professionals in Schools program that aims to increase student understanding and engagement with STEM.

Part 2
Annual performance statements

Statement of preparation

We, the CSIRO Board, as the accountable authority of CSIRO, present the 2016–17 annual performance statements as required under s39(1)(a) of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act). These annual performance statements are based on properly maintained records, and accurately present CSIRO's performance in accordance with s39(2) of the PGPA Act.

Purpose

CSIRO is an Australian Government statutory authority within the Industry, Innovation and Science Portfolio, operating under the provisions of the *Science and Industry Research Act 1949* (SIR Act).

Our purpose is to collaboratively address national priorities and assist industry by conducting and encouraging the uptake of world-class scientific research, managing research facilities on behalf of the nation and mobilising and developing the next generations of scientists for the benefit of Australia.

Additionally, CSIRO is tasked to connect and collaborate:

- with individuals, institutions and industry across the world around scientific research
- to provide scientific solutions, information and advice with a strong focus on pathways to adoption
- to provide opportunities and financial support for partnerships and mentoring.

Results

The activities and achievements outlined in this part of our annual report are evidence of our performance against the measures stated in the Corporate Plan 2016–17[2] and the Portfolio Budget Statements (PBS) 2016–17[3]. They reflect the priorities of the Board for the organisation and our performance. In addition to this report, we monitor our performance throughout the year through:

- regular reports to the CSIRO Executive Team and Board to assist with their decision-making and governance responsibilities
- detailed planning and review processes at a range of levels, including Business Units, functional areas and individuals.

Customer first

Collaboration hub

Global outlook, national benefit

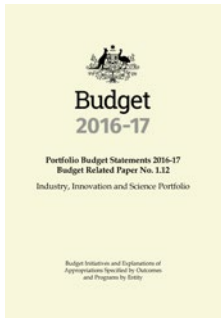
Deliver on commitments

Breakthrough innovation

Excellent science

Inclusion, trust and respect

Health, safety and environment



Research – Science, Services and Innovation Fund

National Research Infrastructure – National Facilities and Collections

Science and Industry Endowment Fund

2 CSIRO Corporate Plan 2016–17 is at: www.csiro.au/en/About/Strategy-structure/Corporate-plan/Corporate-plan-2016-17

3 CSIRO Portfolio Budget Statements 2016–17 is at: www.csiro.au/en/About/Our-impact/Reporting-our-impact/Performance-reviews/Portfolio-budget-statement

Performance against our strategy

Table 2.1 provides the summary results for CSIRO's Strategy 2020 objectives and performance criteria, as published in the Corporate Plan 2016–17.

TABLE 2.1: PERFORMANCE AGAINST OUR STRATEGY

STRATEGIC OBJECTIVE	PERFORMANCE CRITERION	RESULT
Customer first	Evidence of progress towards, and delivery of, impact objectives based on mixed-method evaluation, including external review outcomes, independently validated impact studies, verifiable evidence of uptake and adoption, and periodical whole-of-CSIRO impact assessments	CSIRO completed 12 impact case studies in the research areas of advanced manufacturing, agriculture, energy, health and mineral resources. Additionally, an independent evaluation was undertaken to assess the whole-of-CSIRO value to the nation using 28 case studies and other forms of evidence. The estimated present value of benefits from CSIRO's work is approximately $3.2 billion per year. This is almost three times the total annual CSIRO budget and more than four times the funding provided by the Australian Government.
	Maintain our customer satisfaction using our Customer Willingness to Recommend Net Promoter Score (NPS)	The NPS for 2016–17 was +34, which is a solid improvement over the +11 favourable result achieved last year.
Collaboration hub Global outlook, national benefit	Increase internal and external collaboration through the assessment of staff mobility across Business Units and our external engagement with industry and other stakeholders	Internal staff mobility and collaboration has slightly decreased to 9% of full-time equivalent (FTE) staff deployed outside of their Business Units, compared to 11% last year, resulting from the simplification of the CSIRO structure and merger of some units the previous year. Collaboration with external parties increased by more than 3% compared with the previous year (based on 3-5-year rolling averages, through higher rates of co-publication with external partners, growing inclusion of external capability in our projects through sub-contracting and maintaining rates of supervision of higher-degree students by CSIRO researchers).
	Increase the number of active technology licences from our research over base year 2014–15	The total number of active licences recorded as at 30 June 2017 was 360, which is an increase of 4%, or 13 licenses more than the previous year.
Deliver on commitments	Achieve budget as approved by the Board and consistent with the PBS	CSIRO achieved an operating result consistent with the approved budget, with a slightly positive variance of approximately 1% of the budget. Both expenditure and external revenue were materially consistent with the budget, with the actual results of each being about 2% less than budget.

STRATEGIC OBJECTIVE	PERFORMANCE CRITERION	RESULT
Breakthrough innovation	Increase our innovation capacity across all staff cohorts over the base year of 2015–16	The 2016 staff survey showed that 36% of staff perceived the organisation was good or very good at supporting innovation. The survey indicated that 55% of respondents reflected they had the ability to 'think outside the box'.
Excellent science	Increase our investment in future science and technology platforms, including capability development and central competitive funds	Our investment in future science increased to more than 125% of the base year 2014–15 through the allocation of an additional $9 million to the Future Science Platforms (FSP) program. Six new FSPs were established during the year, with some lag in expenditure due to this process, however expenditure was maintained in ResearchPlus programs for a total year-on-year growth in expenditure of more than 35%.
	Maintain or increase the number of refereed publications	The total number of refereed publications has decreased by 8% over the past year. The number of refereed journal publications decreased from 3,385 to 3,122, and refereed conference papers decreased from 595 to 364.
Inclusion, trust and respect	Increase the diversity of our leadership cohort including gender, non-English speaking background, and Aboriginal and Torres Strait Islander people	The representation of women in middle-to-senior leadership roles increased from 29% in 2015–16 to 31% in 2016–17. Employment of Aboriginal and Torres Strait Islander people and the percentage of leaders of non-English speaking background has seen minor increases.
Health, safety and environment	Increase staff safety via 'Zero Harm' policy of continuous improvement of Recordable Injury Frequency Rate (RIFR)	We achieved a RIFR of 8.3 per million hours worked, which represents a drop of 19% compared to last year and 44% compared with our baseline at 30 June 2015.

Analysis of our performance

The Minister's Statement of Expectations (SoE)[4] issued in November 2016 reinforced the CSIRO Strategy 2020 focus areas. Key activities were undertaken to increase staff understanding of the strategy and how it is embedded in the organisation, as well as sharing our vision and mission with our customers and stakeholders. We also focused on increasing collaboration with industry, universities and other publicly funded research agencies to understand and address national and global challenges.

Rapid technological change is transforming the nature of work, requiring a diverse, skilled workforce and improve access to work for disadvantaged groups. We must create a culture and environment that encourages our staff to work collaboratively and creatively to deliver on our unique purpose. This year we commenced CSIRO Connect workshops for team and group leaders to provide clarity about what the strategy means for leaders and their teams and how they play an important part in our success. We launched a number of programs in support of Strategy 2020 and the Culture and Morale Building Plan 2016, including Launch and Pitch Camps in collaboration with ON, Intensive Development Centres for aspiring and experienced leaders, and Career Development Centres for all staff.

By working towards a Science in Australia Gender Equity Bronze accreditation we have taken an evidence-based approach to measuring and addressing gender equity. We also invested in

4 See the index page 177 for a summary of the SoE and our response.

Science, Technology, Engineering and Mathematics (STEM) programs for school students, females and Aboriginal and Torres Strait Islander peoples to support researchers to access innovation funding and training resources.

We supported and progressed technology development to attract commercial investment and market uptake. Consistent with the SoE, we provided the tools to take world-class science from benchtop to market through programs such as our ON program. The SME Connect team actively raised performance through programs designed to connect small-to-medium businesses with Australia's best researchers.

Science and industrial research is a global discipline requiring key global partnerships. CSIRO's commitment to increasing the global outlook of Australia's world-class research and innovative businesses was realised this year by establishing a CSIRO office in the US, which will broaden our engagement with pre-eminent organisations in the international scientific and industrial community.

CSIRO also collaborated with the Qingdao National Laboratory for Marine Science and Technology, the University of New South Wales and the University of Tasmania to create the $20 million Centre for Southern Hemisphere Oceans Research. The Centre, based in Hobart, will conduct research to improve our understanding of the complex nature of the climate system, providing information, products and services to assist Australia and China to manage the impacts of climate variability and climate change.

Further details against each criterion

Evidence of progress towards and delivery of impact objectives

CSIRO conducts research to address the scientific problems facing industry and the nation. To provide the evidence that our work delivers economic, social and environmental impacts, we undertake impact case studies annually. Each case study is assessed within the context of a common framework, as outlined in the CSIRO Impact Evaluation Guide[5].

In 2016–17, CSIRO completed 12 case studies across the Energy, Health and Biosecurity, Manufacturing, Mineral Resources, and Agriculture and Food Business Units.

For example, the Plant Breeding Research Project, in conjunction with major research and commercial partners, has developed approaches to plant breeding that will enable existing arable land to provide food sustainably for a global population of almost 10 billion by 2050. CSIRO's Reversible Addition Fragmentation Chain Transfer (RAFT) technology enables the development of new tailored materials for the Australian biomedical industry. The toolkit developed from our Distal Footprints project enables the exploration of areas where mineral detection and extraction have been previously deemed too technically difficult or not cost effective.

Separately, in 2017, CSIRO commissioned ACIL Allen Consulting (ACIL Allen) to update its 2014 estimate of the impact and value delivered to the economy and the innovation system by the public investment in CSIRO[6]. ACIL Allen considered 28 case studies and examined additional ways in which CSIRO delivers value, including our standing capacity, the options created by our research, training and education services and the collaborations that CSIRO engenders. The estimated present value of benefits across the 28 case studies is approximately $3.2 billion per year, which is almost three times the total CSIRO budget and more than four times the funding provided by the Australian Government. The report also found that the annual value delivered by all other CSIRO research would at least match that delivered by the case studies. This suggests that the full research portfolio is providing an estimated return of over 5:1. Consideration of the additional ways in which CSIRO could add value provides further confidence that the actual value delivered by CSIRO is likely to be considerably higher than the estimate based on the case studies alone.

The estimated present value of benefits across the 28 case studies is approximately $3.2 billion per year, which is almost three times our total budget.

5 CSIRO Impact Evaluation Guide: www.csiro.au/en/About/Our-impact/Evaluating-our-impact
6 The report can be found at: www.csiro.au/en/About/Our-impact/Reporting-our-impact/Performance-reviews/2017-impact-assessment

Maintain our customer satisfaction

Fundamental to our success as an innovation organisation are the relationships we build with our customers. During 2016–17, CSIRO again used the comprehensive industry benchmark, Net Promoter Score (NPS) methodology, to determine customer satisfaction. NPS is a strong indicator not only of customer loyalty and satisfaction, but also as an indicator for growth. The NPS for 2016–17 was +34, which is a significant improvement from +11 last year and a favourable result.

The survey results show that customers find our scientists to be professional, innovative and a pleasure to work with. The excellence of our science and depth of knowledge of staff comes through strongly from customer responses. Our research adds value to business and CSIRO is a valued partner in solving their problems and finding solutions. According to our customers, our strengths are integrity, empathy, science quality, excellence and innovation. Customers have a high level of trust in CSIRO and consider us to be professional and ethical.

The survey also identified opportunities for improvement, including maintaining our capability and improving competitiveness, and contractual and intellectual property processes. These are already underway as a specific focus of our Strategy 2020 Customer First initiative.

Increase internal and external collaboration

We want to be Australia's innovation catalyst, and to innovate we must collaborate. As the connector between partners, we create career development opportunities for our staff, deepen our relationships with universities, other research organisations and industry, and we actively build Australia's future STEM talent.

Internal collaboration

Staff internal mobility and collaboration, as assessed through the percentage of staff deployed outside their home Business Unit, has slightly decreased to nine per cent of FTE, a drop from 11 per cent in the previous year. This is the result of simplification of the organisation's structure and the merger of some research units.

External collaboration

The external collaboration metric is based on 3-5-year rolling averages of the number of joint publications, industry and international project contracts and the number of research students co-supervised with Australian universities. Our external collaboration has increased by more than three per cent from the previous year. This is due to:

- an increase in the five-year rolling average of joint publications to 2,954 in 2016–17
- an increase of more than 10 per cent, to over $90 million per annum, in the three year rolling average value of sub-contracts and grants to partner institutions contributing to CSIRO projects
- maintaining the rate of student co-supervision, with 856 students, compared to last year.

Joint research publications

CSIRO has a high level of collaboration both domestically and internationally. Our number of collaborative publications has more than doubled since 2006. In 2017, 84 per cent of our publications were partnerships with authors from other institutions and 66 per cent were produced with authors from other Australian institutions. We have also increased the rate of collaborations with organisations overseas, as measured by the number of joint publications. In addition, 60 per cent of our scientific publications were co-authored with an international colleague, compared to 55 per cent in 2015.

Industry collaboration

In 2016–17, CSIRO earned approximately $219 million of external revenue through co-investment, consulting contract research and testing contracts with international and Australian private sector partners and customers.

This year, we worked with 1,750 private industry customers, including 400 major Australian companies, more than 1,060 Australian small-to-medium enterprises (SMEs), and a large number of overseas corporations (280).

This year, we worked with 1,750 private industry customers, including 400 major Australian companies, more than 1,060 Australian small to medium enterprises (SMEs), and 280 overseas corporations.

For example, our collaboration with Australian company Clinical Genomics enabled the delivery of a blood test for bowel cancer (Colvera™), which is currently in clinical trials for use in Australia and the US as a screening and early diagnostic test. As a blood test for cancer recurrence, Colvera™ was released in the US market in December 2016.

CSIRO has worked with Boeing over the past 28 years, collaborating on more than 170 projects covering everything from better production methods to space science, airport modelling software and how to best repaint a plane, to more recently including new manufacturing processes and ways to keep Boeing's workers safe. This close relationship was a key factor in the aviation company's decision to set up one of its largest R&D facilities in Australia. Boeing now has around 3,000 Australian employees. Local industry has also reaped the benefits with more than $336 million in Boeing related exports. In 2017, CSIRO was named a Boeing 'Supplier of the Year' in the technology category.

CSIRO strives to achieve science alignment with key industry sectors. The Industry Growth Centres Initiative is an industry-led approach to focus science and research in key areas with an aim of delivering commercial outcomes. The initiative covers six industry sectors:

- Advanced Manufacturing
- Cyber Security
- Food and Agribusiness
- Medical Technologies and Pharmaceuticals
- Mining Equipment, Technology and Services
- Oil, Gas and Energy Resources

In 2016–17, CSIRO delivered three Industry Roadmaps for the Advanced Manufacturing[7], Medical Technologies and Pharmaceuticals[8] and Mining Equipment, Technology and Services[9] sectors. These roadmaps are an important step in working with Australian industry to understand current and future trends. The remaining roadmaps will be delivered in 2017–18.

International collaboration

CSIRO's international activities support our role as a trusted advisor to the Australian Government and as a leading and respected institution in national and global innovation. In line with Strategy 2020, the pursuit of a global outlook has strongly informed our activities in 2016–17. Our connections with international universities and research institutes provides access to essential data and expertise. Our new US office will create opportunities to partner with SMEs and major companies in the US market. We already have a strong foundation in the market through strong relationships with NASA, Bayer LLP, Boeing and the Bill and Melinda Gates Foundation, and have worked with 49 of the top US Fortune 500 companies.

We already have a sound foundation in the US market through strong relationships with NASA, Bayer LLP, Boeing and the Bill and Melinda Gates Foundation, and have worked with 49 of the top US Fortune 500 companies.

7 Advanced Manufacturing Roadmap: www.csiro.au/en/Do-business/Futures/Reports/Advanced-manufacturing-roadmap
8 Medical Technologies and Pharmaceuticals Roadmap: www.csiro.au/en/Do-business/Futures/Reports/Medical-Technologies-and-Pharmaceuticals-Roadmap
9 Mining Equipment, Technology and Services Roadmap: www.csiro.au/en/News/News-releases/2017/Roadmap-to-drive-growth-for-Australian-METS

CSIRO's historic and more recent efforts demonstrate that our science supports Australian foreign policy and trade agendas, including alleviating poverty and improving market access for Australian exporters and trading partners, particularly in Asia. For example, CSIRO is working with The Nature Conservancy (TNC), an international conservation non-governmental organisation, and government, industry and communities in New Britain to help them plan for the best possible future development in their region. TNC and CSIRO are developing tools to build capacity among decision makers to take advantage of opportunities for mining, agriculture, fisheries and tourism in the Bismarck Sea, while considering the potential unintended consequences of development on communities and the environment.

CSIRO is working with Nepali organisations to support integrated water resources management in the Koshi Basin. We aim to build the evidence base necessary to guide strategic investments in water resources development under The Sustainable Development Investment Portfolio, an Australian Government initiative with the goal of increasing water, food and energy security in South Asia.

University collaboration

CSIRO partners with universities to ensure the best available research is used to deliver outcomes in areas of national priority. In 2016–17, CSIRO worked with 41 Australian universities in a range of activities. These universities were collaborators on 60 per cent of CSIRO's research publications, an increase from 57 per cent in 2015–16. In partnership with universities, CSIRO supervised 856 postgraduate research students, up from 801 last year.
Other highlights include:

- **Mining3**. CSIRO joined forces with CRCMining to create the world's largest, most advanced mining innovation centre. Mining3, located in Brisbane, brings together universities including Curtin University, the University of Queensland and the Queensland University of Technology, as well as industry members. Drawing on its extensive network, Mining3 has the scale and industry focus to address the greatest challenges facing mining. It is focused on shortening the innovation cycle to drive real outcomes for industry and the broader community.
- **RV *Investigator***. The vessel continues to deliver science and training in marine research. An eight-week trip led by Macquarie University with scientists and students from University of Tasmania, the Australian National University, University of Wollongong and Colgate University (US) to Antarctica's east coast returned with the world's first detailed map of the region's sea floor. The research vessel journeyed to the Sabrina Coastline to observe and research the melting Totten Glacier. The Chief Scientist for the voyage, Associate Professor Leanne Armand, is also the coordinator for CAPSTAN (Collaborative Australian Postgraduate Sea Training Alliance Network). CSIRO, with Macquarie University, selected the first cohort of postgraduate students to participate in this breakthrough sea training program that is providing a national approach to training in the marine sciences.
- **CSIRO ON Accelerator and ON Prime**. These pre-accelerator programs helped more than 175 university participants to develop their projects, with an average willingness to recommend score of 9/10. CSIRO also signed two Memorandums of Understanding (MOUs) with the University of Adelaide and University of New South Wales to consolidate our partnerships. A key collaborative activity resulting from these partnerships, and consistent with the Minister's SoE, is the Industrial PhD program for PhD students to do industry-focused research. The pilot program with the University of New South Wales will commence early in 2017–18.

Cooperative Research Centres

The Cooperative Research Centres (CRC) Program supports industry-led collaborations between researchers, industry and the community to foster high quality research to solve industry-identified problems. Since the program commenced in 1991, 211 CRCs have been funded by the Australian Government, and 31 active CRCs are operating in 2016–17.

CSIRO has participated in over 140 CRCs and participated in 19 during 2016–17. The total value of our projects in all CRCs in 2016–17 was $21.6 million, a $4 million increase on last year.

Several CRCs reached the end of their funding cycle in June 2017. These were the Polymers CRC, Defence Materials Technology Centre, Invasive Animals, Poultry and Rail Manufacturing.

CRC-P grants were announced in 2015–16 to support short-term, industry-led research. CRC-Ps are generally small collaborations that operate on project timelines of up to three years and grants of up to $3 million. There are 11 CRC-Ps in which CSIRO has participated, and we were involved with three in 2016–17:

- An Antibody based In Vitro Diagnostic for Metastatic Cancer CRC-P, CSIRO project value $278,000
- Printed Solar Films for Value-added Building Products for Australia CRC-P, CSIRO project value $497,000
- Future Oysters CRC-P, CSIRO project value $95,000.

Increase the number of active technology licences

Part of our purpose is to facilitate the application and use of our research. Technology licences are used as a key indicator of research and development uptake and adoption by customers and collaborators. The total number of active licences recorded as at 30 June 2017 was 360; an increase of 13 active licenses, or four per cent more than 2015–16. This total includes 129 patent licences, over 100 copyright licences and more than 30 Plant Breeder's Rights. The reported result is an aggregate count of all executed IP licences currently in force. This includes both revenue and non-revenue generating agreements and indirect licences. The revenue generated over the last five years from licences and royalties is $239 million. For details of our IP and equity portfolio see pages 30–31.

The total number of active licenses recorded as at 30 June 2017 was 360; an increase of 13 active licenses, or four per cent more than 2015–16.

Achieve approved budget

Financial sustainability is important to CSIRO. Through careful management of expenditure and projects generating revenue, the operating deficit of $20.8 million this year was within tolerance of the $36 million operating deficit approved by the Government. This was the result of total expenses of $1,292.1 million, externally earned revenue of $484 million and appropriations from government of $787.3 million, all being materially consistent with approved budgets (see Table 2.2).

Increase our innovation capacity

Our aim is to increase our capacity to help reinvent existing industries, create new industries for Australia and deliver public good. To achieve this, we need a culture that embraces innovation and programs that build entrepreneurial capacity and investments in future science areas. Our 2016 staff survey showed 36 per cent of staff perceived our culture as good or very good at supporting innovation. The survey also indicated that 55 per cent of respondents felt they had the ability to 'think outside the box'. CSIRO undertook considerable measures during 2016–17 to increase its innovation capacity.

We established six new FSPs to stimulate collaboration and develop a strong foundation for prospective multi-disciplinary innovations. The FSPs are designed to provide researchers with resources and opportunities to explore new scientific areas. Through the ON program, we have run pre-accelerator and accelerator programs to develop the capability and capacity of our teams to translate research into innovative solutions for real-world users.

In addition, we commenced a series of CSIRO Connect workshops for our Group and Team Leaders to enable staff to understand their role in Strategy 2020. To date, these workshops have involved nearly 1,000 of this critical leadership cohort.

TABLE 2.2 CSIRO'S FINANCIAL PERFORMANCE BY SOURCE OF REVENUE, $M

REVENUE SOURCE	2012–13	2013–14	2014–15	2015–16	2016–17
Australian private sector	70.1	78.5	69.4	80.1	86.9
Australian governments	190.3	179.3	181.1	147.8	165.6
Rural industry research and development (R&D) corporations	38.4	50.2	38.1	31.7	38.7
Cooperative Research Centres	16.9	14.7	9.5	10.0	12.0
Overseas entities and international	84.3	84.7	81.4	99.3	80.7
Work in progress/deferred revenue	25.1	–13.0	–6.1	–4.0	–9.3
Total co-investment, consulting and services	**425.1**	**394.4**	**373.4**	**364.9**	**374.7**
Intellectual property (IP) – royalty and licence revenues	37.5	29.1	60.8	59.7	51.1
Total research and services revenue	**462.6**	**423.5**	**434.2**	**424.7**	**425.8**
Other external revenue	44.1	43.2	44.6	37.8	57.3
Gain/(loss) on sale of assets	0.0	-	0.0	1.2	0.9
Other fair value gains and reversals	5.5	-	6.7	-	-
Total external revenue	**512.2**	**466.7**	**485.5**	**463.7**	**484.0**
Revenue from government	733.8	778.2	745.3	750.3	787.3
Total revenue	**1,246.0**	**1,244.9**	**1,230.8**	**1,214.0**	**1,271.3**
Less expenses	1,267.5	1,270.6	1,245.3	1,270.6	1,292.1
Operating result	**–21.5**	**–25.7**	**–14.5**	**–56.6**	**–20.8**

Increase our investment in future science and technology platforms

CSIRO established six new FSPs as an investment in science to underpin innovation. These have the potential to reinvent and create new industries for Australia by developing new capability in leading-edge, interdisciplinary science. The growth of our investment in the portfolio of FSPs is an important element of our Strategy 2020. Our investment increased to more than 125 per cent of the base year 2014–15 through the allocation of an additional $9 million to the program. In the first full year of operation the emphasis was on building teams and establishing research activities and partnerships. This resulted in a lag in expenditure of less than 10 per cent below the investment allocated. The ResearchPlus grants programs, which attract and develop early- and mid-career researchers, support international research visitors and fund seminars to explore cutting-edge science. These investments remain within the allocated budget. The overall forward budget trajectory is consistent with investment targets in future years.

Maintain or increase the number of refereed publications

Research publications are an important measure for research organisations by which to judge the standard and quality of research. The number of published, refereed CSIRO journal articles and reviews has trended upwards since 2012 (see Figure 2.1). This has decreased from 3,385 to 3,122 over the last year. The number of refereed conference papers recorded in the ePublish system has also decreased from 595 in 2015 to 364 in 2016. Overall, the total number of refereed publications has decreased by eight per cent.

We would expect a reduction in publication counts some years after a drop in research-active FTE, as was experienced between 2013 and 2015. However, notwithstanding the impact of reduced numbers of scientists and engineers, the total number of refereed papers is still greater than earlier years when staff numbers were higher. For example, in 2012–13, there were 2,952 publications for 6,477 staff, compared to the current result of 3,122 for 5,565 staff.

Journal articles are the main type of research publication produced by CSIRO, followed by conference papers (see Figure 2.2). In addition, CSIRO produced 579 client reports and 402 technical reports during 2016–17.

FIGURE 2.1: CSIRO JOURNAL PUBLICATION OUTPUT BY YEAR 2012–16

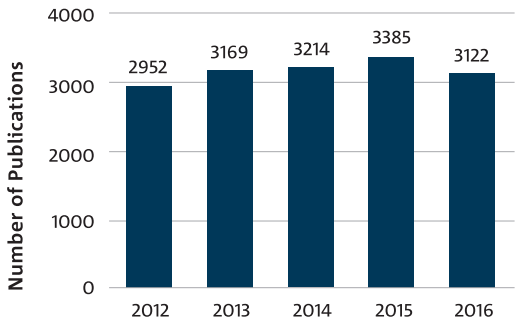
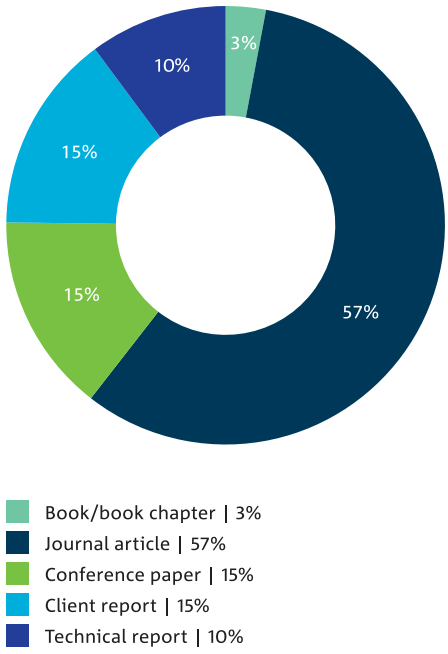


FIGURE 2.2: PERCENTAGE OF CSIRO PUBLICATIONS BY TYPE



Increase the diversity of our leadership cohort

A diverse and inclusive culture supports the excellence of our science and increases our impact for the nation. The gender representation across CSIRO, regardless of role, remained unchanged at 40 per cent women and 60 per cent men over 2016–17. Overall, representation of women in middle-to-senior leadership roles (science-specific and enterprise-support roles) increased from 29 per cent in 2015–16 to 31 per cent in 2016–17.

The female leadership representation (in science-specific roles) improved from 21 per cent in the previous year to 25 per cent. CSIRO's participation in the SAGE program aims to develop initiatives to support the increase of women's representation in leadership within CSIRO and across STEM more broadly. Additional information on these initiatives is on pages 91–92.

CSIRO's participation in the SAGE program aims to develop initiatives to support the increase of women's representation in leadership within CSIRO and across STEM more broadly.

Employment of Aboriginal and Torres Strait Islander people has increased from 1.8 per cent to 1.9 per cent this year through the ongoing initiatives within our Indigenous Engagement Strategy. These are detailed on page 92.

The percentage of leaders reporting a non-English speaking background increased from 17 per cent to 18 per cent. To meet our diversity and inclusion objectives, reference groups and plans have been established across all Business Units to provide clear blueprints on what is to be achieved and how we will embed processes to ensure successful implementation.

Increase staff safety

The health and safety of our staff is fundamental to our ability to deliver great science and innovative solutions. In the last 12 months, CSIRO's Recordable Injury Frequency Rate dropped by 19 per cent from last year's result due to decreases in both the Lost Time Injury Frequency Rate (LTIFR) and Medical Treatment Injury Frequency Rate (MTIFR) measures. Thirty staff suffered an injury serious enough to prevent them from coming to work. This equalled last year's result. The LTIFR (the number of lost time injuries occurring per million hours worked), was 3.2 for 2016–17, down from 3.3 in 2015–16, a reduction of 3 per cent. Our ongoing focus on preventing musculoskeletal and low-frequency, but potentially serious, injuries resulted in the MTIFR dropping to 5.1 in 2016–17 from 7 in 2015–16, a substantial decrease of 27 per cent.

Although the number of injuries significantly decreased, there were nine incidents that were reportable to Comcare. The most serious was an explosion at the Clayton site that resulted in one staff member being hospitalised with minor injuries. There was also damage to one building. Along with all reported incidents, this event was fully investigated, and corrective actions and process improvements are being implemented.

Initiatives continue to encourage staff to avoid physical risk and to report body-stress injuries early before they develop into more disabling injuries. More information on our health and safety is on page 84.

Performance of Portfolio Budget Programs

The majority of CSIRO's funding (62 per cent) is received from the Commonwealth. Our work is focused on delivering against our Outcome Statement[10].

Our Outcome Statement is:

To contribute to delivering innovative scientific and technology solutions to national challenges and opportunities to benefit industry, the environment and the community through scientific research and capability development, services and advice.

We achieve this through three Programs.

1.1 Research – Science, Services and Innovation Fund
1.2 National Research Infrastructure – National Facilities and Collections
1.3 Science and Industry Endowment Fund.

The following sections provide a report against the deliverables and performance measures specified for each Program. Table 2.3 outlines a summary of our consolidated financial performance by Program.

TABLE 2.3: CSIRO (CONSOLIDATED) FINANCIAL SUMMARY BY PBS PROGRAM 2016–17, $M

	ACTUAL	PBS BUDGET	VARIANCE
Government revenue	787.3	787.3	0
External revenue	510.7	494.0	16.7
Total revenue	**1,298.0**	**1,281.3**	**16.7**
Program 1.1 (Research – Science, Services and Innovation Fund)	1,132.6	1,179.7	–47.1
Program 1.2 (National Research Infrastructure – National Facilities and Collections)	152.5	148.3	4.2
Program 1.3 (Science and Industry Endowment Fund)	18.4	23.6	–5.2
Total expenses	**1,303.5**	**1,351.6**	**–48.1**

10 The relevant section of the Portfolio Budget Statement can be viewed at: www.industry.gov.au. The Outcome is the formal legal statement of the purpose for which funds are appropriated to CSIRO.

Program 1.1:
Research – Science, Services and Innovation Fund

CSIRO's Research Program activities deliver economic, social and environmental impacts to the nation by providing scientific solutions, information and advice.

CSIRO commits the majority of its resources to this program through large-scale, interdisciplinary research partnerships with Australian universities, publicly funded research institutions, the private sector and selected international organisations. We also provide technical and advisory services to industry and government. CSIRO Services runs student education programs and provides technical and engineering services, SME support and foresight advisory services.

Our science outreach activities promote the importance of CSIRO science and its application to students, parents, teachers and the Australian community. We support undergraduate, postgraduate and postdoctoral research to boost the calibre of researchers working in the Australian community and strengthen Australia's future innovation capacity. We also operate CSIRO Publishing, an independent science and technology publisher that has a global reputation for quality products and services covering a wide range of scientific disciplines.

This year our Research Program continued to perform well. Table 2.4 provides a summary of the results of the performance against each criterion, followed by additional details for each criterion, where not already provided earlier in this report.

Analysis of our performance

In 2016, the National Innovation and Science Agenda (NISA) augmented CSIRO's vision to be Australia's innovation catalyst. NISA has created new opportunities for collaboration in science by supporting the establishment of the CSIRO Innovation Fund 1, LP to invest in start-up and spin-off companies and SMEs engaged in research generated through the publicly funded research sector. This is important as Australia builds more ways to realise the value from the outstanding research from our nation's scientists. This includes a concentrated effort in linking research to industry, and the pursuit of a next-generation, STEM-qualified labour force.

Under the Minister's SoE, CSIRO is tasked with supporting women in STEM and closing the gap in Aboriginal and Torres Strait Islander achievement and employment in STEM. CSIRO remains committed to ensuring we are an employer of choice, a preferred collaboration partner and a trusted advisor. CSIRO rolled out the Balance initiative to foster a diverse and inclusive workplace for the future, and continues to work towards the diversity benchmarks in the SAGE program. Our science outreach programs promote the importance of CSIRO research, its application and STEM literacy and connection to the Australian community.

CSIRO will continue to build capability in managing our research for impact and supporting staff in planning, monitoring and evaluating the outcomes from their work. Reporting impact from research is becoming a central discussion in the national innovation system, and anticipated inclusion into an impact assessment framework for Australian universities.

TABLE 2.4: PERFORMANCE SUMMARY FOR PROGRAM 1.1

PERFORMANCE CRITERION	RESULT
Customer and user satisfaction as measured through satisfaction and willingness to recommend surveys and other feedback mechanisms	The NPS for 2016–17 was +34, which is a solid improvement over the +11 result achieved last year. Further details about this result are included in the strategy performance section, pg 20.
Improve the innovation capacity, diversity and inclusion of staff with a focus on leadership	The 2016 staff survey showed that 36 per cent of staff felt CSIRO culture was good or very good at supporting innovation. The survey also showed that 55 per cent of respondents felt they had the ability to 'think outside the box'. The representation of women in middle-to-senior leadership roles increased to 31% in 2016–17. Employment of Aboriginal and Torres Strait Islander people and the percentage of leaders of non-English speaking background has seen minor increases. Further details about these results are included in the strategy performance section, pp 24, 26.
Maintain or grow proportion of external revenue, particularly from industry and internationally	Total external revenue was in line with the budget, delivering revenue from industry, government and international customers of 37% of total expenditure.
The CSIRO Innovation Fund 1, LP has a strong pipeline of investible propositions across deep science based technology	Efforts to date have been on establishing the necessary entities for the operation of the Fund, which will commence in 2017–18. Details of the performance of the Fund will be reported in next year's annual performance statements.
The CSIRO Innovation Fund 1, LP aligns with key industry sectors including Government's Science and Research priorities and Industry Growth Centres	
Evidence of economic, social and environmental impacts through validated uptake and adoption of research outputs and science excellence	47% of CSIRO's patent portfolio is either subject to a commercial licence, arose as a result of collaborative activity, was used as background IP in a collaboration or evaluation, or is subject to a research right. Currently, CSIRO has interest in 41 companies and special purpose vehicles with a total market value of $664 million. Our research publications were 51% more cited than the global average for 2016, with 2.8% of CSIRO publications in the top one per cent of articles globally and 10.6% in the top five per cent globally. Uptake and adoption of our research and education programs is demonstrated through nine case studies.

Further details against each criterion, where not already provided earlier in the report

Maintain or grow external revenue

Financial sustainability is fundamental to CSIRO. External revenue reflects our external commercial engagement and informs our planning. The total external revenue was in line with the budget, delivering revenue from industry, government and international customers of 37 per cent of total expenditure. See page 24 for an overview of CSIRO revenue and sources.

CSIRO Innovation Fund

The CSIRO Innovation Fund 1, LP aims to help improve the translation of publicly funded research into commercial outcomes and stimulate innovation in Australia. In 2016–17, our focus was on establishing the necessary entities to operationalise the Fund, to be managed by a CSIRO subsidiary known as Main Sequence Ventures. All necessary legal entities are now in place. Managing Director Bill Bartee was recruited in December 2016 and finalisation of the team is complete with Phil Morle, Mike Zimmerman, Mike Nicholls and Martin Duursma now on board. Innovation and Science Australia (ISA) conditionally registered the Fund as an early stage venture capital limited partnership at the 20 June Board meeting. An application for an Australian Financial Services Licence is in process with the Australian Securities and Investments Commission. Licensing and ISA registration are the final steps required before investments can be made by the Fund. An Information Memorandum for potential investors in the Fund will be issued in early 2017–18 after licensing and registration and once due diligence has been completed.

Uptake and adoption of research outputs and science excellence

Another way in which we evidence the adoption and uptake of our research is through our IP assets, equity portfolio and case studies. They provide examples from our Science and Services Business Units of how businesses and communities have benefited from our work. The quality of our science is evidenced by the citation impact and ranking of our research publications.

Intellectual property

As of June 2017, CSIRO had 692 patent families, 261 trademark families and 116 Plant Breeder's Rights. The total number of patent families[11] in the IP portfolio has increased over the last year as a result of the incorporation of NICTA bringing 29 families. There has been steady increase in new invention filings over the past few years, with 79 new invention patent filings during 2016–2017. The number of granted cases and the number of live cases has also shown steady increase.

Of the IP assets listed in Table 2.5, 47 per cent of our patent portfolio is either subject to a research right, arose as a result of collaborative activity, was used as background IP in a collaboration or evaluation, or is the subject of a commercial licence.

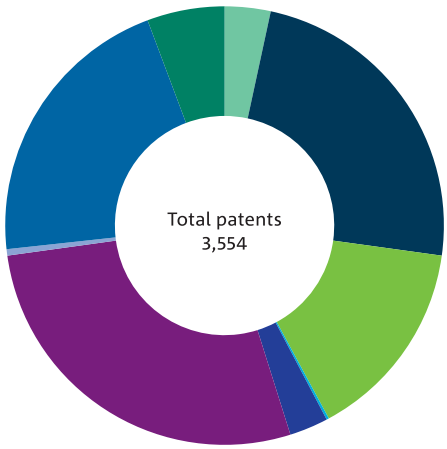
The total number of live patent cases in Asia has been increasing steadily over recent years. CSIRO has a large proportion of live patent cases in Asia, with approximately 23 per cent in Japan, China, India, South Korea, Hong Kong, Malaysia, Indonesia, Singapore, Vietnam, Taiwan, Thailand and the Philippines (see Figure 2.3). There has been a slight decrease in the number of filings in regions such as Africa and South America. These regions represent a relatively small portion of our patent portfolio (approximately eight per cent). Overall, our spread of patent cases mirrors the geographic regions where we focus our research.

11 A patent family is a collective set of patents to protect a single invention. In other words, all patent filings around the world for the same invention constitute a patent family.

TABLE 2.5: CSIRO INTELLECTUAL PROPERTY PORTFOLIO (INCLUDING NICTA IP)

IP CATEGORY	SUB CATEGORY	2012–13	2013–14	2014–15	2015–16	2016–17
Patents	Current Cooperation Treaty (PCT) applications	83	56	78	75	59
	Granted	1,647	1,755	1,854	1,959	2,122
	Live cases	3,454	3,506	3,430	3,544	3,773
Inventions	Patent families	718	644	578	595	692
	New provisional and direct filings	87	66	63	70	79
Trademarks	Australian	281	257	250	251	238
	Foreign	88	91	63	62	94
Plant Breeder's Rights	Australian	87	91	89	89	90
	Foreign	24	26	25	25	26
Registered designs	Australian	3	2	2	2	2
	Foreign	8	6	6	6	6

FIGURE 2.3: CSIRO'S STANDARD PATENT CASES[12] BY GEOGRAPHIC REGION



- Africa | 106
- Asia | 833
- Australia, NZ and PNG | 565
- Central America and the Caribbean | 6
- Eurasia | 97
- Europe | 983
- Middle East | 17
- North America | 764
- South America | 183

Equity portfolio

Central to CSIRO's purpose is the application of our research directly to industry. We systematically partner with the companies, large and small, best placed to take new technologies to market and deliver positive outcomes for Australia. CSIRO licenses technology to existing companies where it is deemed the most likely to maximise IP value. It also directly creates new high-technology SMEs through spinning out IP when that is considered to be the best pathway to commercialisation.

CSIRO's equity holdings (Table 2.6) are represented by ordinary shares, convertible notes and investments in the CSIRO Innovation Fund 1, LP and units in a pre-seed investment fund. The total value of CSIRO's equity portfolio at 30 June 2017 was $69.8 million.

12 The total patents reported excludes PCT and Provisional Application filings, as these by themselves do not give rise to a patent right. The total number of 'live cases' reported in Table 2.5 does include PCT and Provisional filings.

TABLE 2.6: VALUE OF CSIRO'S EQUITY HOLDINGS

	2015–2016	2016–2017
Listed and unlisted companies	$8,930,281	$19,541,035
Unlisted special purpose vehicles (SPV), CSIRO Innovation Fund 1, LP and Unlisted Unit Trust	$40,515,560	$50,279,196
Total	**$49,445,841**	**$69,820,231**

Currently, CSIRO has interest in 26 listed and unlisted companies with a total market value of $581 million. We are involved in 15 special purpose vehicles (SPV), which brings the total market value to $664 million. A major contributing factor of the revaluation of the portfolio was new and additional investments in unlisted companies. During 2016–17, the Fund increased by $10 million in government funding. CSIRO also became a shareholder in the start-up company Chrysos Holding to commercialise the PhotonAssay, a disruptive gamma activation analysis technology to measure ultra-low levels of gold and other valuable elements (see page 40 for further information). CSIRO received 38 per cent shareholder worth of $4.1 million shares in return for a transfer of IP and asset and research work.

A new investment was also made in the US company Amfora Inc. to develop applications of technology in corn and to progress applications in sorghum. This is of potential importance to farmers in northern Australia and dry environments. CSIRO has invested $3.3 million for a 28 per cent shareholding.

Other changes such as additional investments in unlisted companies and changes in share price for listed companies resulted in the increase of $20.4 million.

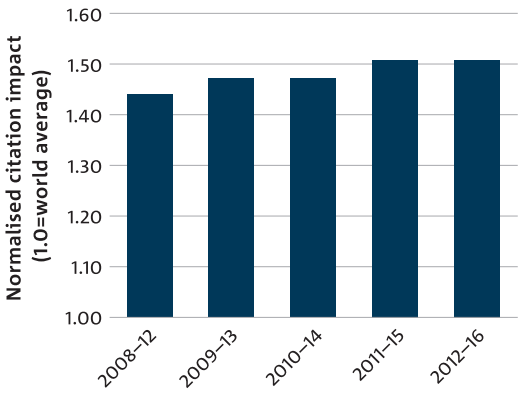
Two companies were impaired as at 30 June 2017, resulting in an impairment expense of $425,000. One company went into voluntary administration (Carbon Energy Pty Ltd) and the other was deregistered (Skiatech Pty Ltd).

Citation impact

Research performance is often measured in the scientific community by counting the citations of research publications as well as rankings in a range of fields. Citations are taken as recognition of value and academic impact.

Citations can be expressed relative to the global average performance, accounting for the age and subject of publications. A result of 1.0 is equal to the global average, 1.2 is 20 per cent more cited and 0.75 is, accordingly, 25 per cent less cited. CSIRO's publications for the period 2012–16 were 51 per cent more cited than the world average, a result equal with the period 2011–15 (see Figure 2.4).

FIGURE 2.4: CSIRO NORMALISED CITATION IMPACT BY 5-YEAR ROLLING WINDOWS



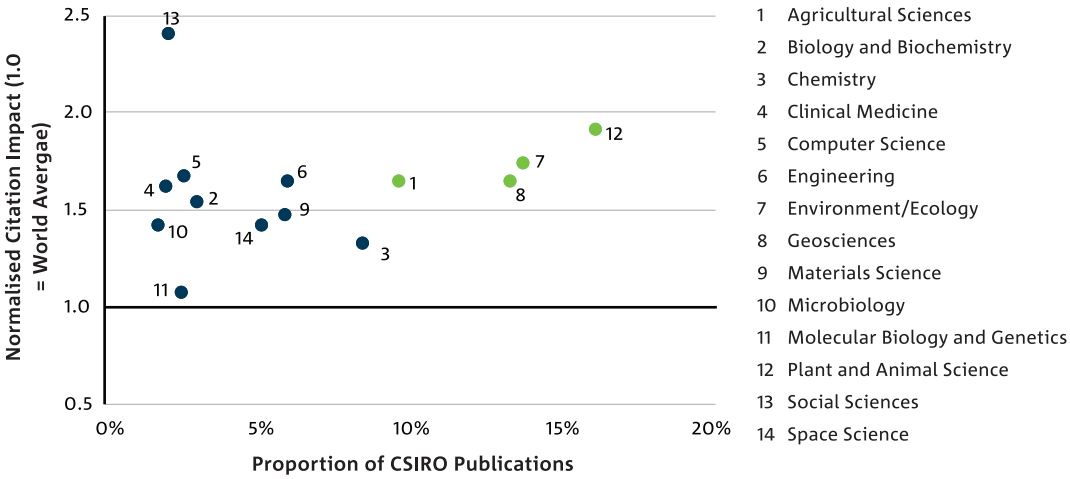
CSIRO produces publications in a range of research fields. Figure 2.5 shows the top 14 fields in which we continue to rank in the top one per cent globally by total citation count. Fifty-three per cent of our publications are in the four fields for which we are most strongly ranked for citations (that is, in the top 0.1 per cent). We have held this position for 13 years—as long as CSIRO has tracked this performance.

Another established metric is ranking articles by citation count based on percentile performance, compared with all other articles of the same type and in the same subject area. In 2012–16, 2.8 per cent of CSIRO publications were in the top one per cent of articles globally, 10.6 per cent in the top 5 per cent and 18.2 per cent in the top 10 per cent. These results demonstrate that our share of the very best research output is substantially above average and continues to improve.

Adoption case studies

Case studies showcase the achievements of CSIRO staff in attaining adoption and uptake of their work. The following section provides examples from our Science and Services Business Units of how businesses and communities have benefited from our work.

FIGURE 2.5: CSIRO PUBLICATION OUTPUT AND CITATION IMPACT BY RESEARCH FIELD 2007–16[13]



13 The four research fields represented by green points are CSIRO's four main fields of research.

Agriculture and Food

Novacq™ prawn feed additive going global

One third of the annual worldwide fish catch is used to produce fish meal for farmed fish and crustaceans. A six per cent per annum worldwide growth in aquaculture means there is a critical need to develop cost-effective, sustainable alternatives to wild-harvest fish products for aquafeeds. Commercial prawn diets typically contain about 25 per cent fishmeal. Currently, about one million tonnes of fishmeal go into shrimp diets worldwide. CSIRO's novel prawn feed additive, Novacq™, is helping reduce Australian prawn farming reliance on fish meal for feeds and to preserve global fish stocks.

Novacq™ is the result of over a decade of CSIRO research into prawn nutrition. This has required a unique, interdisciplinary capability in prawn biology, disease, microbiology, biochemistry and nutrition. Novacq™ is an entirely natural bioactive product based on the smallest organisms in the marine environment – the microbes that are the foundation of the marine food pyramid. Novacq™ is produced via the bio-conversion of low-value plant waste from agriculture. Adding Novacq™ to the diet of farmed prawns results in prawn stock that grows on average 40 per cent faster and is healthier, while providing a high-quality product for consumers.

Farmed prawns fed with Novacq™ grow bigger, faster and provide a healthy, high-quality product.

The $75 million Australian prawn farming industry was the first to benefit from Novacq™. Successful farm trials were conducted at Australian Prawn Farms, one of Australia's leading prawn farming companies. The growth rate and prawn health benefits of Novacq™ have since been demonstrated in Black Tiger prawns and Vannamei shrimp, the major breeds for both the local and international industries.

This Australian innovation is now being taken to the world by Australian company, Ridley AgriProducts. Ridley became the first licensee for the Novacq™ technology in 2013 for Australia, Indonesia, the Philippines and Malaysia. In 2016, Thailand and other South Pacific territories were added. In early 2017, CSIRO extended Ridley's licensing arrangements to the rest of the world (excluding China and Vietnam). Ridley has commenced development of production sites and blending facilities in Thailand from where it can service multiple markets and feed manufacturers quickly and cost-effectively.

CSIRO has granted additional licences to two companies enabling commercialisation of Novacq™ technology into China and Vietnam; two of the world's largest producers of farmed prawns. In Vietnam, Viet-Uc is the key CSIRO partner. Its Novacq™-based feed factory is expected to begin selling to the Vietnamese prawn industry in 2017. CSIRO has now issued licences for 100 per cent of the global prawn feed market.

Our work has reduced pressure on precious marine resources and has created a new industry in Australia – the production of a sustainable prawn feed ingredient. The key impact of Novacq™ is the improved yield of farmed prawns through increased growth rates. Additional jobs in the industry are expected as a result of the expansion of Ridley's Novacq™ production plants in Yamba, NSW and in Thailand. The positive impacts on the environment include a more sustainable prawn industry, reduction in agricultural waste and protection of existing fish stocks.

This year CSIRO and Ridley signed a long-term research development alliance to continue research and development of the Novacq™ technology and to explore the potential of expanding use to other species, such as potentially livestock.

Data61

PaidRight set to future-proof payroll practices

How do you prevent headaches, legal battles and fines? Data61's PaidRight system could make it easier for staff to be paid in line with their employment contracts and allow employers to avoid the highly publicised payroll errors, reputational damage and fines that are known to follow suit.

A joint venture between Data61 and PricewaterhouseCoopers (PwC) has resulted in PaidRight, a world-first web application that solves a global business problem: how to interpret modern awards and complex enterprise agreements and avoid payroll errors.

Data61 is a leader in the emerging field of regulation technology (known as RegTech) and has been researching how to encode law and regulation as machine-readable code for a decade. PaidRight strips back enterprise agreements and quickly turns them into machine-readable code.

PaidRight works by going deeper into the field of legal informatics. It transforms rules and regulations into digital logic using a multi-stage process and makes connections between complex regulations. It means that 'If X then Y' scenarios can be explored at the touch of a button. Using PaidRight, businesses can assess the implications of overtime for certain employees, analyse the impact and cost of roster changes and make quick comparisons before determining the best course of action while staying compliant.

While PaidRight is digital logic at its best, it still requires human interaction. One of the strengths of PaidRight is that it uses the interaction between computer and humans to deliver best practice decision-making. As complex problems such as efficient rostering are solved, the application makes suggestions that humans can act on. For example, PaidRight may indicate that some workers perform overtime, but it is the human managers who make the final decision.

For CEOs and Board members looking for assurance that franchisees or sub-contractors are paying employees appropriately, the arrival of PaidRight in the marketplace is a way to stay on the right side of increasingly active regulators. It is a way to avoid the hefty fines that come with underpayments or non-compliance with enterprise agreements.

PwC's global client list will be among the first companies able to run the application alongside their in-house payroll systems. Within its first year on the market, PaidRight is set to help 100 companies ensure their employees are being paid correctly.

The successful collaboration between Data61 and PwC allowed the team to take the application from development to commercialisation in just 16 weeks. As PaidRight enters the market, Data61 is looking to the future. The team is designing other platforms to springboard future digital regulation tools and services to remain at the forefront of the RegTech industry.

PaidRight is a world-first web application that translates employment awards and complex enterprise agreements into machine readable code to avoid costly payroll errors. Image: iStock

Energy

Transforming the grid: our Electricity Network Roadmap

Australia has experienced an unprecedented take-up of rooftop solar panels, and the adoption of batteries and other technologies is expected to increase. There is a significant opportunity to transition Australia's electricity network to ensure the future grid supports energy security, affordability for customers and significant reductions in emissions. The next decade will see considerable changes resulting from new technologies that must deliver lower costs and consumer preferences as well as limits on emissions following the Paris climate commitments.

In partnership with Energy Networks Australia, CSIRO developed the Electricity Network Transformation Roadmap that sets out concrete actions and milestones to 2027 to achieve significant outcomes for customers. The Roadmap provides a plan for the electricity sector to achieve a significant reduction in cumulative total expenditure, primarily due to avoided duplication of capacity and better use of the distribution, transmission and end-use sectors. As a consequence, substantial increases in average residential electricity bills can be avoided and customer cross-subsidies reduced. The Roadmap minimises inequitable outcomes and unintended cost transfers that might arise where customers are not able to take up opportunities that would save on electricity bills.

CSIRO's approach to developing the Roadmap provides an excellent foundation for industry and other stakeholders implementing positive change. Besides the strong stakeholder collaboration during its development, further Roadmap adoption includes consumer groups and government using the Roadmap scenarios and outputs to determine protections needed for consumers in a changing electricity system[14] and stress testing current electricity sector regulations.

In October 2016, CSIRO presented its work to the COAG Energy Council on the future of the electricity system. In January 2017, CSIRO and Energy Networks Australia provided a joint briefing to the Council's senior committee providing an update on the Roadmap findings. CSIRO also provided briefings and responded to a number of information requests from Chief Scientist Alan Finkel who was head of the independent review into the Future Security of the National Electricity Market. The review's final report emphasis on demand management using customer-distributed energy resources can, at least in part, be attributed to the Roadmap.

The Roadmap was launched in April 2017 and is the result of comprehensive CSIRO energy system analysis and input from over 200 electricity industry stakeholders. The Roadmap conclusions are supported by 25 expert reports. Feedback from public webinars and workshops was incorporated into components of the Roadmap that received a great amount of public interest. To date, the Roadmap website has had over 30,000 visits.

CSIRO and Energy Networks Australia were invited to provide expert information to the Select Committee into the Resilience of Electricity Infrastructure in a Warming World, and the Standing Committee on Environment and Energy's inquiry into modernising Australia's electricity grid. Energy Networks Australia has developed 11 critical projects that are essential to Roadmap success.

Dr Glenn Platt, Research Director CSIRO Energy, discusses Roadmap findings with an Expert Panel. L to R: Merryn York, CEO Powerlink; Gavin Dufty, Manager Policy & Research, St Vincent De Paul; Dr Glenn Platt; Luke Osbourne, COO Reposit Power; and David Swift, EGM Corporate Development AEMO; John Phillpotts, Roadmap Program Manager, CSIRO.

14 Consumer Action Law Centre 2016.

Health and Biosecurity

Providing Digital Health Infrastructure for Australia

Health systems in Australia and around the world are facing the same challenges – to deliver high quality services to citizens in cost effective ways. Moving a paper-based healthcare system to a digitally enabled system is a key enabler of efficiencies. It also increases the quality and safety of healthcare delivery. This requires the sharing of patient data across many different electronic systems, often captured using different formats and data types.

The use of standardised language in electronic health records enables health data to be shared between these different systems. This interoperability supports the data sharing, clinical decision support and data analytics required for a safer healthcare system and better health outcomes for patients.

Health records often use various terms to describe the same medical concept and clinical terminologies can be complex. Australia has adopted the international standard, Systematized Nomenclature of Medicine-Clinical Terms (SNOMED CT) for clinical documentation. It has also developed the Australian Medicines Terminology for medications used in Australia. Due to their complexity, these terminologies are difficult to implement and maintain in electronic health record systems.

In 2016, CSIRO partnered with the Australian Digital Health Agency to develop the National Clinical Terminology Service (NCTS). This is one of four national digital health foundation services supporting Australia's data driven health future. The NCTS makes CSIRO's terminology server, Ontoserver, available free for use in Australia. Ontoserver is one of the clinical terminology tools developed at the Australian e-Health Research Centre (AEHRC).

Ontoserver allows easy and fast implementation of terminology in electronic health records and clinical information systems. It also provides access to the advanced features needed for decision support and reporting use cases. CSIRO and the Australian Digital Health Agency have also developed a syndication service that provides automated updating of terminology content.

Ontoserver implements and supports a new standard in data interoperability in health – Fast Healthcare Interoperability Resources (FHIR). This emerging standard substantially simplifies implementation for most health IT vendors. Over the past 12 months, over 30 licences of Ontoserver have been taken out by large and small health IT companies, and implementation and deployment is increasing. Organisations already on-board are The Royal Australasian College of Surgeons, the Princess Alexandra Hospital, Mackay and Townsville hospitals and Queensland Health, as well as many small and medium-sized businesses in Australia. Bendigo Hospital was the first adopter of Ontoserver as part of the NCTS.

These tools are already providing benefits for patients and health services The Princess Alexandra Hospital in Brisbane in the last year used the AEHRC SnoMAP tool to automatically map terminology from the hospital's electronic medical records to the Australian disease classification system. They are using it to access accurate funding data and allowing clinicians to benefit from the detailed terminology records. Royal Hobart Hospital has being using Ontoserver for four years to capture procedures and diagnoses, and provide reports from their Clinical Information System.

CSIRO researchers outline the benefits of a National Clinical Terminology Service to Dion McMurtrie, Director of Tooling, Australian Digital Health Agency. L to R: Dr Jim Steel, Dion McMurtrie and Dr Michael Lawley.

Land and Water

Partnering for impact – managing Australia's precious water resources

The sustainable and productive management of Australia's water resources faces significant challenges. These include meeting competing water demands from the agricultural, environmental and urban sectors, impacts of over-allocation and resource extraction, uncertainty in water resource availability and the effects of hydroclimate variability and climate change.

The Australian Government recognised this challenge and introduced new legislated responsibilities, providing additional resources to the Bureau of Meteorology under the *Water Act 2007* to deliver water information for Australia. In 2008, a partnership between CSIRO and the Bureau of Meteorology brought together CSIRO's leading expertise in water and information sciences and the Bureau of Meteorology's operational role in hydrological analysis and prediction. The resulting Water Information Research and Development Alliance (WIRADA) delivers value-added water information products and tools.

Through WIRADA, Australia now has nationally-consistent and regionally-relevant water information products and services based on high quality data and timely delivery systems, to support robust decision making across national, state and local levels. Significant impacts arise from the novel water information products and services and their adoption by the water industry and research community. The benefits from WIRADA and the Bureau's national water information products have been valued by the Centre for International Economics.at $287 million per year.

The hydrological models in Australian Water Resources Assessment (AWRA) have been used in numerous applications, including the ongoing and nationally-significant large resource and impact assessments (Bioregional Assessment and Northern Australia Water Resource Assessment). Over the last year AWRA outputs have been used by a number of federal and state government agencies, water corporations, consultants and researchers to underpin water resources planning and policy formulation. Using AWRA-L (landscape) outputs, the NSW Department of Primary Industries Water is now able to determine seasonal loss triggers for water allocation, relating the AWRA-L outputs of soil moisture to transmission losses in rivers, which enables the management of risks to the delivery of water allocations in NSW river basins.

The water forecasting models are also being applied to support water quality forecasting for the Great Barrier Reef and river forecasting for environmental watering in northern Victorian catchments. Overseas, the forecasting methods are being used to support sustainable development projects in South Asia, collaborations with China and Singapore, and experimental forecasting programmes in the USA.

The science and technology breakthroughs in WIRADA, and the translation of science into operational water products, have enabled the Bureau to fulfil its national water information mandate, delivering direct impacts to the Australian community and industries. The research in WIRADA in the water forecasting, water resources assessment and water informatics areas has significantly advanced the Australian national research priority and helped address the practical challenge area of water. Australia is now recognised as an international leader in the development of water information exchange standards and systems.

WIRADA – bringing together CSIRO's leading expertise in water and information sciences and the Bureau of Meteorology's operational role in hydrological analysis and prediction.

Manufacturing

Protein power: helping create a next-generation cancer and blood disease drug

Around 48,000 Australians are expected to die from cancer in 2017. More than 134,000 Australians are also expected to be diagnosed with some form of the disease over the same period[15]. Many of them will undergo broad based cancer treatments such as chemotherapy, which kill healthy cells along with cancerous ones and can lead to damaging side effects.

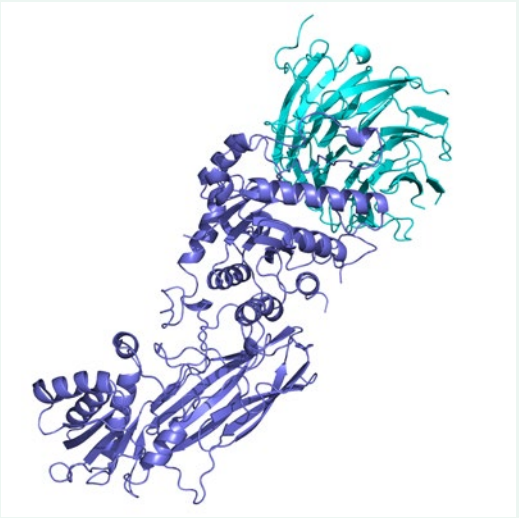
Now, in partnership with CSIRO, the Cancer Therapeutics CRC (CTx) has developed a potential new treatment that is more precise, attacking specific cancers in a targeted way that results in fewer side effects. This truly innovative technique is one of the few in the world to use the cutting edge field of epigenetics, which allows researchers to manipulate specific genes. In this case CTx has created a small molecule inhibitor drug that is hoped will 'switch off' lymphomas by targeting a protein called PRMT5. Heightened levels of PRMT5 are found in patients with cell lymphoma, lung cancer, breast cancer and colorectal cancer.

The drug could also prove a potent weapon in the fight against non-cancerous genetic deficiencies and blood disorders such as sickle cell disease and beta thalassemia. PRMT5 switches on and off important genes in the development of blood and it may be able to make the body produce foetal haemoglobin, which carries more oxygen than adult haemoglobin and may therefore compensate for genetic deficiency.

As Australia's leading producer of high quality protein for research, CSIRO's capabilities were vital to CTx's ground breaking work developing this potential oncology drug. One of the challenges of creating new drugs is producing proteins in large enough quantities to support pre-clinical and clinical trials. CSIRO's state-of-the-art equipment at its Recombinant Protein Production Facility allows the production of proteins in large quantities, from hundreds of milligrams to kilograms.

Using these facilities CSIRO created high quality proteins specifically designed for drug development and provided biophysical screening and crystallisation studies for structure based drug design. These world class protein facilities meet the demand for fast production and evaluation often needed in medical technologies.

US pharmaceutical company, Merck, has licensed the drug for US$15 million in one of the largest ever pre-clinical licensing deals in Australian research. This has the potential to return US$500 million to CTx and its partners. Merck US will further develop the drug and take it to clinical trials with a view to worldwide commercialisation. Phase 1 trials are likely to start in 2018. CSIRO continues to be a part of the process, through our protein production work with Merck. CSIRO and CTx are now a step closer to knowing how PRMT5 works and a greater understanding of how to fight a variety of cancers and blood disorders. Other research partners involved in this project were Monash University, Peter MacCallum Cancer Centre and the Walter and Eliza Hall Institute.



The molecular structure of PRMT5.

15 Cancer Australia: www.canceraustralia.gov.au/affected-cancer/what-cancer/cancer-australia-statistics

Mineral Resources

X-ray vision speeds up gold analytical services

Easy-to-access, high-quality gold deposits are becoming increasingly scarce around the world, and mining companies are seeking cost-effective ways to get more value from lower-quality ore. Australia is the world's second largest gold producer with annual production valued at about $15 billion. Yet a significant fraction of mined gold is unrecovered and goes to waste. This is, in part, because conventional analysis methods are too slow to allow miners to track and optimise their operations in real time. Gold losses from large processing plants can be valued in the hundreds of millions of dollars per year, so improvements in efficiency arising from a faster and more effective analysis method would deliver huge value.

Increasing the efficiency and effectiveness of analytical services (also known as 'assays') has the potential to significantly increase mining productivity. Analytical services – worth nearly $1 billion globally for gold alone – are essential across the mining value chain, ranging from initial exploration to running profitable extraction operations.

CSIRO recognised the potential to deliver greater value to the assays market. CSIRO's PhotonAssay uses high-powered x-rays to bombard rock samples and activate atoms of gold and other metals. A sensitive detector takes just a few minutes to pick up the unique gamma-ray signatures from these elements and determine their concentrations. This is much faster and more accurate than traditional gold assay methods.

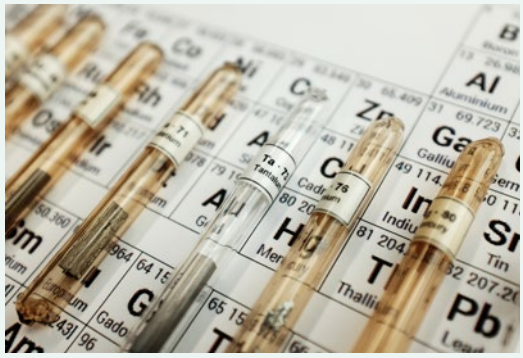
With a turnaround time for analysis now minutes, not days, PhotonAssay mining companies can monitor their operations in real time and rapidly respond to problems. As a result, miners can more readily optimise their processes and make better-informed decisions during the mining process.

PhotonAssay also provides significant health and safety advantages. Traditional manual assay methods require technicians to work with toxic chemicals such as lead or cyanide. PhotonAssay is a fully-automated, chemistry-free process that is also non-destructive, allowing further testing to be performed if required. This reduces both the environmental impact and operating costs of mining assay operations.

In December 2016, CSIRO partnered with a network of experienced investors and industry professionals to create Chrysos Corporation Limited (Chrysos) to bring the technology to market. Together with manufacturing partner Nuctech Company Ltd, Chrysos plans to deliver its first system in late 2017.

Chrysos has set its sights on becoming a global leader in the market for gold assay services. Although focussing initially on gold, Chrysos plans to expand the technology in the near future to a wide range of other important commodities, including silver and copper. CSIRO holds a 38 per cent stake in the company.

ASX-listed Ausdrill is set to install Chrysos' first high-throughput, lab-based PhotonAssay unit in their Perth facility in December 2017. Smaller units for mine-site operations will follow in 2018. Validation of the PhotonAssay technology has been supported by industry partners including Newcrest Mining and Gannet Holdings. BHP Billiton and the South Australian Government have provided funding to support the commercialisation.



PhotonAssay is capable of measuring gold and a wide range of other metals.

Oceans and Atmosphere

World-first platform delivers vital information for the Great Barrier Reef

The Great Barrier Reef is a national treasure that brings significant economic, cultural and social benefits to Australia. It generates $6.4 billion annually for the national economy and underpins more than 64,000 jobs. The health of the reef is under increasing threat from cumulative pressures such as climate change, declining water quality, habitat loss and coastal development.

The reef is vast and complex, requiring the nation's marine and reef scientists to apply their knowledge and skills in its management and recovery. CSIRO Oceans and Atmosphere is helping to do this through the development of a world-first, fully-integrated decision support and communication tool for managing the reef. The eReefs project has developed a digital information platform that provides a picture of what is currently happening on the reef and what will likely happen in the future. The platform spans the estuaries, the reef lagoon and the open ocean and links to models of adjacent catchments.

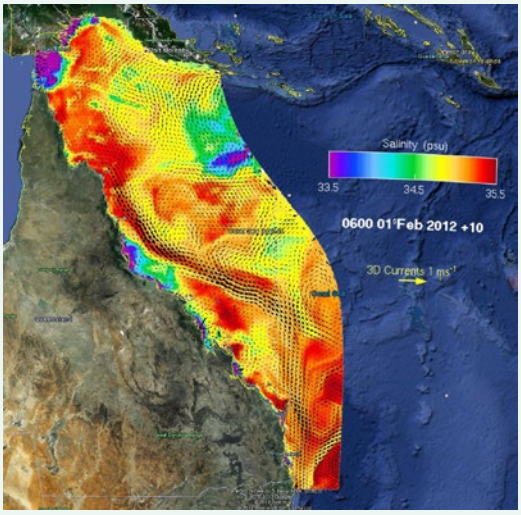
CSIRO has delivered a modelling framework capable of simulating and predicting the physical state of the Great Barrier Reef lagoon and reef matrix across multiple spatial scales. Together, these models represent a capability to accurately reproduce in three dimensions the hydrodynamic, sediment, and biogeochemistry and ecology of the Reef. It provides information on physical processes, sediment transport, biogeochemistry and ocean colour. The eReefs marine models are currently being used in near-real-time operation and can also be used for scenario analysis such as how changes in catchment land-use and practice might affect the health of the reef.

The eReefs tools help inform public policy designed to protect the health of the reef. In the last year, eReefs was used by the Australian and Queensland governments to revise catchment water quality targets to protect the Great Barrier Reef. Modelling has been used to predict the potential of reef bleaching and eReefs is used as a key platform in the Reef Integrated Monitoring Reporting and Assessment Program that supports Reef 2050.

The eReefs models are being used by the Great Barrier Reef Marine Park Authority and the Queensland government to aid decision making. The Bureau of Meteorology uses eReefs to deliver remote sensing products based on CSIROS algorithms. CSIRO has also negotiated an agreement with Chile to create a similar model for their coast region to help protect local aquaculture.

The eReefs project is delivering significant impacts by enabling the protection and improvement of the marine ecosystems, creating more efficient tourism and shipping operations, and supporting sustainable growth in aquaculture. Based on conservative assumptions, the net present value of benefits to 2025–26 from the project is over $80 million.

The eReefs project is conducted in collaboration with the Great Barrier Reef Foundation, the Australian Bureau of Meteorology, the Australian Institute of Marine Science, and the Queensland Government, with funding support from the Australian Government, Queensland Government, the Science and Industry Endowment Fund, and BHP Billiton.



Outputs of eReefs are displayed as animated loops or snapshots of key variables. This image shows salinity and ocean currents across the Great Barrier Reef.

CSIRO Services

Education and outreach

We design and deliver high-quality, national education and outreach programs for school students, teachers and the public about the valuable contribution scientific research makes to the community. We also support undergraduate, postgraduate and postdoctoral researchers to boost the calibre of researchers working in Australian industry and strengthen future innovation capacity. Our science outreach programs also promote the importance of CSIRO research, its application and STEM literacy and connection to the Australian community.

CSIRO Education and Outreach has education specialists and facilities in each capital city as well as in Townsville and Newcastle. This year, 133,135 primary and secondary students took part in hands-on science education programs. More than 30,000 people took part in community programs.

We delivered the STEM Professionals in Schools (formerly known as Scientists and Mathematicians in Schools), Sustainable Futures, BHP Billiton Foundation Indigenous STEM Education project, BHP Billiton Science and Engineering Awards, CSIRO's Creativity in Research Engineering Science and Technology (CREST) Awards (formerly known as CREativity in Science and Technology Awards), the CSIRO Discovery Centre, Digital Careers and Science Bootcamp programs.

The STEM Professionals in Schools program partners STEM professionals with primary and secondary teachers around the country. By 30 June 2017, there were 1,919 STEM Professionals in Schools partnerships in 1,234 schools. Of these, 26 per cent were in rural and regional schools and 46 were in schools with more than 25 per cent Aboriginal or Torres Strait Islander students.

The BHP Billiton Foundation Indigenous STEM Education program increases the participation and achievement of Aboriginal and Torres Strait Islander students in STEM in schools and onto employment. The program is in its third year and is successfully delivering all program elements. Already, 643 teachers and teacher assistants and 11,179 students in 324 schools are taking part in school programs, 11 communities are involved in community programs and 20 students are enrolled in the Bachelor of Science (Extended) at the University of Melbourne.

CSIRO Sustainable Futures worked with 814 schools Australia-wide to help them understand the science behind climate change and how to reduce their carbon footprint.

The Digital Careers program increased student participation and interest in ICT courses and careers. During 2016–17, 78,271 students took part in the suite of Bebras computational thinking challenge programs and 1,249 students took part in the Young ICT Explorers program.

In 2017, CREST helped over 5,500 school students plan and conduct research projects. To increase participation and scale the program, this year the team focussed on updating the CREST materials to map to the curriculum, incorporate digital technologies and ICT components and trial new teacher professional learning models. A new database for participants is also being developed to streamline engagement with participants. Over 60 per cent of students received awards for their work. Many went on to participate in the BHP Billiton Science and Engineering Awards that recognise outstanding scientific research and technology projects by school students. The awards also recognise the commitment and expertise of their teachers. Last year, 10,950 students entered the awards.

We host the CSIRO Discovery Centre in Canberra, and major visitor centres at observatories near Parkes and Narrabri in NSW and the Canberra Deep Space Communication Complex (CDSCC). These centres are purpose-built to showcase our research in an entertaining way that demystifies and educates people of all ages about research and innovation.

Education and outreach programs at the CDSCC attracted 10,221 school students and teachers during 2016–17, which is 12.5 per cent more than in 2015–16. An additional 313 school students and teachers participated in self-guided visits. Programs covered the broad spectrum of science, technology, engineering and mathematics, with a focus on the contribution to space exploration and astronomy. The total number of visitors was 70,753, which is an increase of five per cent from 2015–16.

The visitors centre at the Parkes radio telescope welcomed 83,851 visitors in 2016–17. Thirty-eight schools participated in education and outreach programs, compared with 36 the previous year, reaching approximately 1,082 students. There were 1,579 visitors from seniors groups, clubs or specialised interest groups.

The PULSE@Parkes program attracted 180 students from 16 schools, 75 teachers and 10 university students. Sessions were held at the Pawsey Supercomputing Centre in Perth, at CSIRO Discovery Centre in Canberra and in Brisbane for teachers participating in the STEM X Academy at CONASTA, the national science teacher conference. Three sessions were also held in Guangzhou, China.

At the Australia Telescope Compact Array at Narrabri, 10,965 visitors in 2016–17 took self-guided tours of the visitor centre. This continues to be highly popular with families, schools, photography clubs and seniors groups.

TABLE 2.7: SCIENCE OUTREACH: EDUCATION PROGRAMS

PROGRAM	2012–13	2013–14	2014–15	2015–16	2016–17
CSIRO Science Education Centres (visitors)	363,099	366,305	154,825	0[16]	0
Creativity in Research Engineering Science and Technology (CREST) Awards (participants)	7,767	11,048	10,805	9,600	5,579
BHP Billiton Science and Engineering Awards (participants)	4,065	7,125	8,146	7,639	10,950

TABLE 2.8: SCIENCE OUTREACH: VISITOR CENTRES

CENTRE	2012–13	2013–14	2014–15	2015–16	2016–17
CSIRO Discovery Centre (visitors)	113,000	120,000	33,189[16]	18,477	26,332
Parkes radio telescope (visitors)	92,876	84,698	68,427	95,212	83,851
Canberra Deep Space Communication Complex (visitors)	68,710	67,554	61,051	67,378	70,753
Australia Telescope Compact Array, Narrabri (visitors)	10,500	12,500	10,971	11,511	10,965

16 The state-based science education centres closed in late 2014.

Postgraduate and postdoctoral researchers

Our Postgraduate Scholarship Program provides opportunities in science and engineering for outstanding graduates who enrol at Australian tertiary institutions as full-time postgraduate students for research leading to the award of a PhD. Doctoral students at CSIRO are co-supervised by a university, allowing students to maintain and develop their university connections while being exposed to research in a working environment (see Table 2.9). The number of students fluctuates, with uneven intakes each year and reduced numbers when a cohort moves through the program.

TABLE 2.9: SCIENCE OUTREACH: CSIRO'S POSTGRADUATE STUDENTS AND POSTDOCTORAL FELLOWS AS AT 31 MAY 2017

	2012–13	2013–14	2014–15	2015–16	2016–17
Sponsored postgraduates[17]					
PhD	294	254	224	280	416
Masters	16	19	16	36	27
Honours	22	23	10	19	16
Total	**332**	**296**	**250**	**335**	**459**[18]
Supervised postgraduates[17]					
PhD	642	601	621	599	673
Masters	68	90	70	132	115
Honours	82	61	70	70	68
Total	**792**	**752**	**761**	**801**	**856**
Postdoctoral Fellows	**324**	**325**	**303**	**229**	**248**

17 A student may be either sponsored, supervised or both. The total number of individual students sponsored and/or supervised was 856, including more than 19 supervised in collaboration with Cooperative Research Centres. See glossary on page 167 for definition of sponsorship and supervision.

18 Includes 152 students fully sponsored and 307 students partially sponsored by CSIRO.

A long-standing partnership driving passion for science in our communities

For 35 years, CSIRO has delivered Australia's most prestigious school science awards – the BHP Billiton Science and Engineering Awards (BHPBSEA) – in partnership with the BHP Billiton Foundation, the Australian Science Teachers Association and state and territory science teachers associations. The awards recognise school-aged students for their research projects that demonstrate innovative and thorough scientific and/or engineering procedures, as well as the outstanding contributions made by classroom teachers to science education.

In the last 10 years, the awards have recognised 252 Australian students as national finalists for their scientific work, and 93 teachers for their excellence in teaching and support of open-ended student investigations.

Through the recognition and reward of high-quality work in science and engineering, the BHPBSEA encourages students and teachers to be involved in open-ended STEM-related projects. The goal is to stimulate a thirst for knowledge while setting them on a path for a future career in science and engineering.

A 2015 evaluation of the BHPBSEA found the benefits for students were an increased knowledge and learning in STEM, exposure to future study and career pathways and increased networking opportunities. Of the students surveyed, 86 per cent expressed an interest in a future career working in science fields and 60 per cent in the engineering fields.

BHPBSEA is one of the only Australian competitions that allows winning students to compete at the world's largest international school-level science competition, the Intel International Science and Engineering Fair (ISEF) held in the US each year. Attendance at Intel ISEF is highly competitive and involves approximately 1,800 high school students from more than 75 countries, regions and territories. Attendance at the fair allows students to gain international exposure, provides inspiration and networking opportunities to further their interest in STEM fields. It gives them a chance to compete for a range of awards and scholarships to further their STEM education.

In 2017, six BHPBSEA finalists attended the Intel ISEF, with one student winning third prize in environmental engineering. Another was selected to attend a VIP luncheon and address the five members of the Science and Excellence panel, which included several Nobel Laureates.

All students who attend the international competition return with renewed enthusiasm for STEM and often go on to pursue STEM-related subjects at tertiary level. BHPBSEA alumni reflect that being selected as a finalist and attending ISEF changes their lives, they have a greater appreciation for science, scientific investigation and potential career paths in STEM fields. One student attending the 2017 international competition reflected, 'Intel ISEF for me was a wonderful learning experience, even in ways I did not anticipate. I not only made friends and learned about science but also feel invigorated and motivated for the future. This is only the beginning!'

Winners of the 2017 BHP Billiton Science and Engineering Awards.

Publishing

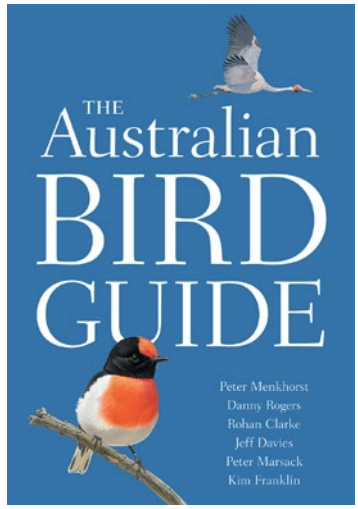
CSIRO Publishing provides a viable, local publishing option for CSIRO itself, and for learned and professional societies to publish scholarly content that champions Australian research. It operates as an independent science publisher within CSIRO on behalf of authors and customers in Australia and overseas. Our publishing program covers a wide range of scientific disciplines, including agriculture, the plant and animal sciences, and the environment. We are Australia's only endemic, scholarly science publisher with a significant digital capability.

During 2016–17, we published 30 journal titles. Thirteen titles were published in partnership with the Australian Academy of Science, a successful relationship dating back to 1948. Fifteen journals were produced under agreements with Australian and international societies or institutions. Additionally, special issues of journals were published in connection with societies and international conferences. These journals are available free to developing countries through the United Nations program Research4Life. This program fosters scientific understanding and education in developing nations. Online use of the journals resulted in 4,224,132 articles being downloaded.

In November 2016, we launched an online resource for teachers of Years 5 and 6 science called Double Helix Lessons. Mapped to the Australian Curriculum, Double Helix Lessons is a suite of online interactive science lessons for upper primary school students. It is designed to make it easy for any school to supercharge their science program. The product was developed in partnership with tech start-up company Stile.

New book titles

During 2016–17, CSIRO Publishing released 32 book titles in print and digital formats. The digital books comprised approximately 12 per cent of sales. A highlight among the titles was *The Australian Bird Guide*, the most comprehensive field guide of Australian birds. It features over 4,700 specially commission paintings of more than 900 bird species and is the culmination of 10 years of work. Over 20,000 copies were distributed in less than four weeks.



***The Australian Bird Guide*, sets a new standard in field guides and provides an indispensable reference for all birders and naturalists.**

Net profit

CSIRO Publishing delivered a net profit of $556,301 for 2016–17. Total revenue for the period was $10,360,929.

TABLE 2.10: CSIRO PUBLISHING SUBSCRIBERS

	2012–13	2013–14	2014–15	2015–16	2016–17
CSIRO Publishing journals (downloads)	2,641,160	2,819,798	2,471,566	2,901,602	4,224,132
Double Helix Magazine* (subscribers)	15,958	15,209	11,226	7,216	6,687
Science by Email (subscribers)	42,422	42,011	43,010	43,029	42,017
Maths by Email (subscribers)	17,292	20,381	22,771	23,456	23,294

*In 2015, two magazines, *The Helix* and *Scientriffic*, were combined in to one magazine called *Double Helix*. The reduction in 2015–16 subscriptions is due to subscribing families, schools and libraries taking only one subscription, not two.

SME Connect

Collaboration between industry and research institutions in Australia is historically poor, resulting in a research knowledge base that is not captured effectively[19]. CSIRO's SME Connect helps to raise that performance through three programs designed to connect SMEs with Australia's best researchers and facilities. The goal is to help SMEs become Australia's next innovation success stories.

In 2016–2017, SME Connect facilitated over 155 research projects nationally, injecting $25 million into research and development. In addition, 143 SMEs were connected with over 37 Australian research organisations, including 24 universities as well as CSIRO. We also facilitated 22 graduate placement grants.

Fostering innovation success stories in regional Australia

As experienced facilitators of Innovation Connections under the Australian Government's Entrepreneurs' Programme, SME Connect has undertaken the most collaborations with the University of Newcastle[20]. This connected more than 40 regional SMEs with the local research sector to undertake 33 projects in 2016–2017. SME Connect is also boosting regional NSW researcher career pathways by securing the placement of nine University of Newcastle graduates in local industry businesses. This is the highest number of placements for a university across the country under this program.

Multiskilled Resources Australia (MRA) is one SME that has developed an ongoing research partnership with the University of Newcastle. This was fostered through three Innovation Connections projects facilitated by SME Connect. The collaboration has seen MRA move to market-leader status in delivering automated ship loading processes with collision avoidance. This is an innovative smart-sensing technology that addresses a major optimisation target for export terminals globally. MRA is continuing to expand its research in this area through a University of Newcastle 12-month Researcher Placement via CSIRO's SME Connect team.

19 Department of Industry, Innovation and Science (2015) *Australian Innovation System Report 2015*, Office of the Chief Economist, pg 115.

20 Innovation Connections League Ladder for grants approved between 1 September 2014 and 31 May 2017 inclusive.

A research-industry partnership to improve cancer detection

Bowel cancer, or colorectal cancer (CRC), is the second most common cause of death from cancer in Australia, with almost 15,000 new cases diagnosed each year. It is responsible for more than 600,000 deaths worldwide each year. Post-surgical recurrence of CRC occurs in 30 to 50 per cent of cases, most often in the first two to three years following initial diagnosis and treatment. SME Connect, through Innovation Connections and a Researcher in Business placement, facilitated three collaborative research projects between CSIRO and Australian-founded biotechnology company, Clinical Genomics.
The projects assisted further development and application modelling of a new innovation, Colvera™, that detects cancer-specific chemical changes in fragments of DNA from the tumour found circulating in the blood. The test has been shown to be more than two times as sensitive for CRC recurrence as existing tests. It also has potential broader application in CRC screening. Colvera™ increases the likelihood of detecting curable CRC recurrences that could lead to a reduction in the number of deaths from the cancer. Clinical Genomics successfully launched Colvera™ in the US market in late 2016.
It is anticipated that the test will become available in Australia in 2018.

Clinical Genomics CEO Larry LaPointe and CSIRO researchers collaborate through SME Connect.

Program 1.2:

National Research Infrastructure – National Facilities and Collections

CSIRO hosts National Research Infrastructure on behalf of the broader scientific community to assist with the delivery of research. There are two types of National Research Infrastructure: National Research Facilities and National Biological Collections.

As the national provider of a range of specialised laboratories, scientific and testing equipment and other research facilities, CSIRO provides science-ready facilities for use by Australian and international researchers through application and user funded arrangements, related to the facility.

The National Research Facilities include:

- The Australian Animal Health Laboratory (AAHL), Geelong
- The Australia Telescope National Facility (ATNF) comprising:
  - The Parkes telescope, NSW
  - The Compact Array telescope, Narrabri
  - The Australian Square Kilometre Array Pathfinder (ASKAP), Murchison
  - The Mopra telescope at Coonabarabran
  - The Murchison Radio Observatory
- The Marine National Facility (MNF), Hobart
- Pawsey Super Computing Centre in Perth.

The National Research Collections Australia, including the Atlas of Living Australia, comprise:

- Australian National Fish Collection (ANFC), of marine fish
- Australian National Herbarium (ANH), of native plants and weeds
- Australian National Insect Collection (ANIC), of terrestrial invertebrates
- Australian National Wildlife Collection (ANWC), of terrestrial vertebrates
- Australian National Algae Culture Collection (ANACC) of living microalgae cultures
- Australian Tree Seed Centre (ATSC), supplying tree seed to both domestic and overseas customers.

This year our national facilities and collections program continued to perform well. Table 2.11 provides an overview of the results against each performance criterion as published in the PBS, followed by a more detailed analysis and evidence for each of the facilities and collections.

TABLE 2.11: PERFORMANCE SUMMARY FOR PROGRAM 1.2

PERFORMANCE CRITERION	RESULT
National research infrastructure maintained and operated to appropriate standard	We achieved compliance with relevant Australian and international standards. New users of the ATNF telescopes are required to observe from the Science Operations Centre at the ATNF's headquarters in Sydney, where they are provided with training and support. Once qualified, astronomers can also operate Parkes or the Compact Array from their home institutions. AAHL continues to maintain or exceed the many regulatory requirements certified by the Department of Agriculture and Water Resources (DAWR), the Office of the Gene Technology Regulator and the Department of Health's Security Sensitive Biological Agents legislation, and all relevant International Organization for Standardization (ISO) accreditation.
Maintain or increase the proportion of collections available to researchers and the public, including digitised and non-digitised collections	The national biological collections continued to increase in size and representation and overall the proportion of the collections that are digitised also increased particularly in ATSC and ANIC. The ANACC maintained 100% digitisation.

Analysis of our performance

The national research infrastructure CSIRO hosts is of global significance, and is used by the international and Australian research communities. Increasingly, major facilities and instruments are beyond the capacity of a single entity to run. This gives rise to multinational, interdisciplinary and applied research institutions collaborating and co-investing in resources. These arrangements present opportunities of efficiency, effectiveness and sustainability, but can also present challenges regarding their use.

Additionally, science is experiencing rapid growth in the application of digital technologies and data digitisation in international natural history collections. CSIRO will continue to manage the national collections employing digital and genomic technologies to provide rapid access to comprehensive and reliable data.

In 2016, CSIRO engaged with the 2016 National Research Infrastructure Roadmap process under the leadership of the Chief Scientist. In 2017, CSIRO will continue to advocate for the ongoing development and upgrade of key facilities in the national interest.

The following sections give an overview of the activities at CSIRO's National Facilities and Collections and additional details for each criterion where relevant.

Australian Animal Health Laboratory

The Australian Animal Health Laboratory (AAHL) provides Australia's highest level of biocontainment within a purpose-built biosecurity infrastructure. AAHL is recognised nationally and internationally as a centre of excellence in disease diagnosis, research and policy advice in animal health and human diseases of animal origin. AAHL helps protect Australia's billion-dollar livestock and aquaculture industries, and the public, from exotic and emerging infectious diseases. It is built and operated to safely store and enable work on the most dangerous pathogens and our experience developed in biosecurity and biosafety is sought by customers around the world.

AAHL's infrastructure and scientific expertise enables it to deliver a vital service to the Department of Agriculture and Water Resources (DAWR) as Australia's Reference Laboratory for emergency animal diseases and high consequence pathogens of animal origin. Over the past 30 years there has been a marked increase in the public health threat of emerging infectious diseases of animal origin, known as zoonoses, which has resulted in increased global demand for biocontainment laboratory space at PC3 and PC4.

The AAHL is funded primarily by CSIRO appropriation. DAWR provide funding for an ongoing diagnostic service, and the National Collaborative Research Infrastructure Strategy (NCRIS) has provided funds to enable universities to access the facility. AAHL also delivers diagnostic and research services to Australian and state governments as well as to industry and international bodies. AAHL is recognised as a crucial part of Australia's biosecurity infrastructure.

The AAHL customer base has expanded through initiatives that deliver to local and international customers, while remaining true to the DAWR contract to provide a diagnostic, surveillance and response service to underpin Australia's licence to trade in animal products. From July 2017, AAHL will formally be able to service a wider customer base that delivers benefits not only to the agriculture sector, but also in the health and defence sectors.

Examples of services offered include:

- access to high-containment laboratories and animal facilities for research
- collaborations with CSIRO Business Units to develop vaccines and therapeutics against dangerous pathogens
- research on vector-borne diseases such as Dengue and Zika viruses
- quarantine-testing for horses, birds, aquatic species and companion animals
- training courses for vets in the diagnosis of animal diseases and biosafety training for scientists
- services that enhance regional biosecurity and food security across Asia.

Maintenance and operations

Maintaining and updating the microbiological and physical security of AAHL is an ongoing priority. Significant works to upgrade and reinforce many of its existing external security access systems occurred following a security review in 2014–15. Ongoing minor infrastructure works to replace end-of-life plant have included completion of clean steam generator upgrades, replacement of water softener systems and replacement of SCADA (System Control and Data Acquisition) network switches. Planning is underway for a broader capital upgrade program as part of a third-of-life re-fit to ensure the facility continues to meet regulatory requirements of both the Commonwealth and State of Victoria.

In May 2017, the World Organization for Animal Health (OIE) General Session in Paris confirmed the designation of AAHL, the University of Melbourne and Massey University, New Zealand, as OIE Collaborating Centres for Diagnostic Test Validation Science in the Asia Pacific region.

Each year, AAHL analyses samples from around 3,000 cases for diagnostic testing. Other samples are received from around the world for a range of purposes, including to enable global movements of healthy animals, facilitate import of biological materials, exclude exotic diseases in Australian livestock or characterise viruses detected in our region.

An example of the preventative or 'insurance' work of AAHL is foot-and-mouth disease (FMD). Every month AAHL receives samples to confirm the exclusion of FMD, collected by field veterinarians in Australia – a critical service to our livestock industries. This is because FMD is a highly contagious animal disease and an outbreak in Australia would cause major production losses. A FMD outbreak would seriously interrupt Australia's international livestock trade and cost the economy tens of billions of dollars. If FMD were diagnosed, the government's National Response to a Foot and Mouth Disease Outbreak would be enacted and AAHL, which was built to cope with an FMD outbreak, would lead the national laboratory response.

Emergency response to white spot disease

The diagnostic skills and knowledge of AAHL scientists, including specialists in the diagnosis of disease in aquatic animals, is an important component of Australia's ability to deal with an emergency animal disease outbreak.

In late November 2016, white spot disease was identified in a commercial prawn farm in Queensland. Until that time, Australia was one of the few countries in the world with a prawn farming industry that had remained free of the highly contagious viral infection that affects crustaceans. With the Australian prawn industry having a gross value of prawn production worth $413 million in 2015–16, and employing 5,000 people, it is of national significance to control disease outbreaks.

AAHL received the first sample of suspected white spot disease from Queensland Biosecurity on 30 November 2016 and confirmed the disease within 24 hours. AAHL confirmed a second property as being infected on 6 December, with a third property, along with six samples from the Logan River being confirmed positive on 8 December. A fourth property was confirmed infected on 14 December and a fifth on 29 December 2016. Two more properties were confirmed as infected on 3 and 13 February 2017.

During December 2016, AAHL received an all-time monthly high of over 1,000 submissions and 21,000 samples for testing. The AAHL team responded quickly and effectively to the surge in testing demand not only for this outbreak but all the other diagnostic submissions received in the same period.

The Queensland Department of Agriculture and Fisheries has completed its work to drain and decontaminate all seven prawn farms hit by white spot disease on the Logan River. They now carry out ongoing surveillance and biosecurity management within the Queensland Movement Control Area.

The national Aquatic Consultative Committee on Emergency Animal Diseases, of which CSIRO is a member, continues to meet regularly in response to this outbreak. Based on current information and good progress, the committee maintains the view that the disease can be eradicated. Since the start of the outbreak, AAHL has conducted over 58,400 tests for white spot disease on 22,500 samples.

AAHL's ability to rapidly diagnose disease and confirm suspected outbreaks is an important capability supporting Australia's biosecurity system. Our work protects the health of Australia's aquaculture species, wildlife and livestock to ensure the competitiveness of Australia's agriculture and trade.

Prawn with white spot disease. Image: Biosecurity Queensland

Australia Telescope National Facility

The Australia Telescope National Facility (ATNF) comprises world-class radio-astronomy facilities operated by CSIRO, and associated instrumentation and research programs. ATNF observatories are located near the towns of Parkes, Narrabri and Coonabarabran in eastern NSW and in the mid-west region of Western Australia. In 2016–17, Australian Government funding supported merit-based access to the Australian Square Kilometre Array Pathfinder (ASKAP), the Australia Telescope Compact Array (ATCA) and the Parkes radio telescope.

Approximately 20 per cent of observing time on Parkes and all observing time on the Mopra telescope was funded by external partners. ATNF observatories also contain other instruments: the Murchison Radio-astronomy Observatory, home to ASKAP, also hosts the Murchison Widefield Array and is where an instrument of the international Square Kilometre Array will be built.

ATNF telescopes support galactic, extragalactic and cosmological research in fields as diverse as the interstellar medium, the formation and evolution of stars and galaxies, cosmic magnetism and understanding the extreme physics of pulsars and black holes.

The ATNF comprises the major part of CSIRO Astronomy and Space Science, which also operates the Canberra Deep Space Communication Complex (CDSCC) on behalf of the US National Aeronautics and Space Administration (NASA). CDSCC is responsible for meeting the government's obligations under the US–Australia agreements for deep space tracking and communications in Australia. CSIRO, through the CDSCC, provides critical front-line mission control support to NASA for its deep space missions. CDSCC currently supports around 40 missions representing 27 nations worldwide that operate deep space telescopes and probes. CSIRO also manages Australian astronomers' access to these antennae, which are often used in conjunction with ATNF telescopes as part of the Long Baseline Array (LBA), an array linking radio telescopes in Australia and overseas.

Maintenance and operations

Observing time on ATNF telescopes is awarded on the basis of scientific merit. New users of the Parkes telescope and the ATCA typically first observe from the Science Operations Centre at ATNF headquarters in Sydney, where they are provided with training and support. Once qualified, astronomers can operate these telescopes from their home institutions.

Early science with the ASKAP in Western Australia commenced in October with 12 antennae fitted with the enhanced second generation of CSIRO's multi-award-winning phased-array feed (PAF) receivers. Observing with ASKAP is currently performed by CSIRO staff. Thirty ASKAP antennae are fitted with PAFs and commissioning of these continued during the year. We continue to manufacture and install the remaining receivers to complete the full 36-antenna array.

Several times each year, ATNF telescopes are linked with other telescopes in Australia and overseas, and sometimes CDSCC antennae, as part of the LBA. This enables improvement – by a factor of several thousand – in the detail in resulting images.

In 2016–17, research teams of more than 540 astronomers from more than 25 countries submitted proposals to use ATCA, Parkes and the LBA.

For ASKAP, 10 major survey science projects, representing 363 investigators from 131 institutions, were awarded 75 per cent of observing time in the first five years of full operation. Most of the observing time on Mopra is allocated to a consortium of universities that fund its operation.

Observers on ATNF telescopes other than ASKAP have an 18-month period after the observation during which they have sole access to their data. After this, the data are made publicly available to astronomers worldwide. Data from ATCA, Mopra, Parkes and LBA are archived on the Australia Telescope Online Archive and most Parkes data from pulsar observing is archived on the CSIRO Data Access Portal. ASKAP data has no proprietary period and is released into the Science Data Archive as soon as it has passed quality assurance checks.

Metrics for time allocation are calculated by dividing the time awarded to an observing project by the number of members in that observing team. Figures for 2016–17 include the merit-based allocation for ATCA and Parkes. Time allocated to observations dropped slightly this year as an increased amount of time at Parkes was used for testing new receivers and upgrades to the telescope.

TABLE 2.12: UTILISATION OF THE ATNF, IN %

	2012–13	2013–14	2014–15	2015–16	2016–17
Time allocated to observations	76.7	76.8	76.3	77.5	72.3
Time lost to equipment failure	2.7	3.3	2.2	3.0	2.0
Time allocated to CSIRO staff	22.0	19.0	22.5	21.5	24.0
Time allocated to other Australian researchers	28.0	30.3	28.4	33.6	30.3
Time allocated to international researchers	50.0	50.7	49.1	44.9	45.7

Tech leaps prime telescopes for discovery

The ASKAP telescope finished the first chapter of its story this year with the completion of the basic construction, and embarked on the next phase, which will dominate its work for many years – collecting data for big survey projects.

ASKAP commenced observations in October 2016, for the Widefield ASKAP L-Band Legacy All-sky Blind survey (WALLABY), a giant census of galaxies. By the end of the year, researchers had gathered more than 400 hours of data. WALLABY detects atomic hydrogen gas, which galaxies draw on to form stars. This gas can show how galaxies interact, for plumes of it are stripped off as they wrestle and collide.

To understand the WALLABY galaxies' star formation rate, total mass and dark matter content, the team will use complementary data from other southern hemisphere telescopes, such as CSIRO's Compact Array and the optical telescopes of the European Southern Observatory. In future, ASKAP will also work with SKA-mid antennae of the Square Kilometre Array based in South Africa.

WALLABY is a big project. It will detect more than half a million galaxies, 20 times more than the total found by similar surveys to date. A survey this size is possible with ASKAP because of the telescope's PAFs, a kind of 'radio camera' that gives the telescope a field of view 60 times the size of the full moon.

In the 1990s, CSIRO's Parkes telescope carried out another survey of atomic hydrogen in galaxies, smaller than WALLABY, but ground-breaking for its day. It too was made possible by unique CSIRO technology, the Parkes multi-beam receiver. The multi-beam system proved so successful that CSIRO has now built variants for other telescopes around the world, including FAST, China's new 500-hundred-meter Aperture Spherical radio Telescope. The FAST multi-beam receiver was completed and handed over to China this year.

In 2007, a scientist using the Parkes multi-beam data made an extraordinary discovery: a super-strong burst of cosmic radio waves lasting just a few milliseconds. Two dozen of these fast radio bursts (FRBs) have now been found. They appear to come from far across the Universe and signpost extremely powerful, still unknown phenomena. So far only one FRB has been located precisely enough to link it to a specific galaxy.

Due to its excellent instrumentation, Parkes has discovered most of the known fast radio bursts, but it will soon cede its crown to ASKAP, which recently found its first fast radio burst after less than four days of searching, followed by an additional two detections. This rapid rate of discovery is made possible by the telescope's large field of view, setting ASKAP up to become a world leader at detecting fast radio bursts. By working with the Compact Array and the European Southern Observatory's large optical telescopes, it will also be able to pinpoint their locations, and thus answer the decades-old question about where fast radio bursts originate.

CSIRO's Australian Square Kilometre Array Pathfinder radio telescopes in fly's eye mode. Usually dishes all point at one part of the sky, but they can be made to point in different directions, like the segments of a fly's eye, when searching for fast radio bursts. Image: Kim Steele

We acknowledge the Wajarri Yamatji people as the Traditional Owners of the Murchison Radio-astronomy Observatory site.

Marine National Facility

The Marine National Facility (MNF) is a key element of Australia's research infrastructure. The MNF operates the research vessel *Investigator* to provide a world-class, blue-water research capability for Australian researchers and their international collaborators for work in Australia's vast and largely unexplored marine areas.

Access to the vessel is offered through two streams: MNF Granted Voyages (GV) and MNF User Funded Voyages (UFV). GV are offered through a competitive, independent, peer-reviewed application process focused on scientific and technical excellence, the potential to contribute to Australia's national benefit and the ability of the research team. Sea time for GV is funded by the Australian Government with successful proponents responsible for meeting all other project costs.

The UFV stream provides a mechanism for any unallocated sea time, within the primary schedule, to be made available to research organisations and their collaborators under a charter arrangement. UFV recipients pay for sea time, with the cost established via an assessment of the national benefit and the risk posed by the proposal.

Through this process, the MNF enables research in the national interest, providing key information to government, industry, policy makers and the Australian community. Research data supports evidence-based decision-making on challenges affecting regional and global climate, fisheries management, geological resources, coastal and offshore developments and marine operations.

Maintenance and operations

The new model of interdisciplinary science voyages spanning atmospheric, oceanographic, biological and geoscience research has brought with it new challenges for the MNF with regard to health, safety and the environment. To meet these challenges, the MNF completed a detailed review of its health and safety systems in 2016–17 to ensure that new and existing risks were identified and adequately mitigated. As a result of the review, the MNF introduced a range of new processes and controls to ensure that the work conducted on board causes no harm to people or the environment.

This year saw the successful introduction of a new expert panel to assist with the assessment of applications for GV. The National Benefit Assessment Panel is tasked with assessing applications and the contribution to the national benefit in parallel with the Science Advisory Committee's assessment of science excellence and the science team's ability. The expertise brought to bear by the panel builds on the MNF's robust framework of governance designed to ensure sea time is awarded meritoriously.

Several voyages undertaken this period have highlighted the public interest in *Investigator* and the science operations conducted on board. Significant national media coverage was achieved during the:

- Reef2Rainforest research voyage to the Great Barrier Reef, led by Professor Zoran Ristovski, Queensland University of Technology
- 51-day Totten Glacier research voyage, led by Associate Professor Leanne Armand, Macquarie University
- Sampling the Abyss voyage led by Dr Tim O'Hara, Deputy Head of Marine Sciences, Museums Victoria.

Investigator provides a platform for the next generation of Australian marine researchers, not only through student participation in the majority of voyages, but through the pilot program – Collaborative Australian Postgraduate Sea Training Alliance Network (CAPSTAN) led by Macquarie University. The MNF Steering Committee has awarded one voyage per year over the next three years for the pilot. A high-level voyage planning process commenced in late 2016, soon followed by a call for trainers and students in early 2017.

The program gives 25 Australian postgraduate marine research students a unique opportunity to obtain blue-water research experience. The program aims to establish a national syllabus incorporating marine industry safety and survival training certification. The inaugural CAPSTAN voyage will commence on *Investigator* in November 2017.

The MNF was successful in securing two UFV to fill remaining days available outside of those funded by the Australian Government for GV in 2016–17. The first of these, delivered by CSIRO Energy in a collaboration with Chevron, conducted research in the Great Australian Bight. The second, with the Australian Hydrographic Survey (AHS), was delivered during May 2017 to conduct bathymetry in an area of Bass Strait. The relationship with AHS is a key strategic relationship for the MNF, with further opportunities possible for 2017–18.

TABLE 2.13: UTILISATION OF THE MNF

	2014–15	2015–16	2016–17
Research days scheduled	44	248	234
Research days delivered	44	248	234
Scientist days possible	1,300	9,110	9,600
Scientist days delivered	947	8,549	7,707
Time allocated to CSIRO researchers (%)	61	63	26
Time allocated to other Australian researchers (%)	39	37	74

Delivering a world-first biodiversity survey of the abyss

The marine life at abyssal depths (>4000m) along Australia's eastern coastline is little understood. The lack of baseline data about species and their distribution makes it difficult to set policy and measure change. A core mission of *Investigator* is to collect high-quality data to reliably inform decision-making by community, industry and government, in particular those shaping environmental research and policy.

In May and June 2017, Museums Victoria led a 31-day voyage on *Investigator* to conduct the first dedicated survey of marine life and the geophysical features of the abyss from Tasmania to Queensland. The voyage involved 38 scientists and support staff from seven countries and 14 institutions, including CSIRO, Museums Victoria, Australian Museum and the UK's Natural History Museum.

A broad range of research was undertaken during the voyage using a wide suite of the MNF scientific equipment, including deep water biodiversity sampling using nets, sleds and underwater cameras as well as processing, sampling and analysing specimens recovered using the ship's on-board laboratory facilities.

Almost 5,000 specimens were collected with over one third of the invertebrates thought to be new species. New vertebrate species will require description and be housed at museums and institutions across Australia, providing future material for research and study.

Highly detailed sea floor bathymetry surveys were also completed in seven marine reserves for the managing authority, Parks Australia. Better understanding of these habitats will assist Parks Australia to manage these important but little understood parts of our national marine assets.

The bathymetry voyage also surveyed marine debris and micro-plastics encountered in surface waters and from abyssal depths. This research is only possible due to the space and flexibility that *Investigator* offers. The information gathered from this project will contribute to better understandings of the impact of human activity on natural environments far removed from cities and homes.

Investigator demonstrates the value of the MNF as an international collaboration hub for knowledge exchange between scientists and, importantly, between scientists and the public. The significant public interest this voyage generated means that the data collected are already having an impact. Using the ship's communication and broadcast capabilities, the science and discoveries were shared in the media during the voyage and reached a combined global audience in the millions. This increases awareness of life in our deepest oceans and how human activity can impact on it.

Weird and wonderful deep sea species, such as this spiny crab, were discovered during RV *Investigator's* Sampling the Abyss voyage. Image: Asher Flatt

Pawsey Supercomputing Centre

CSIRO owns and operates the Pawsey Supercomputing Centre (Pawsey), one of two Australian high-performance computing facilities enabling Australia's commitment to the solution of 'Big Science' problems. The Centre provides access to one of the most powerful supercomputers in the Southern Hemisphere for researchers in government, academia and industry. Pawsey is currently serving over 80 organisations and achieving unprecedented results in science domains including radio astronomy, geosciences, resources engineering, bioinformatics and health sciences.

The Centre is located at CSIRO's Kensington site and offers advanced data-storage capabilities and tools critical to processing, storing and analysing the data, including from CSIRO's ASKAP facility and the Murchison Widefield Array, run by Curtin University. Pawsey also partners with the International Centre for Radio Astronomy Research to curate and publish the data for the international research community.

Pawsey is a collaboration hub involving an unincorporated joint venture between the Australian Government represented by CSIRO, the Western Australian Government and university partners (Curtin University, Edith Cowan University, Murdoch University and the University of Western Australia) in a consortium. Rather than a single-service agency, Pawsey is focused on providing integrated research solutions by giving users access to world-class expertise and infrastructure in supercomputing, data and visualisation services.

Pawsey is governed by a Board comprised of core member representatives and several independent members, including the chairman. Its primary funding partners are the Australian Government Department of Education and Training, the Minister for Science (WA Government) and the Pawsey members. To 30 June 2017, Pawsey hosted seconded staff from all five member organisations.

Maintenance and operations

Pawsey provides access to its supercomputing resources (Cray XC40 Magnus and Cray XC30 Galaxy) through a number of national and stakeholder merit allocation schemes. These schemes were for the 2016–17 period:

- National Computational Merit Allocation Scheme – 25 per cent of resources allocated. The call for proposals was made in September/October, with 12-month allocations, budgeted quarterly.
- Geosciences Merit Allocation Scheme and Energy and Resources Merit Allocation Scheme – 15 per cent of resources allocated, with 12-month allocations, budgeted quarterly.
- Pawsey Partner Merit Allocation Scheme – 30 per cent of resources allocated, with 12-month allocations, budgeted quarterly.
- Pawsey Director's Allocation Scheme – 5 per cent of resources allocated. Responsive-mode grant assessment process, available most of the year and most resources were made available with small (<0.1 per cent of available resource time), 3-month allocations.
- Radio-astronomy operational commitment – 25 per cent of Pawsey resources allocated (100 per cent of Cray XC30 Galaxy). Priority access to these resources was to support MWA operations and ASKAP commissioning. Additional radio-astronomy science projects were allocated where resources were available.

TABLE 2.14: ALLOCATION OF THE PAWSEY SUPERCOMPUTERS AND DATA STORAGE IN %

SUPERCOMPUTERS ALLOCATION	2015–16	2016–17
NCMAS	15	25
Focused domain (Geoscience)	25	15
Partner share (allocated through merit process)	30	30
Director's discretion	5	5
Radio astronomy (ASKAP and MWA)	25	25
DATA STORAGE ALLOCATION		
Radio-astronomy	80	80
General science	20	20

Pawsey helps researchers power the world with waves

It's a given that supercomputers are powerful, but for most people the terms 'powerful' and 'supercomputer' rarely offer up any context. This year, the supercomputers of Pawsey helped over 80 organisations undertake everything from investigating the genetic compounds of an insect that is destroying African crops, to supporting the Australian radio telescope precursors to the Square Kilometre Array.

Pawsey's supercomputer has played an important role in assessing something many across the globe are monitoring – wave energy. If wave energy can be successfully harnessed we will have an infinite, sustainable energy source on our hands. The people closest to making it happen, the team at Carnegie Clean Energy (CCE) are relying on Pawsey's supercomputer, Magnus, to achieve this.

Throughout this year, researchers from CCE and its partner, the University of Western Australia's Centre for Offshore Foundation Systems, used Pawsey to simulate the environments their wave farms face in real-world climates. Their High End Computational Modelling of CETO Wave Energy Converter project, conducted on Magnus, studies the wave interaction of wave energy converters in the ocean. Researchers use code to remotely access Magnus and allow it to process complicated calculations and answer complex questions such as how weather extremities influence the wave farms and their energy outputs to the grid.

Much progress has been made in the last 12 months. Simulations from Magnus have allowed the teams to increase the amount of energy captured (up 50 per cent) by moderate waves and improve their device's chances of survival in extreme waves.

It is complex work, but one with many pay offs. The computational fluid dynamics (CFD) simulations have been used to improve predictions of day-to-day device performance and boost reliability of the energy-generating devices in large sea areas. Those outcomes will help CCE reduce the running costs of its innovative equipment, while increasing its lifespan in the ocean.

Were it not for the facilities at the Pawsey Centre, CCE's work would have looked very different. Traditionally, such outcomes would have been achieved via wave basin (field) testing, but due to the CFD capabilities of Magnus, simulations were able to deliver the same outcomes much faster and at a far lower cost.

Of course, 'fast' in a project like this is relative. Even with Magnus' power, the project has been time-consuming. This year alone the project used more than two million core hours on Pawsey's supercomputer.

An array of CETO devices tethered to the sea floor. Image: Carnegie Clean Energy

National Research Collections of Australia

Australia is home to more than half a million species of plants and animals. Three-quarters of these are found nowhere else on Earth. This unique biodiversity is a national treasure and is a crucial environmental asset, providing ecosystem services and economically valuable resources.

CSIRO is the custodian of a number of collections of animal and plant specimens that contribute to national and international biological knowledge. The National Research Collections of Australia (NRCA) are a vital resource for conservation, science and industry innovation. They provide a history of Australian fauna and flora. NRCA's six biological collections contain more than 15 million specimens, representing a 240-year time series of data on the occurrence and distribution of native and introduced plants, terrestrial vertebrates, insects, fish and algae.

These collections are Australia's most reliable set of nationally representative biological collections. They underpin research in agriculture, biosecurity, biodiversity and climate change and are used by researchers all over the world. The collections allow us to identify, quantify and explore Australia's biodiversity over time and also inform public policy decisions, support biosecurity and contribute to environmental management.

NRCA's role is to protect and explore the rich biological information in its collections to conserve and exploit unique biodiversity for the benefit of our environment, the community and industry. NRCA also hosts the NCRIS supported Atlas of Living Australia (ALA), a modern informatics, visualisation and analytics platform that integrates Australian biological and environmental data from a wide variety of sources and makes them available to users online for education, research and policy development.

Digitisation is important to making biological collections widely available. It can span capturing a specimen's metadata through to including images and genomic information. NRCA is deploying a new collections-management system in the Australian National Insect Collection (ANIC) and Australian National Herbarium (ANH) that will lead to increased efficiency and security in data handling. Improvements made to digitisation processes within the collections have also delivered reductions in the cost and time it takes to digitise specimens.

Maintain or increase the collections available and utilised

This year, the ANH contributed to national and global research through loans and exchanges with more 46 herbaria in 18 countries. The ANH-developed Weed Seed Key is helping the Department of Agriculture and Water Resources (DAWR) staff to rapidly identify weed biosecurity risks for imported cargo. A new collaboration with the Gas Industry Social and Environmental Research Alliance (GISERA) is developing novel approaches to the conservation and management of rare plants. More than 80 per cent of specimen records are digitised and available through the Virtual Herbarium and the ALA. Imaging of all ANH type specimens (>9,000) has been completed, with images now publicly available through the Global Plants Initiative hosted by the digital library JSTOR.

This year ANIC hosted almost 100 national and international researchers and loaned more than 10,000 specimens. Two DAWR staff work as part of ANIC to identify hundreds of insects intercepted at Australia's borders each year. In 2016–17, ANIC reviewed Australia's biosecurity diagnostic system and ran training courses that build national biosecurity capacity. A large-scale project was launched focusing on the digitisation of more than 36,000 specimens of Australian bees and 7,500 Australian wasps, which represent important pollinator groups for both native plants and crops. The records are being transcribed by digital volunteers though the DigiVol portal and will be made available for collection management and research outcomes.

The Australian National Wildlife Collection (ANWC), especially its cryo-frozen tissue collection, is a major research resource for the international community, with 416 samples sent for DNA sequence-based research during 2016–17. ANWC digitised 4,420 specimens and 2,401 genetic samples. These primarily involved bird specimens collected from the savannas of Papua New Guinea and northern Australia, and herpetology specimens from Papua New Guinea and northern Australia donated by researchers at the Australian National University. The ANWC subfossil collection was also digitised, adding 785 records to the database. A research project into the feasibility of eggshell thickness as an indicator of environmental stress resulted in the digitisation of 827 clutches of eggs.

The ANACC, through the Australian National Algae Supply Service (ANASS), provides microalgae strains as starter cultures to industry, research organisations and educational institutions in more than 70 countries, with a particularly strong customer base in Oceania, Africa and Asia. During 2016–2017, ANASS supplied a total of 330 living microalgae cultures to 89 customers (71 per cent Australian and 29 per cent international). Core culture and accession information is digitised for all ANACC specimens, while additional imaging, geo-referencing, genomic and phenotypic characterisation have been digitised to different levels. Overall digitisation rates have remained the same as 2016–17.

The Australian Tree Seed Centre (ATSC) supplies wild and genetically improved native tree seeds to Australian and international customers. During 2016–17, ATSC filled 86 seed orders (49 per cent Australian and 51 per cent international) to 68 customers. This year, ATSC focused on digitising archival records. Fifty per cent of germination sheets and record cards have been scanned to PDF and are now searchable from the ATSC's web-served database.

The ANFC is one of CSIRO's most accessible collections due to the high proportion of digitised specimens that are publicly available through the ALA. These records include 151,000 fish specimens, 65,000 images of fishes, 11,000 x-rays, and 16,000 tissues for genetic analyses, representing marine species from Australia, the Antarctic and the Indo-Pacific region. Work has focused on innovative methods for extracting high-quality genomic information from preserved specimens that represent snapshots of past levels of genetic diversity. This allows estimations of historical ecological parameters for important Australian fisheries.

The Atlas of Living Australia is recognised as a global biodiversity platform, adopted by 10 countries around the world. It is also the primary mechanism through which NRCA's digitised biological collection data is made freely available. The Atlas holds more than 70 million records provided by partnering with museums, state and local governments, non-government organisations, universities and CSIRO. During 2016–17, 3.6 billion records were downloaded for uses in education, research and management. Approximately 88 million of the records downloaded were provided by NRCA.

TABLE 2.15: COMBINED UTILISATION OF NATIONAL RESEARCH COLLECTIONS[21]

USE OF NRCA	2012–13	2013–14	2014–15	2015–16	2016–17
Number of specimens dispatched	13,660	30,514	20,156	18,588	16,946
Outward-going loans	153	222	171	177	143
Tissue samples sent	2,415	8,461	4,033	2,884	3,032
Tissue sample grants	74	34	61	74	58
Number of visitors hosted			417	404	329
Total visitor research days			**651**	**1,018**	**828**
Number of tours hosted			90	126	116
Total number of visitors on tours			**695**	**888**	**1,133**

TABLE 2.16: DIGITISATION OF THE NATIONAL BIOLOGICAL COLLECTIONS

	PROPORTION DIGITISED (%)				
COLLECTION	2012–13	2013–14	2014–15	2015–16	2016–17
Australian National Insect Collection	5.0	5.0	5.0	5.0	5.3
Australian National Wildlife Collection (excluding sound archive)	92.0	92.0	92.0	99.9	96.0
Australian National Fish Collection	100.0	100.0	85.0	85.0	85.0
Australian National Herbarium	76.0	76.0	76.0	80.0	80.0
Australian National Algae Culture Collection	-	-	100.0	100.0	100.0
Australian Tree Seed Centre	67.0	68.0	70.0	70.0	75.0

21 Excludes ATSC and ANACC, because the function of these collections is a supply service, not coverage.

Digitising the bees of the Australian National Insect Collection

Biodiversity and food security depend on pollination of native plants and crops. Globally, pollinators are in decline due to habitat changes such as land clearing, habitat fragmentation, pesticides, diseases and climate change. Bees play a particularly vital role in pollination. While the European honeybee is the most well-known, Australia has more than 1,500 species of native bees that, alongside other insects, birds and even some mammals, actually pollinate the majority our native plants and agricultural crops.

The ANIC in Canberra holds more than 50,000 bee specimens collected from across the continent during the past 80 years. These specimens tell us where different species live, whether their distributions have changed over time and often what plants they lived on and pollinated. This information is crucial to predicting future trends in pollinator abundance and activity and the implications for both native biodiversity and pollinator-dependent industries.

To maximise its value for research, CSIRO is undertaking a project to digitise its collection using high-resolution imaging and capturing metadata. So far, the bee digitisation project has captured information from 36,000 bee specimens, unlocking the rich biodiversity information held in the National Research Collections Australia and making it freely available to both the research and industry communities. CSIRO is using volunteers and students as the workforce behind the digitisation program. The project has built core capability among volunteers and casual staff in digitisation and curation.

To implement innovative methods to rapidly digitise ANIC's collection of 50,000 bee specimens, the team sought help from citizen scientists, strengthening community involvement and increasing scientific awareness and knowledge about biodiversity. Citizen scientists transcribed ANIC's bee specimen labels using the online volunteering portal DigiVol, a collaboration between the Australian Museum and the Atlas of Living Australia.

CSIRO is also collaborating with external parties to assist the digitisation effort and to accelerate the delivery of data held within the National Research Collections Australia. Prior to commencing this digitisation project, CSIRO partnered with the Australian Museum to curate ANIC's bee collection. Taxonomic classification requires detailed knowledge and is a skill essential to managing Australia's biodiversity into the future.

CSIRO's bee digitisation project has added to knowledge about the distribution and diversity of Australia's bees. It is part of a worldwide effort to understand bee diversity that includes partners such as the Smithsonian National Museum of Natural History. Access to CSIRO's digitised collection data is available through the Atlas of Living Australia. The bee digitisation project has significantly increased the proportion of the National Research Collections Australia that is available for research, education and policy making. The project delivered productivity gains in collection specimen digitisation in a very short time, with costs being reduced from $4 or $5 per specimen to around $1 per specimen (excluding salaries).

A native blue-banded bee, collected in 1971, still has pollen stuck to its legs.

Program 1.3:
Science and Industry Endowment Fund

The Science and Industry Endowment Fund (SIEF) is a separately constituted trust under the *Science and Industry Endowment Act 1926*. The Fund invests in science that addresses issues of national economic, industrial, environmental and cultural priority and contributes to Australia's sustainable future, including:

- fundamental research for sustainable resource use, environmental protection and community health
- tactical research, seeking solutions to national challenges
- collaborative research between organisations working on solutions to national challenges
- scholarships sustaining young researchers capable of working on national challenges.

The CSIRO Chief Executive Dr Larry Marshall is Trustee of the SIEF and awards funding to parties across the national innovation system. The SIEF Advisory Council provides independent advice and recommendations on funding of proposals. CSIRO manages the Fund on behalf of the Trustee.

Some programs operate on a competitive basis, others by invitation on the basis of identified needs. All applications are considered against rigorous merit criteria. SIEF funds the:

- Experimental Development Program (EDP)
- Joint CSIRO–Macquarie University Chair in Wireless Communications
- Promotion of Science Fellowships and Scholarships Program (competitive)
- Research Infrastructure Program, including the Medium Equipment Program
- Research Projects Program (competitive)
- SIEF–AAS Fellowships to the Lindau Nobel Laureate meeting and the Heidelberg Laureate Forum, facilitated by the Australian Academy of Science (competitive)
- SIEF STEM+ Business Fellowships, facilitated by CSIRO
- Special Research Program.

The contribution of research to solving issues of national importance can only be measured long-term. The SIEF has developed several key performance indicators for its programs. As the funds available for allocation diminishes and fewer new projects are commenced, some KPI results will not change from previous years.

This year the SIEF program continued to perform well. Table 2.17 provides an overview of the evidence against each performance criterion as published in the PBS, followed by a more detailed analysis and evidence.

Analysis of our performance

The monies gifted to SIEF in 2009–10 are finite and most of these funds have now been committed. Projects are now drawing to the end of their SIEF funding and the research teams are securing and consolidating the ongoing and alternative resources they will need to take their work to the next stage of development. The SIEF Trustee, guided by the independent SIEF Advisory Council, has a role in identifying funding gaps across the national innovation system. The recently established SIEF EDP was designed to address the dearth of funding options available for progressing technology development to a stage suitable for attracting commercial investment and market uptake. Similarly, the SIEF Medium Equipment Program (launched in April 2017) is designed to address a gap in funding for equipment in the medium range ($500,000–$4 million) and, in so doing, enhance capability and capacity, and encourage national, international and industry collaboration.

TABLE 2.17: PERFORMANCE SUMMARY FOR PROGRAM 1.3

PERFORMANCE CRITERION	RESULT
Proportion of projects aligning with the Government's Science and Research Priorities	All research projects, research infrastructure, experimental development and special research program activities align with the Australian Government Science and Research Priorities. Almost 90% of promotion of science scholarships and fellowships align with the national priorities.
Proportion of projects involving more than one organisation	Over 94% of SIEF activities involve more than one organisation. Since 2009, SIEF has successfully facilitated collaboration among 60 different organisations that have been formally involved in SIEF-supported research. These collaborators represent a mix of Australian universities, governments, industry and overseas organisations. Almost a quarter of these collaborators have come from industry, with a further quarter from overseas entities.
Financial contributions of partners	Co-investment rates continue to be strong at 73% for 2016–17 for existing and new programs. A condition of the new SIEF Experimental Development Program is that co-investment by applicants must at least match the SIEF grant. To date, collaborators have created a portfolio of research activities with a total investment of $500 million.
Number of publications from SIEF projects	Publication output continues to increase, with 506 publications by the end of 2016–17. Bibliometric analysis indicates that the quality of science being reported is well above world average.
Number of Early Career Researchers (ECRs) funded through SIEF projects	Cumulative ECR numbers have increased to 337 at the end of 2016–17. The STEM+ Business Fellowship program has added 17 ECRs with a further 5 to commence in the next year.
Evidence of outcomes and impacts of funded projects as demonstrated by case study impact assessment, independent reviews and evaluations	In 2016, the SIEF Trustee commissioned an independent review[22] of the impact being delivered by SIEF and SIEF-funded activities. The review established that the value of the benefits delivered by the activities are highly likely to be significantly greater than the total value of the Fund. SIEF has also delivered a range of benefits that, while difficult to monetise, are clearly making an important contribution to the future health of the Australian innovation system.

22 The SIEF Impact Review is at: www.sief.org.au/AboutSIEF/Reports.html

Proportion of projects aligning with the Government's Science and Research Priorities

A key objective of SIEF is to support scientific research that aligns with the National Science and Research Priorities[23]. All SIEF research programs and most of our fellowships and scholarships are funded on this basis (see Table 2.18). The alignment between SIEF funding and the National Priorities is extremely strong. Over 98 per cent of SIEF's overall investment is aligned with the National Priorities. This result is higher than the Australian Research Council's 94 per cent of investment aligned for the period 2010 to 2015[24], and CSIRO's over 90 per cent of resources aligned with the National Priorities for 2011 to 2012.

All of the Research Projects, Research Infrastructure, Experimental Development, and Special Research Programs are 100 per cent aligned with the National Priorities. In the case of the Promotion of Science projects, 87 per cent are aligned with Australia's Science and Research Priorities. The small number of Promotion of Science projects that do not align with the priorities are either undergraduate projects or projects in areas such as astronomy.

Proportion of projects involving more than one organisation

Studies of innovation have shown that collaboration is critical for improving the effectiveness of translating research outputs into business innovation that delivers economic, environmental and social benefits. Collaboration helps Australian industry gain marketplace advantage by fostering creativity, developing new skills, transferring knowledge, managing risk and attracting aspiring investors and partners. One of SIEF's primary objectives is to improve collaboration across the Australian innovation system.

More than 94 per cent of SIEF-supported activities involve more than one organisation (see Table 2.18), fostering communication, interaction and collaboration. Over 60 organisations are formally involved in one or more SIEF-funded projects. These collaborators represent a mix of Australian universities, governments, industry and overseas organisations. Almost a quarter have come from industry, with a further quarter from overseas entities. Many more organisations draw on SIEF-funded activities, particularly via the Research Infrastructure and Special Research Programs, where development and availability of research infrastructure plays an important role in supporting Australian innovation for the future.

TABLE 2.18: PERFORMANCE DATA FOR PROGRAM 1.3

PERFORMANCE CRITERION	2012–13	2013–14	2014–15	2015–16	2016–17
Projects aligning with Government's Science and Research priorities	100% Research projects, research infrastructure and special research program. 83% Promotion of science.	100% Research projects, research infrastructure and special research program. 84% Promotion of science.	100% Research projects, research infrastructure and special research program. 84% Promotion of science.	100% Research projects, research infrastructure and special research program. 88% Promotion of science.	100% Research projects, research infrastructure, experimental development and special research program. 87% Promotion of science.
Projects involving more than one organisation	>90%	>92%	>92%	>93%	>94%
Financial contributions of partners	Approximately 69%	Approximately 68%	Approximately 70%	Approximately 73%	Approximately 73%

23 Government's National Science and Research Priorities list is at: www.science.gov.au/scienceGov/ScienceAndResearchPriorities/Pages/default.aspx

24 ARC Research Funding Trend Data 2002-2015 is at: www.arc.gov.au/grants-dataset

Another good example of SIEF's collaborative efforts is the STEM+ Business Fellowship program that enables ECRs to work with Australian SMEs for two to three years. This placement helps to break down the cultural divide between researchers and SMEs, which can be a barrier to innovation.

The number of publications co-authored with other organisations reinforces the strength of a collaboration as well as demonstrating that both parties recognise the value of the research outputs. A recent analysis of the authorship of publications arising from SIEF-funded activities provides useful insights into the impact on collaboration of SIEF funding. This study considered 417 publications arising from SIEF-funded activities (at October 2016) for which at least one author was a member of a team receiving SIEF funding. Almost 83 per cent of these articles were co-authored. Almost 69 per cent of these have Australian co-authors, while 46 per cent have at least one or more international co-author. This is at the upper end of the scale compared to the proportion for a range of other Australian research organisations. International co-authors are drawn from 43 different countries. The strong international connectedness of SIEF-funded research is evidenced by the large percentage of publications with international co-authors. It is also a strong indicator of the high level of regard that the international community has for the research.

Financial contributions of partners

Collaboration increases a research team's ability to access the resources and capital it needs to complete a project. SIEF does not fully fund activities; rather it commits funds to help stimulate investment by partner organisations. To date, SIEF investment has supported the creation of a portfolio of research activities with a total investment of $500 million. Collaborating partners in this research have contributed 73 per cent of the total funding with SIEF contributing the remainder.

Research Projects leverage an average of more than 60 per cent co-investment from partner organisations. The Research Infrastructure and Special Research Programs have higher co-investment levels, indicating the longer-term commitment to these activities by partner organisations. The level of co-contribution for the Promotion of Science Program is lower; however, this is to be expected as this Program involves relatively low-value grants, and there is limited need for co-investment as the research is still in its early stages. The STEM+ Business Fellowship Program requires co-investment from the SME partner to demonstrate the commitment to work together to realise the potential impact of the research. Similarly, co-investment by applicants for Experimental Development activities must at least match the SIEF grant. The impact of these two new programs will be seen in the coming years.

Number of publications from SIEF projects

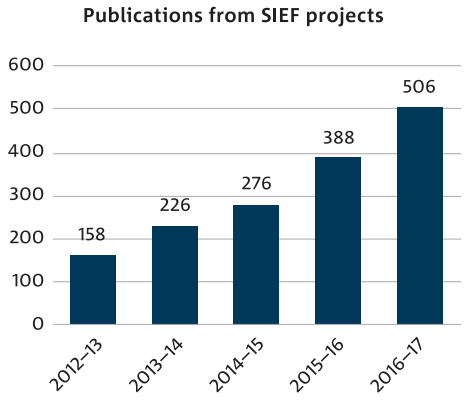
Reported peer-reviewed journal publication numbers continue to rise (see Figure 2.6). The recorded numbers are likely to under-represent the true level of publications associated with SIEF funding. Publications resulting from grants in the Research Infrastructure and Special Research Programs are not included and, once SIEF funding has ended, it is challenging to capture all subsequent publications. To understand research quality, it is necessary to consider the quality of the journals in which the research findings are published. Bibliometric analysis conducted in October 2016 indicates that the quality of science being undertaken in the overall SIEF portfolio is high. Eighteen per cent of published articles appear in the top five per cent of journals globally, and four per cent of SIEF publications appear in the top one per cent of publications globally. Citations for SIEF publications are 108 per cent higher than the global average, substantially ahead of the national average, which is 30 per cent above global[25].

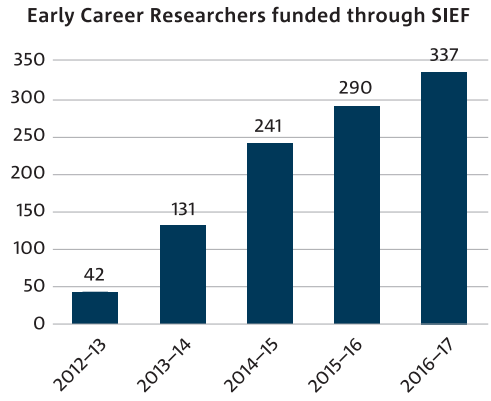
Early-career researchers funded through SIEF projects

High-quality STEM training not only helps develop the nation's future researchers, but also ensures an innovative and flexible workforce of STEM practitioners, and facilitates the development of knowledge-based organisations, communities and economies. SIEF has a remit to support ECRs and does this in several ways, through scholarships and fellowships, project funding and travel support. The number of ECRs has risen steadily over the past five years to 337 in 2016–17 (see Figure 2.6).

25 Data source: Web of Science, 2011–16.

FIGURE 2.6: SIEF PUBLICATIONS AND ECRS FUNDED 2012–13 TO 2016–17





ECRs work on SIEF-funded research projects and are associated with Research Infrastructure and Special Research Programs[26]. The SIEF–AAS Nobel Laureate Meeting Fellowships continue to ensure that young Australian researchers have the opportunity to interact with Nobel Laureate scientists, as well as their top peers from around the globe. This opportunity has now been extended to support high calibre young researchers to attend the Heidelberg Laureate Forum.

The SIEF STEM+ Business Fellowship Program offers young researchers experience in industry. It is anticipated that projects funded under the new Experimental Development Program will also involve ECRs.

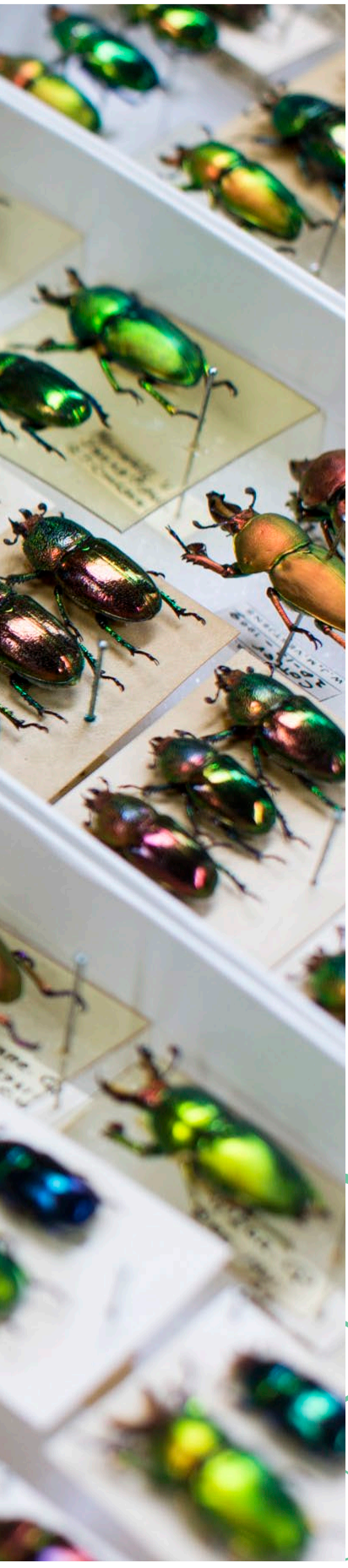
The John Stocker Postgraduate Scholarship program and the Honours and Vacation scholarship programs are no longer offering new scholarships. The final cohort of John Stocker Postdoctoral Fellowships commenced in 2016. Over the last five years, these scholarships have helped many young researchers further their careers. A survey of ECRs funded under all SIEF activities, conducted in October 2016, provides strong evidence that SIEF support has helped ECRs address some of the structural barriers they face in the early stages of their professional careers. It has assisted them to gain new skills, work experience and opportunities for collaboration. This, in turn, has improved their prospects for securing further employment in the research sector, and has enhanced their longer-term career prospects. For instance, 68 per cent of respondents believe that the support they received through SIEF had an extremely high or high impact on their career progression. Also, 54 per cent of respondents reported that the support they had received from SIEF had helped them to secure further employment.

Evidence of outcomes and impacts of funded projects

In 2016, an independent review[27] was conducted with ACIL Allen to assess the impact and value of SIEF's activities. Five research projects were assessed, and additional case studies were developed on a Special Research Program and a Research Infrastructure Activity. The evaluation concluded that the value delivered by SIEF could easily be two orders of magnitude greater than the cost of the portfolio. It was also shown that SIEF is able to deliver a range of benefits that are crucial to the robustness of the Australian innovation system, including developing and fostering the next generation of Australian researchers, encouraging and promoting increased research collaboration both within Australia and overseas and developing and maintaining leading-edge research infrastructure. These outcomes are all important prerequisites to ensure Australian researchers continue to deliver high-quality research outputs that enable businesses to innovate and grow, and which allows Australia to address the environmental and social challenges it faces.

26 Early-career researcher figures are not collected for Research Infrastructure and Special Research Programs.
27 The SIEF Impact Review is available at www.sief.org.au/AboutSIEF/Reports.html

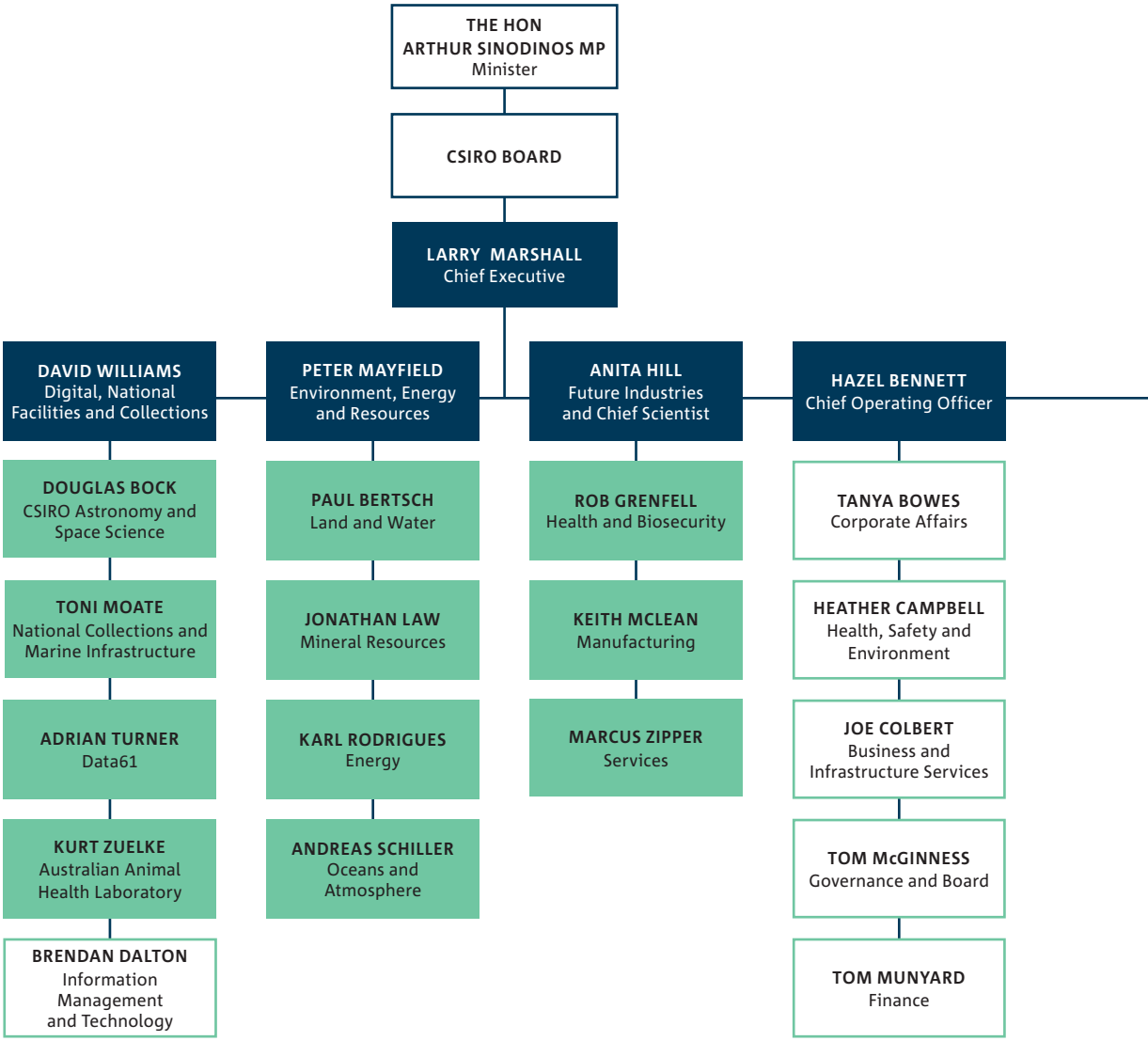
The Australian National Insect Collection is used by Australian and international researchers, industry, government and university students. The collection is growing by more than 100,000 specimens each year.

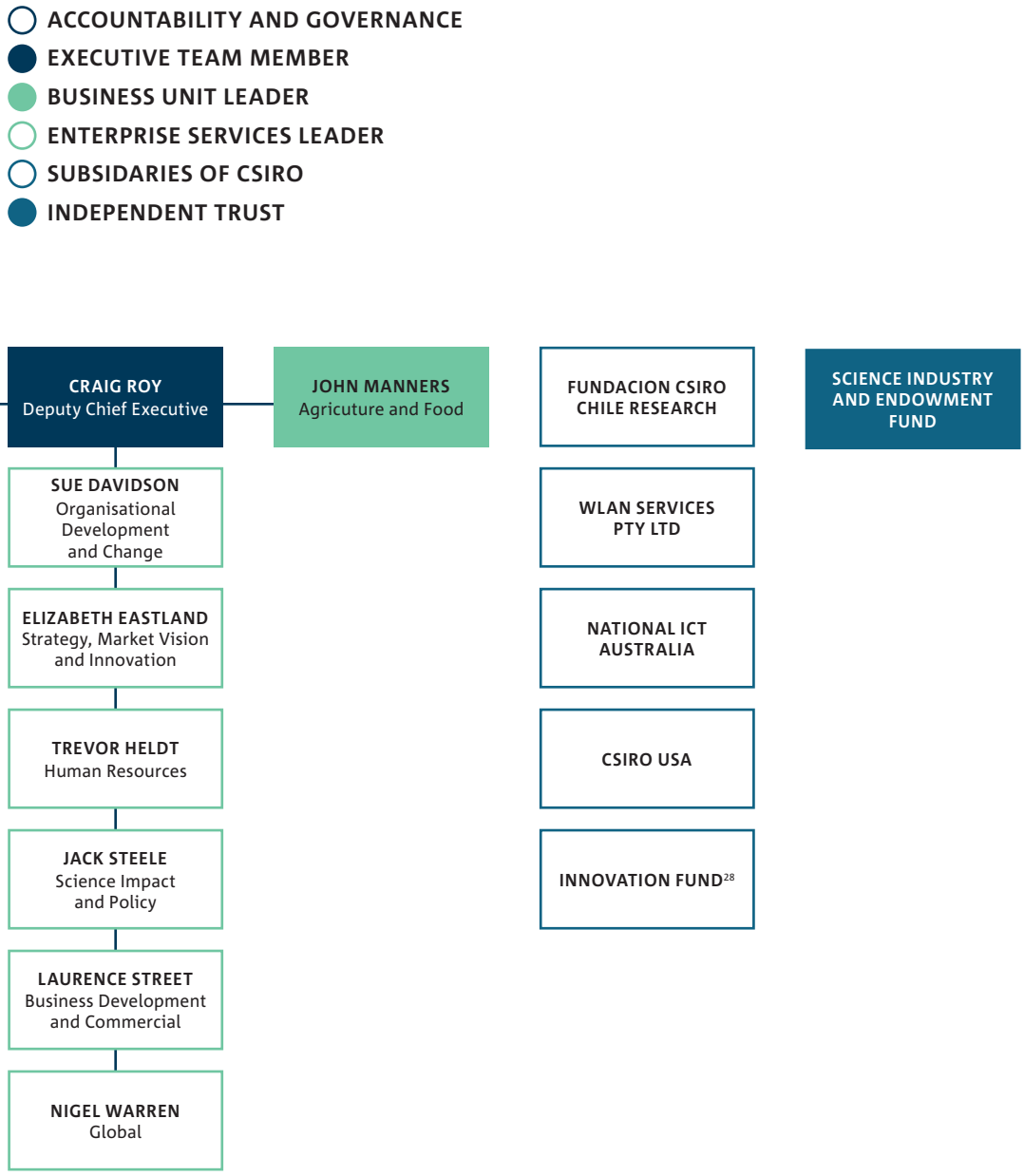


Part 3
Our organisation

How we are organised

AS AT 30 JUNE 2017





28 Further details on the structure and entities to manage and operate the Fund are on page 128.

Management and accountability

OPERATING MODEL

The CSIRO operating model is designed for the successful execution of our strategy and delivery of our objectives. We define the roles, relationships and accountabilities of our leaders and operating units and use processes for planning, investing, reviewing and reporting on our work. CSIRO also has an extensive Policy Framework[29].

LEGISLATION AND GOVERNMENT POLICY

CSIRO is an Australian Government statutory authority constituted and operating under the provisions of the *Science and Industry Research Act 1949* (SIR Act).

Our primary functions are to:

- carry out scientific research to:
  - assist Australian industry and to further the interests of the Australian community
  - contribute to national and international objectives and responsibilities of the Commonwealth
- encourage or facilitate the application and use of the results of CSIRO scientific research.

Our secondary functions include international scientific liaison, training of research workers, publication of research results, technology transfer of other research, provision of scientific services and dissemination of information about science and technology.

Reporting, accountability and other rules for our operations are set out in PGPA Act.

CSIRO also provides administrative support services to the Trustee of the SIEF consistent with the *Science and Industry Endowment Act 1926*. The Fund has its own governance structure (see pages 148–149 for more information on the Fund).

CSIRO had no significant non-compliance matters to report to its Minister. There were no government policy orders to CSIRO during 2016–17.

RESPONSIBLE MINISTER

As at 30 June 2017, the responsible Minister for CSIRO was the Senator the Hon Arthur Sinodinos AO, Minister for Industry, Innovation and Science. Other responsible Ministers during 2016–17 were:

The Hon Arthur Sinodinos AO, Minister for Industry, Innovation and Science

- The Hon Christopher Pyne MP, Minister for Industry, Innovation and Science (1 July 2016 to 19 July 2016)
- The Hon Greg Hunt MP, Minister for Industry, Innovation and Science (19 July 2016 to 24 January 2017).

Under the SIR Act, the Minister has powers to:

- add to the purposes for which CSIRO may carry out scientific research (SIR Act, section 9)
- provide to the CSIRO Board, in writing, directions and guidelines with respect to the performance of the functions, or the exercise of the powers, of the Board or of the Organisation (SIR Act, section 13).

The Minister provides CSIRO with a Statement of Expectations and the Board responds with a Statement of Intent. The latest Statement of Expectations was provided by then Minister Hunt on 18 November 2016. CSIRO's responding Statement of Intent was provided to Minister Sinodinos on 1 May 2017.

These documents are available at: www.csiro.au/en/About/Leadership-governance/Minister-and-Board/Statement-of-Expectations.

MINISTERIAL DIRECTIONS AND NOTIFICATIONS

On 15 July 2014, the CSIRO Minister directed the CSIRO Board to apply the Australian Government Public Sector Workplace Bargaining Policy to Enterprise Bargaining Agreement negotiations in CSIRO. During 2016–17, CSIRO kept the Minister for Industry, Innovation and Science and the Minister for Finance informed through our Board and in accordance with section 19 of the PGPA Act.

29 Further information about our operating model can be found at: www.csiro.au/en/About/Strategy-structure/Operating-model

GOVERNMENT ENGAGEMENT

Throughout 2016–17, CSIRO staff had regular meetings with ministers, parliamentarians and senior staff from relevant government departments to discuss their needs, share research activities and provide scientific information. They also received advice to inform policy development and program implementation and evaluation. We made eight submissions to parliamentary inquiries and our staff attended 14 inquiry hearings to provide information.

CSIRO BOARD

We are governed by a Board[30], who are responsible to the Australian Government for the overall strategy, governance and performance of our organisation.

The Board comprises nine part-time, non-executive members including the Chairman and a full-time Chief Executive. At June 2017, there was one vacancy on the Board. All non-executive members are appointed by the Governor-General. The Chief Executive is appointed by the CSIRO Board, in consultation with the Minister.

In 2016–17 our Board operated in part through three standing committees:

- Board Audit and Risk Committee
- Board People, Health and Safety Committee
- Board Science Excellence Committee.

On appointment, Board members receive a formal induction on the organisation and their duties. Members maintain their professional development and they participate in visits to CSIRO sites as well as governance and business briefings. In the pursuit of their duties, Board members may seek independent professional advice and have high-level access to CSIRO senior management.

Under its Charter and Operating Guidelines, the CSIRO Board reviews its performance, composition and skill base at regular intervals to ensure it is operating efficiently, effectively and with regard for the principles of good corporate governance. A review of Board performance is usually conducted at least every 18 months. In early 2017, the CSIRO Board conducted a governance review of the Board to benchmark itself against best practice and to identify any opportunities for improvement[31].

Details of Board members, including qualifications and terms of appointment, are on page 82. Details of remuneration, membership of Board committees, attendance at meetings and related party directorships and associations are shown in the financial statements (Part 4).

CSIRO EXECUTIVE MANAGEMENT

The Chief Executive conducts the affairs of the organisation in accordance with CSIRO's strategy, plans and policies approved by the Board as well as the Board Directions to the Chief Executive.

Our Chief Executive is supported by our Executive Team (ET). As a team and through their individual roles, the members lead, direct, coordinate and control CSIRO's operations and performance. Details of the members are on page 83. This year, and in accordance with the Executive Team Charter, the ET developed the Corporate Plan 2017–18, Budget and new Policy Framework (see page 78). The ET is assisted by two standing committees:

- The Science, Strategy, Investment and Impact Committee (SICOM) supports the ET to direct and control the organisation's strategic science, capability, investment and impact planning.
- The Major Transactions Committee (MTC) controls CSIRO's involvement in major transactions, and related matters and investments.

During 2016–17, SICOM met in session four times. The MTC held 15 meetings, including three out-of-session meetings. Our CSIRO Leadership Team of senior managers provides a forum for sharing and discussing issues relating to the management and future strategy for CSIRO.

REMUNERATION OF EXECUTIVES AND STAFF EARNING ABOVE $200,001 PER ANNUM

From 2016–17, CSIRO, along with other Australian Government agencies, will provide greater transparency of senior executive and staff earnings above $200,001 per annum. The following tables outline annual reportable remuneration including gross payments, reportable fringe benefits, reportable employer superannuation, allowances, bonuses and at-risk salary components.

30 The Board Charter and membership profiles are at: www.csiro.au/en/About/Leadership-governance/Minister-and-Board
31 The outcomes from this assessment are internal to CSIRO and not for public release.

TABLE 3.1: AVERAGE ANNUAL REPORTABLE REMUNERATION PAID TO SUBSTANTIVE EXECUTIVES IN 2016–17

TOTAL REMUNERATION	EXECUTIVES (NO)	AVERAGE REPORTABLE SALARY ($)	AVERAGE CONTRIBUTED SUPER-ANNUATION ($)	AVERAGE ALLOWANCES ($)	AVERAGE BONUS PAID ($)	AVERAGE TOTAL REMUNER-ATION ($)
$225,000 and less	-	-	-	-	-	-
$225,001 to $250,000	1	199,256	24,942	-	25,702	249,900
$250,001 to $275,000	5	219,505	24,813	-	20,190	264,508
$275,001 to $300,000	3	230,904	36,747	-	16,070	283,722
$300,001 to $325,000	1	275,310	38,808	-	-	314,118
$325,001 to $350,000	2	276,571	41,512	-	-	335,253
$350,001 to $375,000	1	292,926	50,931	-	24,480	368,337
$375,001 to $400,000	1	340,359	19,616	-	24,510	384,485
$400,001 to $425,000	1	388,394	19,616	-	16,781	424,791
-	-	-	-	-	-	-
$450,001 to $500,000	1	377,349	65,609	-	25,170	468,129
-	-	-	-	-	-	-
$625,001 to $650,000	1	520,920	90,572	-	24,600	636,092
-	-	-	-	-	-	-
$825,001 to $850,000	1	652,006	19,616	-	168,159	839,781
Total number of executives	**18**					

TABLE 3.2: AVERAGE ANNUAL REPORTABLE REMUNERATION PAID TO SUBSTANTIVE STAFF EARNING ABOVE $200,001 IN 2016–17

TOTAL REMUNERATION	STAFF (NO)	AVERAGE REPORTABLE SALARY ($)	AVERAGE CONTRIBUTED SUPER-ANNUATION ($)	AVERAGE ALLOWANCES ($)	AVERAGE BONUS PAID ($)	AVERAGE TOTAL REMUNER-ATION ($)
$200,001 to $225,000	95	178,959	30,060	-	3,192	212,211
$225,001 to $250,000	47	195,671	32,801	-	7,567	236,039
$250,001 to $275,000	24	216,528	33,552	-	8,498	258,578
$275,001 to $300,000	6	235,623	38,825	-	9,584	284,031
$300,001 to $325,000	7	268,568	35,361	-	10,531	314,460
$325,001 to $350,000	3	278,868	47,719	-	11,350	337,936
$350,001 to $375,000	3	279,166	43,404	-	39,017	361,587
Total number of substantive staff	**185**					

DISCLOSURE OF INTERESTS AND RELATED ENTITY TRANSACTIONS

Board members and the Chief Executive declare material interests in accordance with the SIR Act and PGPA Act. The Board Governance document contains processes for managing conflicts of interest including a requirement that members absent themselves from discussions and voting where a member has declared a material personal interest, or where a potential or actual conflict of interest or duty arises.

In 2016–17, the Board considered the following transactions where a Board member was also a director on the entity involved in the transaction:

- The Board noted Chairman's declaration of interest as Chair on NSW Jobs for the Future Board and agreed that David Thodey would be excluded from the decisions for this item and the Deputy Chair would chair the meeting for this item.
- Board 200 Item 3.1c Innovation Fund – (update on Innovation Fund including 'draft' thesis of the Investment Mandate): Dr Michele Allan is excluded from any decisions on Innovation Fund given her role on the ISA Board
- Board 201 Item 3.2 Innovation Fund – Dr Michele Allan is excluded from decision given her role on the ISA Board
- Board 202 Item 3.3 Innovation Fund – Dr Michele Allan did not receive a copy of the paper and was absent from Board discussion

There have been 206 transactions involving entities related to CSIRO above $10,000 which came to a total combined value of $22.9 million.

PLANNING AND MONITORING PERFORMANCE

In accordance with the requirements of the PGPA Act, our Corporate Plan 2016–17 set out the broad objectives to be achieved by 2020, the key activities we committed to carry out, the resources allocated to them, and details how achievement is to be measured. Specifically, it included the annual delivery targets set by our ET and agreed by our Board for the financial year, in the form of strategy KPIs. An assessment of our performance against this year's KPIs is on pages 17–18.

To ensure we remain on track, our ET and Board receive regular updates on how we are performing against the plan, the KPIs, the budget and other internal performance indicators. In addition, our Research Business Units are periodically reviewed by panels chaired by independent experts, who assess the strength of our capability as well as the relevance and impact of our research. No Business Unit reviews were undertaken in 2016–17. Commencement of reviews has been delayed to accommodate the availability of external panel members and movement of staff in Business Unit leadership teams. The first review will be undertaken in August 2017. However, an independent all-of-CSIRO value assessment was undertaken in 2016–17 to assess the economic, environmental and social impacts resulting from CSIRO activities (see page 19).

RISK MANAGEMENT

CSIRO is committed to effectively identifying and managing risk as a vital part of successfully capturing the opportunities created through scientific research and delivering on our purpose as an organisation. CSIRO undertakes research activities that involve challenging and highly technical science. This inherently carries a significant level of risk. As such, we actively identify, monitor and manage strategic and operational risks that may impede our research activities or pose risks to our people, brand, commercial viability, relationships, operations or the environments in which we operate.

CSIRO manages risk at all levels of the organisation and it is the responsibility of all our people. Risk represents one of five organisational policy statements and is supported by our risk standards, procedures and guidelines.

The 'EY Review Of CSIRO's Science Prioritisation and Implementation (SPI) Process' made a series of observations and recommendations across a broad range of areas including the application of the Risk and Crisis Management Frameworks. Recommendations from this review related to better integration of the existing Risk Management Framework into the SPI process, improving risk management practice and culture and clearer application and understanding of the triggers that warrant invoking the Crisis Management Framework. All recommendations have been implemented.

CSIRO's Organisational Risk Profile is updated annually to reflect our main strategic and operational risks in alignment with our strategy. It articulates how CSIRO manages its key risks at an enterprise level. In 2016, the Organisational Risk Profile was endorsed at the August Board Audit and Risk Committee meeting and was formally approved by the Board in September 2016. Updates to the profile are reported through to the ET and Board on a monthly basis. Key risk activities are regularly reported through to the Board Audit and Risk Committee. An Issues Management Team, comprised of business unit and functional leaders, convenes each week to identify, assess and manage issues that have organisational importance. CSIRO's Situation Management Framework supports the management of issues.

General insurance, including General Liability and Professional Indemnity Insurance, is provided through Comcover. CSIRO's worker's compensation liability is covered through a Comcare premium.

ADVISORY MECHANISMS

Our Advisory Committees provide advice on our longer-term strategic directions and research and development priorities and on how we can meet the research, technical and business needs of customers and communities. The committees meet at least twice a year, or more regularly if required. The advice provided by these committees relates to the effectiveness of our businesses to achieve their goals. The committees comprise of representatives from industry, government, non-government organisations and other stakeholders.

In 2016–17, the Board established the CSIRO Board Science Excellence Committee. The role of the committee is to assist the Board to oversee, monitor and endorse the implementation of CSIRO's strategic plans with respect to maintaining and growing our scientific excellence, its connection to impact delivery, and our role as innovation catalyst in the national innovation system.

POLICIES, PRINCIPLES AND PROCEDURES

The CSIRO Policy Framework comprises policies, principles and procedures. In 2016, the CSIRO Board approved a change to the Policy Framework to better support the CSIRO Strategy 2020 and streamline the available information for use by CSIRO officers. The new framework replaces policies, standards, procedures, and will be progressively implemented in 2016–17. The framework is supported by the CSIRO Delegations and Authorities Framework.

The policy statements[32], approved by our Board, cover our commitment in relation to:

- Science and Delivery
- People
- Governance
- Risk
- Health, Safety and Environmental Sustainability
- Freedom to Conduct CSIRO Research and Technology Transfer.

All policy statements are reviewed annually to ensure they clearly articulate current CSIRO commitments.

32 Our policy statements are available at: www.csiro.au/en/About/Policies-guidelines/Our-core-policies

During 2016–17 the following standards and procedures were introduced or amended.

Standards

IP and Commercial

Procedures

Access Control and Visitor Management

Allowances – AAHL Specific Conditions Allowance

Allowances – Enhanced Responsibilities Allowance

Allowances – Field Work Allowance

Allowances – Living Allowance

Allowances – Motor Vehicle Allowance

Animal Welfare

Appointment and Employment – Casual Employment

Appointment and Employment – Probation

Attendance for Work – Part Time Employment and Job Sharing

Attendance for Work – Public Holidays

Bank Guarantees

Commercial Contracts

CSIRO Delegations and Authorities Manual

CSIRO Information Security

Electrical Safety

Ethical Conduct in Human Research

Grievances and Appeals – Grievances

HSE Inductions

HSE Risk Management

Injury Management and Rehabilitation

Leaving CSIRO – Death of a Staff Member

Leaving CSIRO – Resignation

Legal Advice

Memberships

Mobile Devices

Mobility of Staff – International Assignments

Participating in a CRC

Pay and Benefits – Debt Repayment from Salary

Pay and Benefits – Overtime

Pay and Benefits – Superannuation

PC Fleet Management

Plant HSE Management

Print & Image Services

Promotion and Rewards – Senior Staff Rewards

Promotion and Rewards – Accelerated Advancement

Promotion and Rewards – Merit (in situ) Promotion

Promotion and Rewards – Performance and Development Steps

Promotion and Rewards – Performance Cash Rewards

Promotion and Rewards – Recognition (Non cash) Rewards Procedure

Promotion and Rewards – Term Promotion

Purchase and Use of Books and Information Resources

Relocation – Inter-city Relocation

Sanctions

Sponsorship

Travel

Use and Management of Email

Web Management

Work and Training Schemes – Industrial Traineeships

Work and Training Schemes – Post Retirement Research Fellowships

Work and Training Schemes – Postgraduate Studentships

Work and Training Schemes – Visitors

Guidelines

Appearing as an expert witness

Contact Reporting Scheme

CRC Bid Negotiation

CRC Engagement Office

CRC Participation

CSIRO Event Security

Duress Alarm and Response

Hazardous Substances Safety

Laboratory Safety

Personal use of social media

Pricing framework guideline

Risk

Transaction execution guidelines co-investment projects

Transaction execution guidelines – full cost consulting

Transaction execution guidelines – Joint Ventures and centres

Transaction execution guidelines – relationship arrangements

Transaction execution guidelines – research alliances

ETHICS AND THE CODE OF CONDUCT

The CSIRO Code of Conduct sets out the standard of behaviour expected of CSIRO staff and others working in the organisation. All staff members and CSIRO affiliates are required to undertake training on the Code including on commencement with CSIRO.

Ethical conduct is a priority for CSIRO and we have procedures for Ethical Conduct in Human Research, and Animal Welfare regarding the care and use of animals in scientific research. Our practices comply with national codes and relevant state and national legislative requirements. CSIRO operates two human research ethics committees to cover its social and interdisciplinary science and health- and medical-related research. These committees review about 245 new projects each year and provide ongoing monitoring and support for over 435 active projects at any given time. The committees provide independent, expert advice regarding appropriate engagement of people and communities in research. They ensure the effective management of issues such as privacy, informed consent and managing risks and benefits flowing from research.

CSIRO operates five Animal Research Ethics Committees (AECs) that review CSIRO use of animals in research. This covers a range of fields including wildlife conservation, farm animal production, nutrition, disease control and prevention and human health. Approximately 130 new projects are reviewed each year. AECs also play an active role in monitoring the care and wellbeing of animals during any research and ensure CSIRO's compliance with all regulatory requirements. Ongoing support and monitoring is provided for over 210 projects at any given time.

During 2016–17, the process of integrating the support and governance arrangements for CSIRO's animal ethics from across several Business Units to a centralised support function continued. This process will be completed in 2017–18. The North Ryde Animal Ethics Committee ceased operations in February 2017 due to the closure of the animal facility at that site. Functions for the Western Australia-based Floreat Animal Ethics Committee were integrated into the CSIRO Wildlife and Large Animal Ethics Committee, which is registered in all states and territories. The centralised ethics function is located with the Science Impact and Policy Group in Enterprise Support Services. This shift has provided improved levels of service delivery and support for CSIRO AECs and research staff, as well as a consistent approach to regulatory compliance and project oversight. The creation of a new Animal Welfare Officer role within the ethics function also provides organisation-wide support for best practice in animal care.

INTERNAL CONTROLS

Assurances about our financial state of affairs, compliance and control environment are provided through a range of processes, including the role of the Internal Audit, Risk, Legal, Fraud Control and Security units; system design and monitoring; compliance reporting by senior managers; and the operation of the CSIRO Public Interest Disclosure Scheme.

From a fraud-control perspective, and as a corporate Commonwealth entity, CSIRO complies with the PGPA Act, which is underpinned by the Commonwealth Fraud Control Framework 2014. We updated the Fraud Risk Assessment and Fraud Control Plan in late 2016 and the Fraud Control Team continue to review and update CSIRO's Fraud Risk, Governance and Fraud Control strategies. During 2016–17, there were eight instances of suspected fraud reported to or identified by the Fraud Control Team. None of these were substantiated as fraud. During 2016–17, CSIRO Security Teams implemented an enterprise security program to assess applicability and implement strategies and controls in line with the Australian Government Protective Security Policy Framework and the Information Security Manual. The progress is being overseen by the CSIRO Security Committee and Security Executive, who endorse all changes to the security governance and risk mitigation strategies within CSIRO.

REVIEWS BY OUTSIDE BODIES

External audit is provided by the Australian National Audit Office.

The Senate Standing Committees on Economics examines the operations of CSIRO following the Federal Budget, the tabling of the CSIRO Annual Report and the introduction to Parliament of the additional Appropriation Bills. This year, CSIRO senior executives appeared before the Committee on three occasions and responded to all questions on notice. The Committee reviewed the Annual Report 2015–16, noting it considered the annual report to be satisfactory.

On 3 April 2017, the Government's response to an interim report of the Senate Select Committee into the Scrutiny of Government Budget Measures concerning the 'potential ramifications of proposed cuts to the CSIRO' was tabled. In tabling its response, the Government noted all five of the Committee's recommendations.

JUDICIAL DECISIONS

During 2016–17, there were no judicial decisions or decisions of administrative tribunals that have had, or may have, a significant effect on the operations of CSIRO.

Board membership

Mr David Thodey, AO
(Chairman)

BA FAICD
Company Director
15 October 2015 –
14 October 2020

Ms Shirley In't Veld
(Deputy Chairperson)

BCom LLB FAICD
Company Director
28 June 2012 – 27 June 2020

Dr Larry Marshall
(Chief Executive)

BSc (Hons) PhD GAICD FTSE
1 January 2015 – 31 December 2016; 1 January 2017 – 30 June 2020

Dr Michele Allan

BAppSc MMgtTec MCommLaw DBA FAICD
Company Director
5 May 2016 – 4 May 2019

Prof Edwina Cornish, AO

BSc (Hons) PhD FAA FTSE FOSA FAIP MAICD
26 November 2015 – 25 November 2020

Mr David Knox

BSc (Hons) Mech Eng MBA FIE Aust FTSE GAICD
Company Director
5 May 2016 – 4 May 2019

Prof Tanya Monro

BSc (Hons) PhD FAA FTSE FOSA FAIP GAICD
Company Director
25 February 2016 – 24 February 2021

Mr Hutch Ranck

BSc Economics FAICD
Company Director
1 May 2011 – 30 April 2016
Reappointed: 5 May 2016 – 4 May 2018

Dr Peter Riddles

BSc (Hons) PhD Grad Dip Bus FAICD
Company Director
24 April 2014 – 23 April 2017
Reappointed: 24 April 2017 – 23 April 2022

Mr Brian Watson

BComm
Company Director
14 September 2015 – 4 October 2016

Details of the operation of our Board are on page 75.

Executive Team members

Dr Larry Marshall

BSc (Hons) PhD GAICD FTSE
Chief Executive

Mr Craig Roy

BSc MSc MBA FAICD
Deputy Chief Executive

Ms Hazel Bennett

BSc (Hons) ACA FCPA GAICD FAIM
Chief Operating Officer

Dr Anita Hill

BEng (Hons) PhD FTSE FAA GAICD
Chief Scientist and
Executive Director – Future Industries

Dr David Williams

BSc (Hons) PhD
Executive Director – Digital, National Facilities and Collections

Dr Peter Mayfield

BE (Hons) PhD
Executive Director – Environment, Energy and Resources (commenced 1 May 2017)

Dr John Manners – Ex-Officio member

BSc (Hons) PhD
Director, CSIRO Agriculture and Food

Previous members

Dr Alex Wonhas, Physik Diplom (Bsc (Hons) MSc (Hons) equivalent) PhD FTSE GAICD
Executive Director – Environment, Energy and Resources (until 30 December 2016)

Details of our executive management are on page 75.

Members of the Executive Team from L to R: Dr Peter Mayfield, Dr David Williams, Dr John Manners, Ms Hazel Bennett, Dr Larry Marshall, Dr Anita Hill, Mr Craig Roy.

Health and safety

CSIRO aspires to 'Zero Harm' and is committed to the safety, health and wellbeing of its people, partners, customers and the environment.

In 2016–17, 30 staff suffered an injury serious enough to prevent them working, equal to 2015–16. These injuries equate to a rate of 3.2 per million hours worked, which is a slight improvement on the rate of 3.3 in 2015–16. In 2016–17, there was a significant decrease in injuries that required medical treatment. These combined reductions resulted in a 19 per cent reduction in the Recordable Injury Frequency Rate in 2016–17 (see Figure 3.1).

Musculoskeletal injuries remain the most frequent cause of injury. Although not life-threatening, these injuries are painful and often debilitating. In 2016–17, 78 staff experienced an injury that required time off work or medical treatment, 56 per cent of these were musculoskeletal. This is a 20 per cent reduction in the occurrence of these type of injuries compared to last year. This may be as a result of the preventative programs in place, including the Wellnomics Computer WorkPace® software, and Move 4 Life training.

A key focus of our safety programs is on preventing injuries that have the potential to cause death or permanent disability. These incidents are reportable to Comcare or, in the case of radiation incidents, the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA). In 2016–17, there were nine incidents that were reportable to Comcare. None of these incidents resulted in serious injury, however, were extremely serious and have resulted in detailed investigations and a focus being placed on safety leadership within the organisation. Comcare issued a Prohibition Notice under the *Work Health and Safety Act 2011* (WHS Act) after an incident involving an explosion at the Clayton site in Victoria in June 2017. Investigations are ongoing and, as a precaution, all processes involving flammable or explosive liquids or gases under pressure are being re-examined by teams and improvements made to safety processes as required.

In 2016–17, there were two radiation incidents that were reportable to ARPANSA. One incident was reported to the Civil Aviation Safety Authority and one to the Department of Agriculture and Water Resources and the Department of Environment and Energy (Parks Australia).

FIGURE 3.1: CSIRO RECORDABLE INJURY FREQUENCY RATE[33], 2012–13 TO 2016–17

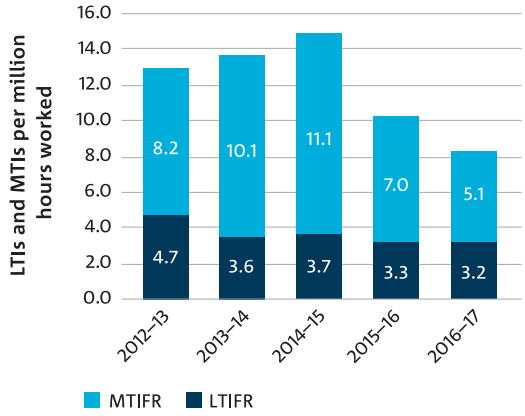
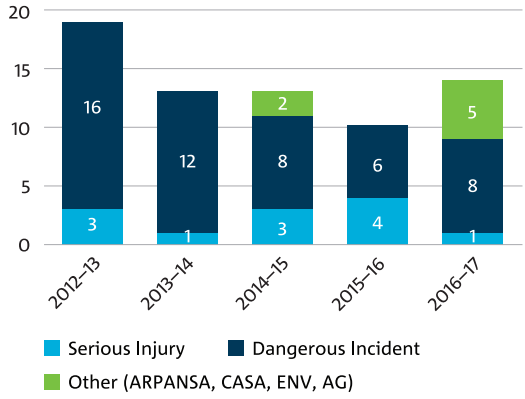


FIGURE 3.2: REGULATORY NOTIFIABLE INCIDENTS[34], 2012–13 TO 2016–17



33 The Recordable Injury Frequency Rate is calculated as the sum of Lost Time Injuries per million hours worked plus the Medical Treatment Injuries per million hours worked.

34 The *Work Health and Safety Act 2011* came into effect on 1 January 2012, changing the criteria that determine which incidents must be notified to Comcare. This change accounts for much of the steep decline in notifiable incidents during 2011–12 and 2012–13.

HEALTH, SAFETY AND ENVIRONMENT STRATEGY

In 2015–16, the CSIRO Health, Safety and Environment (HSE) 2020 Plan was developed to support the CSIRO Strategy 2020. In 2016–17, HSE staff worked with the Business Units and support staff to advance the programs and achieve cultural change by empowering staff to be safety leaders. Ninety-eight per cent of staff completed the online safety induction Starting with your Safety, and case-study-based training was rolled out for leaders.

Another key achievement was the implementation of a much-improved incident and hazard reporting and tracking tool called Lookin2it in May 2017. The online tool was developed to be simple and easy to use to encourage reporting of issues so that early and effective prevention could be achieved. Significant progress was also made in other key areas of the HSE 2020 Plan and these will be finalised in 2017–18. These include:

- global safety principles that will apply to all CSIRO's operations globally
- wellbeing framework that supports a 'whole person' approach
- simplified procedures and systems that are easy to understand and use.

The development of these is underpinned by two guiding principles:

- Tools and processes to effectively manage key risks are developed with end users (our scientists/technicians/support staff).
- Strong HSE partnerships are developed with other CSIRO support teams and the science businesses.

Environmental performance

CSIRO has adopted government policy to reduce its emissions by five per cent by the end of June 2020 (compared to 1999–2000 levels). This aggressive carbon emission reduction target represents a 20 per cent reduction, measured against business-as-usual projections. Emission reductions will be achieved through six focus areas:

- sustainable buildings
- sustainable laboratories
- low-emission collaboration
- low-emission energy technologies
- sustainable procurement
- site consolidation and greater use of facilities to meet future research and enterprise needs.

Energy consumption (electricity and gas) decreased by one per cent compared with 2015–16. The reduction has been achieved despite the addition of new sites to the CSIRO portfolio related to the integration of NICTA. Electricity consumption fell by five per cent, while gas consumption rose by five per cent compared to the previous year. CSIRO's energy consumption continues to trend downward over the longer term, falling by seven per cent over the last five years (see Figure 3.3).

Other factors that have influenced electricity and gas consumption in the last year include:

- increased use of the Newcastle cogeneration plant, increasing gas consumption and decreasing grid-fed electricity consumption
- building improvement projects, such as early fault detection and remediation (see Sustainable facilities page 87) and other energy efficiency projects.

CSIRO's carbon emissions continued to fall, reducing by five per cent compared to the previous year and 14 per cent over the last five years (see Figure 3.3). Electricity-related emissions fell by six per cent in the last 12 months, partially due to changes in emission factors offsetting an increase of five per cent in gas-related emissions.

Although mains water usage has decreased by four per cent over the last five years, consumption has increased in the last two years, including an increase of five per cent compared to last year. Across the CSIRO portfolio, consumption reductions across a number of sites (e.g. Highett, Clayton, Geelong-AAHL, Pullenvale) have partially offset increases across other sites (e.g. Black Mountain, Hobart, Bribie Island, Floreat, Kensington). CSIRO continues to monitor and investigate the reasons for the additional water consumption.

Air travel has continued to trend down slightly, decreasing by seven per cent on the previous year and six per cent over the last five years. In 2016–17, 44 per cent of air travel was within Australia and 56 per cent internationally. Preliminary calculations indicate that domestic flights generated more carbon emissions than international trips due to factors such as the short to medium haul nature of domestic travel. Air travel contributes less than seven per cent of CSIRO's total carbon footprint.

FIGURE 3.3: CSIRO ENERGY AND WATER CONSUMPTION, AND GREENHOUSE GAS EMISSIONS (ELECTRICITY AND GAS ONLY)

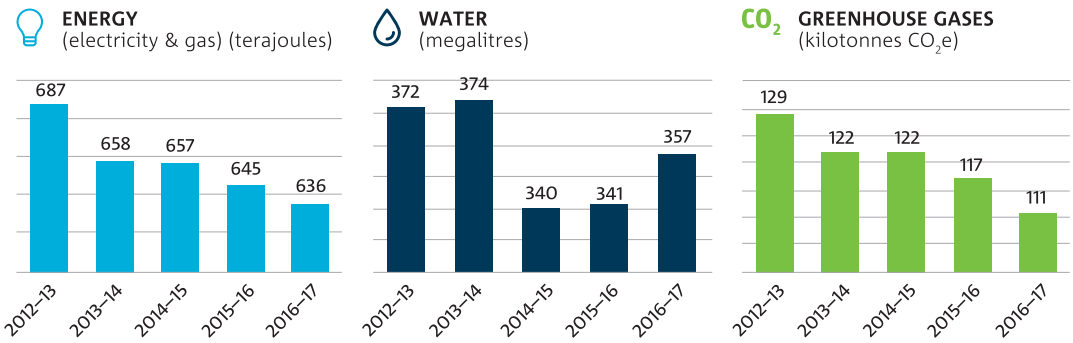


TABLE 3.3: CSIRO ENERGY, AIR TRAVEL AND WATER INTENSITIES

PERFORMANCE MEASURE	INDICATOR(S)	2012–13	2013–14	2014–15	2015–16	2016–17
Energy	Purchased energy (electricity and gas) consumed per employee (GJ/FTE)[35]	119	121	136	131	127
Air travel	Million air kilometres travelled (km)	116	113	100[36]	117	110
	Air travel per employee (km/FTE)	20,214	20,853	18,874	24,187	19,644
Relative mains water use	Amount of total water use per employee (kilolitres/FTE)	65	69	70	72	71

35 GJ/FTE is gigajoules per full-time equivalent (staff). FTE refers to CSIRO Officers as at June 2017.
36 Updated after new June 2015 data was received.

Vehicle fleet

CSIRO added 10 all-electric Nissan Leaf vehicles to its vehicle fleet at seven locations across Australia. A 30 kilowatt (kW) photovoltaic solar array has been installed at CSIRO's Black Mountain site to offset the emissions from the grid-fed electricity used to charge the vehicles.

Electric vehicles contribute to a fuel efficient vehicle fleet, with electric/petrol hybrid vehicles comprising 25 per cent of CSIRO's passenger vehicle fleet and 15 per cent of our total vehicle fleet (excluding farm machinery and other specialist vehicles). We are also consolidating the vehicle fleet by disposing of excess vehicles and trialling alternative modes of transport e.g. Flexicars at CSIRO's Waurn Ponds site in Victoria.

Sustainable facilities

This year, we continued our focus on improving the sustainability of existing buildings through a number of energy efficiency projects, including improvements to building management, sub-metering, lighting and fume cupboard upgrades.

CSIRO participated in an industry trial of Fault Detection and Diagnostic (FDD) tools that enable the early detection and rectification of building plant and control system issues. Deployment of the FDD tool resulted in significant energy and cost savings at the Phytotron building at the Black Mountain Science Innovation Precinct in Canberra. The resultant annual energy saving was 660 Megawatt hours (MWh), 630 tonnes in carbon emissions (tCO_2e) and reduced energy-related costs of $90,000. Savings were confirmed through robust data from extensive sub-metering installed in the building. Sub-metering has proven crucial to validate savings identified in the trial. We commenced a broader sub-metering program in October 2016 that will see installation of more than 500 sub-meters across 10 priority sites.

CSIRO has continued its upgrade to energy-efficient LED lights at several sites, including Pullenvale and Black Mountain, reducing energy savings by 176 MWh and emissions by 167 tonnes CO_2e, while reducing the costs related to energy and maintenance savings by $40,000. The direct energy savings will be confirmed through submeter data after monitoring is complete.

The optimisation of fridges and freezers in CSIRO laboratories has also delivered energy and efficiency savings. Staff at the Kintore Avenue site in Adelaide consolidated and decommissioned a number of laboratory fridges and freezers through a site-wide clean up. Their efforts have saved approximately $60,000 in avoided purchases, $6,000 in ongoing operating costs and 44 MWh in energy consumed per year. This is equivalent to powering nearly seven average Australian homes for a year, representing an annual saving of 25 tCO_2e.

CSIRO also successfully improved the energy efficiency of several older constant air volume laboratory fume cupboards at the Black Mountain site by upgrading the electronic controls, saving over 70 MWh and over 70 tCO_2. Building on the success of the trial, conversion of constant fume cupboards has been investigated at other sites and will form part of future energy efficiency programs.

On-site renewable generation

CSIRO continued to expand its investment in renewable energy with the installation of a 30 kW photovoltaic (PV) system at its Black Mountain site and a new solar façade at its Energy Centre in Newcastle.

The new façade at the Energy Centre consists of 222 thin film solar panels, a leading advancement in solar cell technology. Twenty-four kilowatts of PV was installed, which generates the equivalent energy as consumed by five Australian homes. The façade faces west to allow the peak output of the solar panels to be later in the day and align to the peak air-conditioning requirements of the site.

CSIRO is progressing towards its five megawatt target of on-site renewable energy generation by 2020. To this end, a 300 kW PV system is being installed at the Werribee site in Victoria. This is our first large-scale PV installation in Victoria and complements existing on-grid systems at Black Mountain, Newcastle and Kensington.

The new façade of our Energy Centre generates enough energy to power five Australian homes.

WASTE AND RECYCLING

Improved oversight of waste and recycling practices across our sites under the CSIRO National Waste and Recycling Services Contract highlights the benefits of a nationally coordinated approach to waste and recycling, with the added bonus of a national dataset. We continue to actively manage 30 waste and recycling categories.

CSIRO diverted 10,640 cubic metres (weighing 3,767 tonnes) of waste from landfill, equating to a 40 per cent diversion rate by volume or 69 per cent by weight. Diverting waste from landfill has resulted in avoided emissions of 985 tCO_2-e in the period June 2016 to May 2017. As part of its waste diversion, CSIRO continues its signatory status with FluoroCycle, committing to recycling all lighting containing Mercury on sites where CSIRO has operational control of the facility.

ENVIRONMENTAL MANAGEMENT AND HERITAGE

Heritage management

CSIRO recognises its responsibility to protect and conserve the Commonwealth and national heritage values of the places it owns or controls. We manage these values in accordance with the requirements of the *Environment Protection and Biodiversity Conservation Act 1999*. CSIRO has prepared a Heritage Strategy for CSIRO Land and Buildings 2016–2026[37] that outlines the objectives and responsibilities for the management of heritage values. The strategy has been endorsed by the Australian Heritage Commission.

This year, CSIRO updated the Heritage Management Plans for the CSIRO Yarralumla and Black Mountain sites. These documents will be submitted to the Australian Heritage Council for endorsement in the next few months.

Environmental management

Our ambition to apply the best of science and innovation to realise new benchmarks in sustainable urban development was advanced this year through planning for the future of CSIRO's 701-hectare Ginninderra Field Station. Through real-world application of science and key collaborations, including with a future joint venture partner, we hope to raise the bar across social, economic and environmental outcomes. This year we developed a draft sustainability framework and progressed the selection of joint venture partners. We worked closely with many community volunteers, the Ginninderra Catchment Group and Landcare and Aboriginal groups to restore vegetation in the box gum grassy woodlands, identify and protect Indigenous heritage features and trial methods for restoring threatened grassland communities.

Contribution to ecologically sustainable development

CSIRO upholds the principles of ecologically sustainable development (ESD) outlined in the *Environment Protection and Biodiversity Conservation Act 1999* through its operations and research activities. Table 3.4 provides examples of how we support the principles.

To achieve its research goals, CSIRO operates numerous types of infrastructure, such as laboratories, glasshouses, farm properties and telescope facilities as well as managing plants and livestock. These activities require significant consumption of energy and water and produce waste.

37 The Heritage Strategy, along with a list of CSIRO land and buildings with Commonwealth heritage values can be found at: www.csiro.au/en/About/Strategy-structure/Heritage-management

TABLE 3.4: EXAMPLES OF CSIRO'S CONTRIBUTION TO ESD PRINCIPLES

PRINCIPLES	CSIRO ACTIVITIES
Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations.	One of the CSIRO strategic objectives is to embed a rigorous impact and investment planning, monitoring and evaluation framework into our business and employ it to continually improve performance. CSIRO's Strategy 2020 demands greater emphasis on delivering and providing evidence of triple-bottom-line impact and progress against planned milestones. This is now externally reportable as part of CSIRO's performance framework.
If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	AAHL provides diagnostic, surveillance and response services for the Department of Agriculture and Water Resources (DAWR). It also serves hundreds of customers through its quarantine-testing service. AAHL is an essential step in the emergency response of outbreaks such as white spot disease, and works closely with agencies to test samples, contain disease spread and manage a coordinated response. The national Aquatic Consultative Committee on Emergency Animal Diseases, of which CSIRO is a member, continues to meet regularly in response to the 2017 outbreak.
The principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The Water Information Research and Development Alliance (WIRADA) partnership between CSIRO and the Bureau of Meteorology has developed a set of nationally consistent and regionally relevant water information products and services to support robust decision-making across national, state and local levels. The hydrological models in Australian Water Resources Assessment have been used for numerous applications including the ongoing and nationally significant large resource and impact assessments (Bioregional Assessment and Northern Australia Water Resource Assessment), and floodplain inundation modelling in the Murray-Darling to support Basin Plan implementation. The water forecasting models have been applied to support water quality forecasting for the Great Barrier Reef and river forecasting for environmental watering in northern Victorian catchments. Overseas, the water forecasting methods are being used to support sustainable development projects in South Asia, collaborations with China and Singapore, and experimental forecasting programs in the US.
The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making.	The National Research Collections of Australia (NRCA) hosted by CSIRO are a vital resource for conservation. NRCA's biological collections contain more than 15 million specimens, representing a 240-year time series of data on the occurrence and distribution of native and introduced plants, terrestrial vertebrates, insects, fish, algae and tree seeds. These collections are Australia's most reliable set of nationally representative biological collections. They underpin research in agriculture, biosecurity, biodiversity and climate change and are used by researchers all over the world. The collections enable us to identify, quantify and explore Australia's biodiversity over time, inform public policy decisions, support biosecurity and contribute to environmental management.
Improved valuation, pricing and incentive mechanisms should be promoted.	In partnership with Energy Networks Australia, CSIRO developed the Electricity Network Transformation Roadmap to help Australia transition its electricity network to a future grid that is energy secure, affordable and with significant reductions in emissions. CSIRO provided briefings and responded to a number of direct information requests from Chief Scientist Alan Finkel, who headed the Independent Review into the Future Security of the National Electricity Market. The Review final report's emphasis on demand management utilising customer distributed energy resources can, at least in part, be attributed to the Roadmap.

Our people

To become Australia's innovation catalyst, we must create a culture and environment that encourages our people to work collaboratively and creatively to deliver a positive impact for Australia and the world.

During 2016–17, we have developed our staff and leaders as outlined in our People Strategy. The four focus areas of the strategy are:

Empower

Our leaders and staff are empowered to deliver our strategy.

Mobility and agility

Our people are motivated and able to mobilise swiftly to deliver impact. CSIRO is looking to grow its mobility and collaboration with customers and partners to create an organisation-wide secondment program.

Talent

We actively attract and develop innovative capability to meet the needs of our customers. CSIRO is looking at its talent pipeline and focusing efforts on its student population and early-career staff.

Diversity and inclusion

Our diverse and inclusive teams drive innovation and deliver for our customers.

Our Human Resources and Organisation Development and Change teams provide leadership on matters relating to our people, offer guidance and ensure compliance with the *Equal Employment Opportunity (Commonwealth Authorities) Act 1987*. We build a culture and climate that supports existing and future strategic priorities and delivers on our unique purpose. To achieve this aspiration we will:

- develop our leaders to deliver transformational change by entrusting, engaging and using CSIRO's highly capable, diverse and willing talent
- develop our people to deliver CSIRO's vision, mission and strategy, by supporting their participation in purpose-built events, forums, programs and initiatives
- empower our people by integrating change management and developing agile systems, processes and management practices
- leverage and empower the willingness, dedication and capability of our people and teams by helping them see their place in CSIRO; their contribution to the organisation and support of our nation
- increase our contribution to the mobility and exchange of people and know-how between research, industry and government
- increase our engagement in education and training from school age to PhD level.

ENTERPRISE AGREEMENTS

Enterprise agreements set the terms and conditions of employment for CSIRO staff. Two enterprise agreements are in operation: the *CSIRO Enterprise Agreement 2011–14* and the *CDSCC Enterprise Agreement 2014–2017*.

Negotiations for the new CSIRO Enterprise Agreement have progressed. Following a ballot of eligible staff, CSIRO announced on 23 June 2017 that the majority of staff participating in the ballot had approved the proposed agreement. The proposed agreement was lodged with the Fair Work Commission for approval on 29 June 2017.

The CDSCC Enterprise Agreement reached its nominal expiry date on 18 June 2017. Negotiations to replace the agreement are ongoing within the parameters established by the Australian Government Workplace Bargaining Policy 2015, which applies to the Australian Public Service (APS) and non-APS Australian Government agencies, including CSIRO.

New Enterprise Agreement approved by the majority of CSIRO staff.

LEARNING AND DEVELOPMENT

During 2016–17, CSIRO again delivered strong growth in the learning and development opportunities offered, providing 6,498 development days; an increase from the 4,681 days[38] delivered in 2015–16.

A number of new programs were launched in support of Strategy 2020 and the Culture and Morale Building Plan 2016. Programs include Launch and Pitch Camps in collaboration with ON, Intensive Development Centres for aspiring and experienced leaders, Career Development Centres for all staff and increased frequency and participation in CSIRO's Australia's Innovation Catalyst program (our premier future leaders program). In addition, CSIRO launched an Executive 360 Feedback and Coaching Program targeting the Executive Team and CSIRO Leadership Team. These new offerings complement CSIRO's core curriculum of over 47 programs.

In line with global workplace learning trends, CSIRO is increasingly using feedback instruments, computer-based simulations, team-based experiential challenges, facilitated development conversations and new platforms to support online learning and learning communities. This year, CSIRO introduced the first of the Leader's Webinar Series, including Building Trust, Regrouping and Establishing New Team Norms, and Creating Shared Purpose. More than 150 of our leaders participated in the series. We continually add to and refresh the library of eLearning modules available to improve induction of new staff and to augment key initiatives, for example Starting with your Safety and the Code of Conduct.

All programs are monitored to ensure they achieve good value for investment and meet expectations. Where ratings are not achieved, programs are either redesigned or stopped.

DIVERSITY AND INCLUSION

The CSIRO Strategy and the People Strategy clearly articulate our commitment to realising the innovation benefits that derive from an inclusive workforce diverse in its background, thinking and experiences. CSIRO has had a multi-year focus on diversity and inclusion in its broadest forms, with a targeted focus on gender, cultural diversity and Indigenous Australians.

Diversity and inclusion initiatives this year had a strong emphasis on opportunities for women to progress to senior science roles. To this end, CSIRO is participating in two key government-funded, National Innovation Statement initiatives: the SAGE program, initiated by the Australian Academy of Science, and Male Champions of Change STEM.

SAGE is a program of activities designed to improve gender equity and diversity in science, technology, engineering, mathematics and medicine (STEMM) via the pilot of the Athena Swan Charter in Australia. The Charter is an evaluation and accreditation framework from the UK that addresses gender equity policies and practices in STEM.

Athena Swan Awards offer Bronze, Silver and Gold levels in recognition of institutional capacity to eliminate gender inequity and a demonstrated commitment to bolster the employment, promotion and retention of women.

CSIRO's submission for a Bronze Award demonstrates our solid foundation for eliminating gender bias, developing an inclusive culture that values all staff and our commitment to creating opportunities for women to progress to senior science roles.

Highlights of 2016–17 include:

- announcing the Balance flexible workplace initiative that will commence on 1 July 2017, supported by a project team with senior business unit representation to lead its development and implementation
- establishing a SAGE Self-Assessment Team to lead the initiative and complete CSIRO's submission for the Athena Swan Bronze Award
- increased leader engagement through the SAGE program, roadshows and focus groups
- development of diversity and inclusion committees to support the establishment of Diversity and Inclusion Plans
- delivery of training to eliminate unconscious bias
- integration of diversity and inclusion content into CSIRO leadership development curriculum
- development of the Lesbian, Gay, Bisexual, Transgender and Intersex (LGBTI) Network Strategy to provide support and social networking for people who identify in these groups
- establishing the LGBTI Ally Network.

38 These figures exclude all ON program development days, including Accelerate, Lean Launch Pad and ONPrime.

Since 1994, departments and agencies have reported on their performance as policy adviser, purchaser, employer, regulator and provider under the Commonwealth Disability Strategy. In 2007–08, reporting on the employer role was transferred to the Australian Public Service Commission's State of the Service report and the APS Statistical Bulletin. These reports are available at: www.apsc.gov.au. From 2010–11, departments and agencies are no longer required to report on these functions.

The Commonwealth Disability Strategy has been overtaken by the National Disability Strategy 2010–2020, which sets out a 10-year national policy framework to improve the lives of people with disability, promote participation and create a more inclusive society. A high-level two-yearly report will track progress against each of the six outcome areas of the Strategy and present a picture of how people with disability are faring. The first of these reports is available at: www.dss.gov.au/our-responsibilities/disability-and-carers/program-services/government-international/national-disability-strategy#05.

The percentage of CSIRO staff who recorded a disability as at 30 June 2017 was four per cent.

INDIGENOUS ENGAGEMENT STRATEGY

CSIRO believes that Aboriginal and Torres Strait Islander peoples have made and will continue to make extraordinary contributions to Australia across cultural, economic and scientific domains. Furthermore, we recognise the social and economic disadvantage experienced by Aboriginal and Torres Strait Islander peoples and is committed to overcoming the gap between Aboriginal and Torres Strait Islander peoples and non-Indigenous Australians.

CSIRO initiated its Indigenous Engagement Strategy in July 2007. The Strategy aims to achieve greater participation by Aboriginal and Torres Strait Islander people in our research and development agenda and activities, and to improve outcomes for Aboriginal and Torres Strait Islander people. Building on that strategy, CSIRO launched its Reconciliation Action Plan in late 2016. The plan outlines activities and deliverables aimed at closing that gap.

We are reviewing and revising CSIRO's cultural awareness program and the Aboriginal and Torres Strait Islander Employment Strategy. This strategy provides activities aimed at the recruitment, development, promotion and retention of Aboriginal and Torres Strait Islander staff. As at 30 June 2017, 104 (1.9 per cent) of our employees identify as Aboriginal or Torres Strait Islander, an increase from 22 (0.3 per cent) at 30 June 2011. Of these, 19 are cadets, 21 are trainees and 64 are research, technical and administrative services staff.

We engage and partner with Aboriginal and Torres Strait Islander people across a range of areas, such as marine and environmental science, human resources, property services, astronomy and space science, information management and technology, mining, horticulture and aquaculture. In this way, Aboriginal and Torres Strait Islander people are contributing to research affecting the productivity and sustainability of Australian industry. CSIRO also has Aboriginal and Torres Strait Islander people represented on various advisory committees such as the Indigenous Strategic Advisory Council and the Indigenous STEM Education Project Steering Committee.

Research engagement has continued to develop with Aboriginal and Torres Strait Islander people. This includes the partnerships led by Land and Water, Oceans and Atmosphere, Health and Biosecurity, Astronomy and Space Science and Education Services. CSIRO works towards meeting the Australian Government's target of three per cent of all purchases made from Aboriginal and Torres Strait Islander–owned businesses.

In partnership with the BHP Billiton Foundation, CSIRO is implementing a five-year, $28.8 million education project aimed at increasing the participation and achievement of Aboriginal and Torres Strait Islander students in STEM. For further information on this program please see page 42.

Aboriginal and Torres Strait Islander people are contributing to research affecting the productivity and sustainability of Australian industry.

STAFF DEMOGRAPHICS

Our people are employed under section 32 of the SIR Act. At 30 June 2017, CSIRO had a total of 5,565 staff (FTE of 4,990). Table 3.5 shows the number of staff employed in different functional areas.

On 1 July 2014, CSIRO implemented a new operating model. Under this model, a broader range of leadership appointments were classified as Research Managers (RM). This led to an increase in the level of staff reported in the RM classification from this date. In 2016–17, the integration of Data61 led to the classification of a number of staff in General Management and a resulting increase in staff reported in that functional area.

Overall, the number of staff increased by 3.7 per cent (198) over the last year. Research science staff increased by 0.5 per cent (seven). Voluntary staff turnover remained low at 4.8 per cent. The proportion of female staff remained constant at 40 per cent and the proportion of female research science staff increased by one per cent to 27 per cent.

TABLE 3.5: STAFF NUMBERS (HEADCOUNT)

FUNCTIONAL AREA	2012–13	2013–14	2014–15	2015–16	2016–17	% FEMALE IN 2016–17
Research scientists	1,858	1,798	1,520	1,466	1,473	27
Research project staff	2,149	1,874	1,669	1,752	1,803	41
Senior specialists	25	17	21	20	21	43
Research management	177	181	254	248	246	19
Research consulting	47	47	40	54	58	22
Technical services	623	569	537	586	621	16
Communication and Information Services	369	326	201	203	237	78
General services	38	34	16	23	20	55
Administrative support[39]	1,068	980	908	909	942	75
General management	123	138	103	106	144	40
Total headcount	**6,477**	**5,964**	**5,269**	**5,367**	**5,565**	**40**
FTE	**5,751**	**5,423**	**4,836**	**4,864**	**4,990**	**38**

39 Administrative Support: staff who provide science-based administrative and management services and systems.

Awards and honours

Outstanding performance in research is recognised by various international and national award schemes. These selected examples of awards and honours granted in 2016–17 demonstrate our effectiveness in research and the calibre of our people.

ORDER OF AUSTRALIA

The Order of Australia is the principal and most prestigious means of recognising outstanding members of the community at a national level. In 2017, seven CSIRO affiliates and former staff were recognised.

Companion of the Order (AC)

Professor Andrew Bruce Homes (CSIRO Fellow Emeritus), for eminent service to science through developments in the field of organic and polymer chemistry as a researcher, editor and academic and through the governance of nationally recognised, leading scientific organisations.

Officer of the Order (AO)

Mr David Ingle Thodey (CSIRO Chairman), for distinguished service to business, notably to the telecommunications and information technology sectors, to the promotion of ethical leadership and workplace diversity, and to basketball.

Dr Gregory Arthur Constable (CSIRO Fellow), for distinguished service to agricultural science as an agronomist and plant breeder, particularly to cotton management and production, and to professional national and international scientific organisations.

Mr Brian Francis Watson (former CSIRO Director), for distinguished service to business and finance through leadership roles in the investment and venture capital sectors, as a philanthropist and as a supporter of social welfare and medical research organisations.

Member in the General Division of the Order (AM)

Dr Hugh Dove (former CSIRO Chief Research Scientist), for significant service to agricultural science as a researcher and editor, and to the study of animal nutrition.

The late Dr Owen Bruce Slee (former Honorary Research Associate), for significant service to science, particularly in the field of radio astronomy, as a researcher, author and mentor of young scientists.

Medal of the Order (OAM)

Dr Ronal Woods (former CSIRO Chief Research Scientist), for service to science, particularly in the field of electrochemistry.

AUSTRALIAN ACADEMY OF SCIENCE FELLOWSHIP

The Australian Academy of Science is an organisation of Australia's top research scientists. In 2017, three CSIRO staff members were elevated to Fellow for their outstanding contributions to science and research.

Dr Anita Hill was elected Fellow for major contributions in materials and process engineering. Her focus on measurement has provided an understanding of the controlling factors involved in selective small molecule transport. Her data has been pivotal to the development of theory and design rules for membrane performance.

Dr Evans Lagudah was elected Fellow for making outstanding contributions to international agriculture by providing the first insights into the quantitative wheat rust disease resistance trait, Adult Plant Resistance. He has made critical contributions to durable rust resistance, a trait vital for world food security.

Dr John Volkman was elected Fellow for his important contributions to the discovery and application of lipid biomarkers. His work on novel microalgal lipids in sediments has greatly enhanced our understanding of the evolution of lipid biosynthetic pathways, and underpinned numerous biomarker applications in petroleum fingerprinting, environmental effects of aquaculture and palaeo-environmental reconstruction.

AUSTRALIAN ACADEMY OF SCIENCE HANNAN MEDAL

The Australian Academy of Science Hannan Medal recognises outstanding research in fields of statistical science, pure mathematics, applied mathematics and computational mathematics.

Dr Frank de Hoog was awarded the medal for his highly original and insightful contributions to the advancement of applied, computational and industrial mathematics. His theoretical and applied contributions, and their flow-on to the advancement of science and to improving the efficiency of industrial processes, have been exceptional in their implementation by industry and the subsequent contributions to Australia's export economy.

AUSTRALIAN ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING FELLOWSHIP

Academy Fellows are drawn from the areas of applied physical science and technology, applied biological science and technology, engineering and management, and development and leadership. Three CSIRO staff members were elevated to Fellow.

Dr Larry Marshall was recognised for translating science and technology to products and value over more than 25 years of commercialising inventions into successful products. As Chief Executive of CSIRO, he positioned the organisation as an innovation catalyst and provided influential input to the government's National Innovation and Science Agenda.

Dr Cecile Paris was recognised for translating deep knowledge in computer science to solving real-life problems in the social sciences, developing an understanding of how people communicate, how they interact within information environments to make sense of big data.

Dr Alex Wonhas was recognised for high-impact achievements including the development of a widely used reference carbon abatement cost curve; a blueprint for legislation on coal seam gas developments and the formation of a number of successful spin-off companies.

AUSTRALIAN MUSEUM EUREKA PRIZES

The Eureka Prize rewards excellence in the fields of scientific research and innovation, science leadership, school science and science journalism and communication.

The Marine Debris Team won the New South Wales Office of Environment and Heritage Eureka Prize for Environmental Research. The team applied inter-disciplinary research towards understanding the sources and distribution of marine debris. They were able to translate scientific information into effective policy and behavioural change.

Dr Lisa Harvey-Smith, CSIRO Astronomy and Space Science, won the Department of Industry and Science Eureka Prize for Promoting Understanding of Australian Science Research and bringing astronomy and its real-world impacts to life, particularly for girls and Indigenous Australians.

PUBLIC SECTOR INNOVATION AWARDS

The Public Sector Innovation Awards recognise, celebrate and share innovative approaches to public administration in the Commonwealth and ACT governments.

'ON, powered by CSIRO' won the 2017 award within the Culture and Practice category, as the only national accelerator custom designed for publicly funded research teams, helping them to develop the entrepreneurial skills and capacity to convert great science and technology research into real-world outcomes at pace.

CSIRO staff have achieved outstanding performance in research as recognised by various international and national awards.

CSIRO CHAIRMAN'S MEDAL

The CSIRO Chairman's Medal honours the very best in CSIRO research. It is awarded to the scientist or team whose research is of national or international importance in advancing scientific knowledge, technology application or commercialisation.

The Kebari™ Barley team was awarded the 2016 CSIRO Chairman's Medal for the development and commercialisation of Kebari™ Barley. The team developed the world's first and only gluten–free barley, which enabled the release of the first gluten-free beer in Germany.

Team members: Dr Crispin Howitt, Dr Greg Tanner, Mr Malcolm Blundell, Dr Michelle Colgrave, Dr Philip Larkin, Ms Katrina Spencer, Mr Lionel Henderson, Ms Kit Chow, Dr Robert de Feyter, Mr Hareshwar Goswami, Ms Keren Byrne and Mr Russell Heywood.

CSIRO MEDAL FOR LIFETIME ACHIEVEMENT

The CSIRO Medal for Lifetime Achievement is awarded to individuals who have a record of sustained and meritorious achievement over a prolonged period of CSIRO service.

Dr Ivan Cole was awarded the medal for the development and leadership of research teams, programs and Business Units that have transformed CSIRO science, leading to a lasting impact on international scientific and business communities.

The Kebari™ Barley team – our 2016 CSIRO Chairman's Medal winner.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The American Association for the Advancement of Science is an international not-for-profit organisation dedicated to advancing science and is the largest multi-disciplinary scientific society and leading publisher of cutting-edge research.

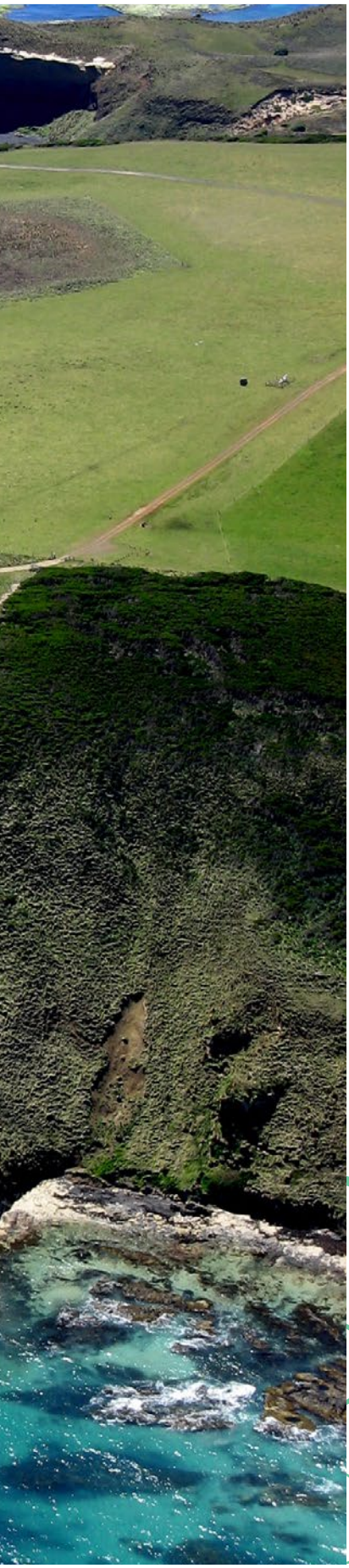
Sarah Mathews was elected as a Fellow of the association in October 2016 in recognition of her contributions to innovation, education and scientific leadership in the biological sciences.

USA NATIONAL COTTON COUNCIL BELTWIDE AWARD

Dr Mike Bange was awarded the Physiologist of the Year Award at the 2017 Beltwide Cotton Conference in Dallas, Texas, for his contributions to research in cotton physiology over 20 years. He is the youngest and second only Australian to receive the award.

From L to R: Dr James Mahan (US Department of Agriculture) previous recipient, Michael Bange and Sr Tyson Raper Chair of the Agronomy, Physiology and Soil Beltwide Conference.

Data from the Cape Grim Air Pollution Baseline Station has been used to create the most comprehensive collection of greenhouse gas data. Led by researchers from CSIRO's Climate Science Centre and the University of Melbourne, the records track the past and current changes in all 43 greenhouse gases that contribute to human-induced climate change.



Part 4
Financial statements

INDEPENDENT AUDITOR'S REPORT

To the Minister for Industry, Innovation and Science

Opinion

In my opinion, the financial statements of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity for the year ended 30 June 2017:

(a) comply with Australian Accounting Standards – Reduced Disclosure Requirements and the *Public Governance, Performance and Accountability (Financial Reporting) Rule 2015*; and

(b) present fairly the financial positions of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity as at 30 June 2017 and their financial performance and cash flows for the year then ended.

The financial statements of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity, which I have audited, comprise the following statements as at 30 June 2017 and for the year then ended:

- Statement by the Chairman of the Board, Chief Executive, and Chief Finance Officer;
- Statements of Comprehensive Income;
- Statements of Financial Position;
- Statements of Changes in Equity;
- Cash Flow Statements; and
- Notes to the financial statements comprising a summary of significant accounting policies and other explanatory information.

The consolidated entity comprises the Commonwealth Scientific and Industrial Research Organisation and its subsidiaries.

Basis for Opinion

I conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. My responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of my report. I am independent of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity in accordance with the relevant ethical requirements for financial statement audits conducted by the Auditor-General and his delegates. These include the relevant independence requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants* to the extent that they are not in conflict with the *Auditor-General Act 1997* (the Code). I have also fulfilled my other responsibilities in accordance with the Code. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Accountable Authority's Responsibility for the Financial Statements

As the Accountable Authority of the Commonwealth Scientific and Industrial Research Organisation the Board is responsible under the *Public Governance, Performance and Accountability Act 2013* for the preparation and fair presentation of annual financial statements that comply with Australian Accounting Standards – Reduced Disclosure Requirements and the rules made under that Act. The Board is also responsible for such internal control as the Board determines is necessary to enable the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, the Board is responsible for assessing the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity's ability to continue as a going concern, taking into account whether the entities' operations will cease as a result of an administrative restructure or for any other reason. The Board is also responsible for disclosing matters related to going concern as applicable and using the going concern basis of accounting unless the assessment indicates that it is not appropriate.

GPO Box 707 CANBERRA ACT 2601
19 National Circuit BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

Auditor's Responsibilities for the Audit of the Financial Statements

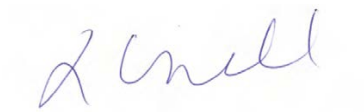
My objective is to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian National Audit Office Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements.

As part of an audit in accordance with the Australian National Audit Office Auditing Standards, I exercise professional judgement and maintain professional scepticism throughout the audit. I also:

- identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Commonwealth Scientific and Industrial Research Organisation and the consolidated entity's internal control;
- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Accountable Authority;
- conclude on the appropriateness of the Accountable Authority's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Commonwealth Scientific and Industrial Research Organisation or the consolidated entity's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my auditor's report. However, future events or conditions may cause the Commonwealth Scientific and Industrial Research Organisation or the consolidated entity's to cease to continue as a going concern;
- evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation; and
- obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the consolidated entity to express an opinion on the financial report. I am responsible for the direction, supervision and performance of the consolidated entity audit. I remain solely responsible for my audit opinion.

I communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

Australian National Audit Office



Lesa Craswell
Acting Executive Director

Delegate of the Auditor-General

Canberra
31 August 2017

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
Financial Statements

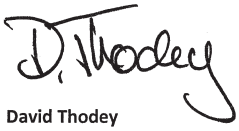
for the period ended 30 June 2017

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION
STATEMENT BY THE CHAIRMAN OF THE BOARD, CHIEF EXECUTIVE AND CHIEF FINANCE OFFICER

In our opinion, the attached financial statements for the year ended 30 June 2017 comply with subsection 42(2) of the Public Governance, Performance and Accountability Act 2013 (PGPA Act), and are based on properly maintained financial records as per subsection 41(2) of the PGPA Act.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and its subsidiaries will be able to pay their debts as and when they fall due.

This statement is made in accordance with a resolution of the directors.



David Thodey
Chairman of the Board
31 August 2017

Larry Marshall
Chief Executive and Board Member
31 August 2017

Tom Munyard
Chief Finance Officer
31 August 2017

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF COMPREHENSIVE INCOME
For the period ended 30 June 2017

		Consolidated		CSIRO	
		2017	2016	**2017**	2016
	Notes	**$'000**	$'000	**$'000**	$'000
NET COST OF SERVICES					
Expenses					
Employee benefits	1.1A	**693,211**	730,863	**689,208**	689,293
Suppliers	1.1B	**429,404**	438,848	**422,272**	403,278
Depreciation and amortisation	2.2A	**172,166**	168,878	**172,027**	168,431
Finance leases		**2,332**	2,201	**2,321**	2,178
Write-down and impairment of assets	1.1C	**1,890**	4,083	**1,795**	4,083
Foreign exchange losses - non-speculative		**1,578**	-	**1,519**	-
Losses from asset sales		**2,929**	3,352	**2,929**	3,362
Total expenses		**1,303,510**	1,348,225	**1,292,071**	1,270,625
Own-Source Income					
Own-source revenue					
Sale of goods and rendering of services	1.2	**367,532**	420,607	**379,045**	369,214
Interest - bank and term deposits	1.2	**8,752**	9,296	**6,264**	6,457
Rental income	1.2	**12,207**	9,409	**12,207**	8,129
Royalties and licence fees	1.2	**51,107**	59,832	**51,107**	59,749
Other revenues	1.2	**61,911**	29,480	**32,731**	18,970
Sale of equity investments and intellectual property	1.2	**8,258**	**-**	**1,750**	**-**
Total own-source revenue		**509,767**	528,624	**483,104**	462,519
Gains					
Foreign exchange gains - non-speculative	1.2	**-**	293	-	267
Gain on revaluation of investment properties	1.2	**888**	929	**888**	929
Total gains		**888**	1,222	**888**	1,196
Total own-source income		**510,655**	529,846	**483,992**	463,715
Net cost of services		**(792,855)**	(818,379)	**(808,079)**	(806,910)
Revenue from Government	1.2	**787,267**	750,281	**787,267**	750,281
Share of net operating surplus/(deficit) of joint venture accounted for using equity method		**-**	(10)	**-**	(10)
Surplus on continuing operation		**787,267**	**750,271**	**787,267**	**750,271**
Surplus/(Deficit)		**(5,588)**	(68,108)	**(20,812)**	(56,639)
OTHER COMPREHENSIVE INCOME					
Items not subject to subsequent reclassification to net cost of services					
Increase/(decrease) in asset revaluation reserves	1.3A	**-**	(1,848)	**-**	(7,664)
Items subject to subsequent reclassification to net cost of services					
Increase/(decrease) in other reserves	1.3B	**7,080**	(959)	**2,048**	(915)
Total other comprehensive income		**7,080**	(2,807)	**2,048**	(8,579)
Total comprehensive income/(loss)		**1,492**	(70,915)	**(18,764)**	(65,218)

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF FINANCIAL POSITION
as at 30 June 2017

		Consolidated		CSIRO	
		2017	2016	**2017**	2016
	Notes	**$'000**	$'000	**$'000**	$'000
ASSETS					
Financial Assets					
Cash and cash equivalents		**299,867**	302,096	**151,071**	176,827
Trade and other receivables	2.1A	**82,947**	57,859	**76,613**	51,723
Other investments	2.1B	**36,212**	21,386	**69,821**	49,446
Total financial assets		**419,026**	381,341	**297,505**	277,996
Non-Financial Assets					
Land and buildings	2.2A	**1,575,886**	1,605,336	**1,575,886**	1,601,668
Plant and equipment	2.2A	**572,400**	580,878	**572,015**	575,475
Heritage and cultural	2.2A	**4,206**	4,206	**4,206**	4,206
Intangibles	2.2A	**19,780**	20,687	**19,780**	20,680
Investment properties	2.2B	**51,110**	50,222	**51,110**	50,222
Inventories		**1,474**	1,334	**1,474**	1,334
Other non-financial assets	2.2C	**41,337**	45,868	**41,399**	45,848
Total non-financial assets		**2,266,193**	2,308,531	**2,265,870**	2,299,433
Properties held for sale		**5,200**	5,200	**5,200**	5,200
Total assets		**2,690,419**	2,695,072	**2,568,575**	2,582,629
LIABILITIES					
Payables					
Suppliers	2.3A	**73,590**	62,176	**70,661**	60,135
Other payables	2.3B	**129,243**	127,820	**124,809**	122,224
Total payables		**202,833**	189,996	**195,470**	182,359
Interest Bearing Liabilities					
Leases	2.4A	**37,755**	42,022	**37,755**	42,022
Deposits	2.4B	**5,178**	5,798	**8,345**	6,848
Total Interest bearing liabilities		**42,933**	47,820	**46,100**	48,870
Provisions					
Employee provisions	3.1A	**217,164**	238,734	**217,078**	231,671
Provision for remediation		**28,665**	29,703	**28,665**	29,703
Total provisions		**245,829**	268,437	**245,743**	261,374
Total liabilities		**491,595**	506,253	**487,313**	492,603
Net assets		**2,198,824**	2,188,819	**2,081,262**	2,090,026
EQUITY					
Contributed equity		**280,954**	270,954	**280,646**	270,646
Asset revaluation reserves		**1,381,732**	1,387,548	**1,381,732**	1,381,732
Other reserves		**5,376**	(1,704)	**365**	(1,683)
Retained surplus		**530,762**	532,021	**418,519**	439,331
Total equity		**2,198,824**	2,188,819	**2,081,262**	2,090,026

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF CHANGES IN EQUITY – CONSOLIDATED
For the period ended 30 June 2017

	Retained earnings		Asset revaluation reserve		Other reserves		Contributed equity/capital		Total equity	
	2017	2016	**2017**	2016	**2017**	2016	**2017**	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000	**$'000**	$'000
Opening balance	**532,021**	578,333	**1,387,548**	1,389,396	**(1,704)**	(745)	**270,954**	270,954	**2,188,819**	2,237,938
Comprehensive income										
Other comprehensive income[1]	**-**	-	**-**	(1,848)	**7,080**	(959)	**-**	-	**7,080**	(2,807)
Surplus/(deficit) for the period	**(5,588)**	(68,108)	**-**	-	**-**	-	**-**	-	**(5,588)**	(68,108)
Total comprehensive income	**(5,588)**	(68,108)	**-**	(1,848)	**7,080**	(959)	**-**	-	**1,492**	(70,915)
Other Movements[2]	**4,329**	21,796	**(5,816)**		**-**				**(1,487)**	21,796
Contributions by owners										
Equity injection	**-**	-	**-**	-	**-**	-	**10,000**	-	**10,000**	-
Contributions by owners – other	**-**	-	**-**	-	**-**	-		-	**-**	-
Closing balance	**530,762**	532,021	**1,381,732**	1,387,548	**5,376**	(1,704)	**280,954**	270,954	**2,198,824**	2,188,819

The above Statement should be read in conjunction with the accompanying notes.

1. Refer to Note 1.3.
2. Other movements relates to the NICTA asset revaluation reserves being written back to retained earnings following disposal of their assets (which were transferred to CSIRO).

Accounting Policy

Equity Injections

Amounts that are designated as equity injections for a year are recognised directly in contributed equity in that year.

CONSOLIDATED FINANCIAL STATEMENTS
STATEMENT OF CHANGES IN EQUITY – CSIRO
For the period ended 30 June 2017

	Retained earnings		Asset revaluation reserve		Other reserves		Contributed equity/capital		Total equity	
	2017 $'000	2016 $'000	**2017 $'000**	2016 $'000	**2017 $'000**	2016 $'000	**2017 $'000**	2016 $'000	**2017 $'000**	2016 $'000
Opening balance	**439,331**	495,970	**1,381,732**	1,389,396	**(1,683)**	(768)	**270,646**	270,646	**2,090,026**	2,155,244
Comprehensive income										
Other comprehensive income[1]		-	**-**	(7,664)	**2,048**	(915)	**-**	-	**2,048**	(8,579)
Surplus/(deficit) for the period	**(20,812)**	(56,639)	**-**	-	**-**	-	**-**	-	**(20,812)**	(56,639)
Total comprehensive income	**(20,812)**	(56,639)	**-**	(7,664)	**2,048**	(915)	**-**	-	**(18,764)**	(65,218)
Contributions by owners										
Equity injection	**-**	-	**-**	-	**-**	-	**10,000**	-	**10,000**	-
Contributions by owners – other	**-**	-	**-**	-		-	**-**	-	**-**	-
Closing balance	**418,519**	439,331	**1,381,732**	1,381,732	**365**	(1,683)	**280,646**	270,646	**2,081,262**	2,090,026

The above Statement should be read in conjunction with the accompanying notes.

1. Refer to Note 1.3.

CONSOLIDATED FINANCIAL STATEMENTS
CASH FLOW STATEMENT
For the period ended 30 June 2017

		Consolidated		CSIRO	
		2017	2016	**2017**	2016
	Notes	**$'000**	$'000	**$'000**	$'000
OPERATING ACTIVITIES					
Cash received					
Receipts from Government		**787,267**	750,281	**787,267**	750,281
Sale of goods and rendering of services		**505,742**	569,472	**488,180**	502,667
Interest		**8,952**	10,172	**6,453**	7,036
Net GST received		**19,728**	30,603	**17,523**	29,273
Deposits		**-**	-	**1,530**	-
Total cash received		**1,321,689**	1,360,528	**1,300,953**	1,289,257
Cash used					
Employees		**712,103**	717,786	**701,014**	677,383
Suppliers		**481,396**	526,043	**479,965**	477,987
Finance costs		**2,332**	2,201	**2,321**	2,178
Deposits		**587**	78	**-**	78
Total cash used		**1,196,418**	1,246,108	**1,183,300**	1,157,626
Net cash from operating activities		**125,271**	114,420	**117,653**	131,631
INVESTING ACTIVITIES					
Cash received					
Proceeds from sales of property, plant and equipment		**3,298**	464	**3,178**	463
Proceeds from sales of equity investments and intellectual property		**6,508**	-	**-**	-
Total cash received		**9,806**	464	**3,178**	463
Cash used					
Purchase of property, plant and equipment		**139,692**	102,839	**138,973**	100,004
Equity investments		**3,288**	848	**13,288**	30,848
Other selling costs		**59**	43	**59**	43
Total cash used		**143,039**	103,730	**152,320**	130,895
Net cash used in investing activities		**(133,233)**	(103,266)	**(149,142)**	(130,432)
FINANCING ACTIVITIES					
Cash received					
Contributed equity		**10,000**	-	**10,000**	-
Total cash received		**10,000**	-	**10,000**	-
Cash used					
Finance leases		**4,267**	6,703	**4,267**	6,703
Total cash used		**4,267**	6,703	**4,267**	6,703
Net cash from financing activities		**5,733**	(6,703)	**5,733**	(6,703)
Net increase (decrease) in cash held		**(2,229)**	4,451	**(25,756)**	(5,504)
Cash and cash equivalents at the beginning of the reporting period		**302,096**	267,129	**176,827**	182,331
Transition of opening balance of NICTA cash and cash equivalents		**-**	30,516	**-**	-
Cash and cash equivalents at the end of the reporting period		**299,867**	302,096	**151,071**	176,827

The above Statement should be read in conjunction with the accompanying notes.

CONSOLIDATED FINANCIAL STATEMENTS
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Overview

Objectives of the CSIRO and its Subsidiaries (the Group)

CSIRO is an Australian Government controlled not-for-profit entity and is classified as a Corporate Commonwealth entity under the *Public Governance, Performance and Accountability Act 2013*. CSIRO is a research enterprise that aims to deliver great science and innovative solutions for industry, society and the environment.

CSIRO is structured to meet the following outcome:

> Innovative scientific and technology solutions to national challenges and opportunities to benefit industry, the environment and the community, through scientific research and capability development, services and advice.

The continued existence of CSIRO in its present form and with its present programs is dependent on Government policy and on continued funding by Parliament for CSIRO's administration and programs.

The Basis of Preparation

The financial statements are required by section 42 of the *Public Governance, Performance and Accountability Act 2013* and are general purpose financial statements.

CSIRO and the Group's Consolidated Financial Statements have been prepared in accordance with:

- Financial Reporting Rule (FRR) for reporting periods ending on or after 1 July 2015; and
- Australian Accounting Standards and Interpretations – Reduced Disclosure Requirements issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period

The financial statements have been prepared on an accrual basis and in accordance with the historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

The financial statements are presented in Australian dollars and values are rounded to the nearest thousand dollars unless otherwise specified.

Key Judgements and Estimates

In the process of applying the Group's accounting policies, management has made a number of judgements and applied estimates and assumptions to future events. Information around judgements and estimates which are material to the financial statements are found in the following notes:

- Note 3.1 Employee Provisions
- Note 4.3 Fair Value Measurements

CSIRO has a provision (raised under other provisions) for remediation costs required at a remote CSIRO location, based on estimates provided by internal and external qualified experts. The provision is predominantly based on externally provided costings, with additional amounts derived from comparable remediation works. The provision is based on the scope of work as it currently stands as at 30 June 2017. As the remediation process progresses, the scope and costs may be subject to change. The work is expected to take several years to reach completion.

Consolidation

The consolidated financial statements comprise the financial statements of the CSIRO and its subsidiaries (referred to as 'the Group'). CSIRO has thirteen subsidiaries, including WLAN Services Pty Ltd (WLAN), the Science and Industry Endowment Fund (SIEF), the CSIRO Chile Research Fundación (Fundación), National ICT Australia (NICTA), the Innovation Fund (seven entities) and the US Office (2 entities). Refer to Note 3.6 for further information.

The consolidated financial statements incorporate the assets and liabilities of all entities controlled by CSIRO as at 30 June and the results of the controlled entities for the year then ended. Subsidiaries are consolidated from the date on which control is obtained through to the date on which control ceases. The Group applies consistent accounting policies and the effects of all transactions and balances between the entities are eliminated in full.

Foreign Currency Translation

The functional currency of CSIRO and its Australian subsidiaries is Australian dollars. The Group has three overseas subsidiary entities, the Fundación and the US Office entities. On consolidation, those entity's:

- Assets and liabilities are translated into Australian dollars at the rate of exchange prevailing at the reporting date; and
- The statement of comprehensive income is translated at average exchange rate.

The exchange rate differences arising are recognised in the net cost of services.

New Australian Accounting Standards

Adoption of new Australian Accounting Standard requirements

No Accounting Standard has been adopted earlier than the application date as stated in the standard. CSIRO has reviewed new standards, revised standards and interpretations/amending standards issued prior to the signing of the financial statements and considers that none of these have had a material financial impact. The adjusted reporting disclosures required by new standard AASB 124 *Related Party Disclosures* are included at Note 3.6.

Future Australian Accounting Standard requirements

No new or revised pronouncements that were issued by the Australian Accounting Standards Board prior to the finalisation of the financial statements are expected to have a material financial impact on the entity in future reporting periods. The following new or revised standards will be adopted and their implementation will require enhanced disclosure in future reporting periods:

Standard	Effective for reporting periods beginning on or after:	Nature of impending changes and likely impact on application
AASB 9 *Financial Instruments*	1 January 2018	Change to requirements for classifying and measuring financial assets and liabilities. May have a moderate impact on the recognition and measurement of financial instruments.
AASB 15 *Revenue from Contracts with Customers*	1 January 2018	Specifies the accounting treatment of revenue arising from contracts with customers. CSIRO considers this will have minimal impact.
AASB 16 *Leases*	1 January 2019	Moderate impact as a new accounting standard which requires assessment of all operating and finance leases.

Taxation

In accordance with Section 53 of the *Science and Industry Research Act 1949*, CSIRO is exempt from all forms of Australian taxation except the fringe benefits tax (FBT) and the goods and services tax (GST). The Group pays applicable taxes in overseas countries.

Revenues, expenses, assets and liabilities are recognised net of GST except:

- where the amount of GST incurred is not recoverable from the Australian Taxation Office; and
- for receivables and payables.

The SIEF is exempt from income tax in Australia. WLAN and the Innovation Fund entities are subject to all applicable taxes in Australia. The Fundación is subject to all applicable taxes in Chile. The US Office is subject to taxes in the United States. NICTA is exempt from income tax however NICTA's subsidiaries (including NICTA IPR Pty Ltd) are subject to applicable taxes in Australia.

Significant Changes in the Reporting Period

CSIRO announced the establishment of a new office in the United States in early 2017. Two new subsidiary entities were created during the year to facilitate the formation of the office – Refer to Note 3.6 for further information.

Events after the Reporting Period

At the time of completion of these financial statements, the Group is not aware of any significant events occurring after the reporting date.

Future Events

CSIRO is exploring future commercial opportunities for the Ginninderra Field Station, a 701 hectare area of land which CSIRO owns in north Canberra. Due to rapid urban growth in the surrounding area, the site has become under-utilised and the field station requires relocation to a more rural setting. As part of its focus on exploring the future possibilities for this site, CSIRO has successfully requested the National Capital Authority (NCA) to include the site as 'Urban Area' on the General Policy Plan for Metropolitan Canberra in the National Capital Plan draft Amendment 86. The Amendment become effective in November 2016.

This initial step in rezoning the land has allowed CSIRO to commence a process to identify a suitable development partner to progress with the next steps in the planning for the future of the site which will involve ongoing significant community and stakeholder consultation. Once a development partner and plan is selected, it is expected that there will be a material increase in the recorded value of the Ginninderra land. This is expected to occur in 2018.

1. Financial Performance

This section analyses the financial performance of CSIRO for the year ended 30 June 2017.

1.1. Expenses

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Note 1.1A: Employee Benefits				
Wages and salaries	**522,115**	531,584	**518,203**	496,883
Superannuation	**89,374**	89,679	**89,315**	87,175
Leave and other entitlements	**67,945**	88,788	**67,898**	85,790
Separation and redundancies	**20,826**	29,006	**20,826**	27,639
Gross employee benefits	**700,260**	739,057	**696,242**	697,487
Less				
Capitalised labour	**(6,623)**	(7,510)	**(6,623)**	(7,510)
Employee cost recovery from subsidiary companies	**(426)**	(684)	**(411)**	(684)
Total employee benefits	**693,211**	730,863	**689,208**	689,293

Accounting Policy

Accounting policy for employee related expenses is contained in the People and Relationships section.

Note 1.1B: Suppliers				
Goods supplied	**91,941**	95,393	**91,975**	93,586
Services rendered	**323,663**	332,719	**316,558**	299,071
Total goods and services supplied or rendered	**415,604**	428,112	**408,533**	392,657
Other suppliers				
Operating lease rentals - minimum lease payments	**6,333**	6,276	**6,333**	6,276
Workers compensation expenses	**7,467**	4,460	**7,406**	4,345
Total other suppliers	**13,800**	10,736	**13,739**	10,621
Total Suppliers	**429,404**	438,848	**422,272**	403,278

Leasing commitments

In its capacity as lessee CSIRO has the following commitments that arise from effectively non-cancellable operating leases:

1. Office and Scientific Research Accommodation - Lease payments are subject to annual increases in accordance with the terms of the agreement (such as CPI increases). The accommodation leases are current and each may be renewed at the Group's option.
2. Motor Vehicles - No contingent rentals exist and there are no purchases options for vehicle leases.
3. Computer Equipment - Provision of computer equipment as designated necessary in the supply contract for a general period of 2-3 years.

Commitments below are stated inclusive of GST.

Commitments for minimum lease payments in relation to non-cancellable operating leases are payable as follows:

Within 1 year	**36,152**	40,208	**35,622**	35,653
Between 1 to 5 years	**127,704**	118,067	**126,978**	116,562
More than 5 years	**21,106**	19,449	**21,106**	19,449
Total operating lease commitments	**184,962**	177,724	**183,706**	171,664

Accounting Policy

Research and Development Expenditure and Intellectual Property

All research and development costs, including costs associated with protecting intellectual property (e.g. patents and trademarks), are expensed as incurred.

Leases

A distinction is made between finance leases and operating leases. Finance leases effectively transfer from the lessor to the lessee substantially all the risks and rewards incidental to ownership of leased assets. An operating lease is a lease that is not a finance lease. In operating leases, the lessor effectively retains all such risks and benefits.

Where an asset is acquired by means of a finance lease, the asset is capitalised at either the fair value of the lease or, if lower, the present value of minimum lease payments at the inception of the contract and a liability recognised at the same time and for the same amount.

The discount rate used is the interest rate implicit in the lease. Leased assets are amortised over the period of the lease. Lease payments are allocated between the principal component and the interest expense.

Operating lease payments are expensed on a straight-line basis which is representative of the pattern of benefits derived from the leased assets.

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Note 1.1C: Write-down and impairment of assets				
Asset write-downs and impairments from:				
Bad debts	**263**	78	**263**	78
Decrease in allowance for impairment of receivable	**(1)**	127	**(1)**	127
Impairment of available for sale investments	**520**	3,088	**425**	3,088
Net impairment loss on revaluation of properties held for sale and investment properties	**-**	-	**-**	-
Net realisation of fair value loss reserve on available for sale investments	**-**	-	**-**	-
Write down and impairment of assets	**1,108**	790	**1,108**	790
Total write-down and impairment of assets	**1,890**	4,083	**1,795**	4,083

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1.2. Revenue and Gains

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Revenue from Government	**787,267**	750,281	**787,267**	750,281
Sale of goods	**9,950**	10,129	**9,950**	10,129
Rendering of services	**357,582**	410,478	**369,095**	359,085
Total sale of goods and rendering of services	**367,532**	420,607	**379,045**	369,214
Bank and term deposits interest	**8,752**	9,296	**6,264**	6,457
Rental Income	**12,207**	9,409	**12,207**	8,129
Royalties and licence fees	**51,107**	59,832	**51,107**	59,749
Gain on sale of investments and intellectual property	**8,258**	-	**1,750**	-
Total interest, rental and royalties and licence income	**80,324**	78,537	**71,328**	74,335
Other revenues				
Sale of primary produce	**1,035**	1,244	**1,035**	1,244
Donation	**25,010**	15	**10**	15
Capital contributions	**16,822**	6,114	**16,822**	7,114
Education programs and subscriptions	**199**	422	**199**	422
Other	**18,845**	21,685	**14,665**	10,175
Total other revenues	**61,911**	29,480	**32,731**	18,970
Total own-source revenue	**509,767**	528,624	**483,104**	462,519
Gain on foreign exchange (non speculative)	**-**	293	**-**	267
Gain on revaluation of investment properties	**888**	929	**888**	929
Total own-source revenue including gains	**510,655**	529,846	**483,992**	463,715

Leasing - Rental Income Commitments

CSIRO has commitments receivable for the sub leasing areas of office and scientific research accommodation to external parties:

Within 1 year	**4,012**	3,293	**4,012**	2,230
Between 1 to 5 years	**6,211**	3,059	**6,211**	2,845
More than 5 years	**4,100**	100	**4,100**	100
Total lease commitments receivable	**14,323**	6,452	**14,323**	5,175

Accounting Policy

Sale of Goods and Services Revenue

Revenue from sale of goods is recognised when:

- The risks and rewards of ownership have been transferred to the buyer;
- The entity retains no managerial involvement or effective control over the goods;
- The revenue and transaction costs incurred can be reliably measured; and
- It is probable that the economic benefits associated with the transaction will flow to CSIRO.

Revenue from rendering of services is recognised by reference to the stage of completion of contracts at the reporting date. The revenue is recognised when:

- The amount of revenue, stage of completion and transaction costs incurred can be reliably measured; and
- It is probable that the economic benefits associated with the transaction will flow to CSIRO.

The stage of completion of contracts at the reporting date is determined by reference to the estimated progress of the contracted deliverables to date. The balances of contract research and development activities in progress are accounted as either contract research work in progress (Note 2.2C), being the gross unbilled amount expected to be collected from clients for contract research and services performed as at 30 June 2017, or contract research revenue received in advance (Note 2.3B), where revenue for contract research and services received and/or billed exceeded revenue earned.

Interest Revenue

Interest revenue is recognised using the effective interest method as set out in AASB 139 Financial Instruments: Recognition and Measurement.

Royalties and License Fees

Royalties and licence revenue are recognised on an accrual basis in accordance with the substance of the relevant royalty agreements.

Revenue from legal settlements related to intellectual property is recognised on an accrual basis in accordance with the substance of the relevant licensing agreements.

Revenues from Government

Funding received from the Australian Government Department of Industry and Science (appropriated to CSIRO as a corporate Commonwealth entity payment item) is recognised as Revenue from Government unless it is in the nature of an equity injection or a loan.

Other Revenue

Other revenues includes sale of CSIRO publications and products, conferences and 'pass through' funding for costs of suppliers and external service providers.

Resources Received Free of Charge

Resources received free of charge are recognised as either revenue or gains depending on their nature. They are recorded as revenue when, and only when, the fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of those resources is recognised as an expense.

Contributions of assets at no cost of acquisition or for nominal consideration are recognised as gains at their fair value when the asset qualifies for recognition, unless received from another Government agency or authority as a consequence of a restructuring of administrative arrangements.

Sale of Assets

Gains from disposal of non-current assets are recognised when control of the asset has passed to the buyer.

1.3. Other Comprehensive Income

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Items that will not be classified to income or loss				
Note 1.3A: Changes in asset revaluation reserves				
Revaluation of land and buildings	**-**	1,489	**-**	-
Revaluation of plant and equipment	**-**	(3,337)	**-**	(7,664)
Revaluation of heritage and cultural assets	**-**	-	**-**	-
Net increase/(decrease) in asset revaluation reserves	**-**	(1,848)	**-**	(7,664)
Items that may be reclassified to income and loss				
Note 1.3B: Change in other reserve				
Net change in fair value gain/(loss) of available for sale of investments	**7,096**	(915)	**2,048**	(915)
Net change arising from foreign exchange movements on conversion of subsidiary accounts	**(16)**	(44)	**-**	-
Realisation of fair value loss on sale and impairment of available for sale investment	**-**	-	**-**	-
Net increase/(decrease) in other reserve	**7,080**	(959)	**2,048**	(915)

2. Financial Position

This section analyses CSIRO's assets used to generate financial performance and the operating liabilities incurred as a result. Employee related information is disclosed in the People and Relationships section.

2.1. Financial Assets

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Note 2.1A: Trade and other receivables				
Goods and services	**76,167**	44,507	**72,495**	44,629
Statutory receivables	**3,761**	5,860	**3,608**	5,028
Interest	**883**	1,083	**443**	632
Other receivables	**2,338**	6,763	**269**	1,788
Total trade and other receivables (gross)	**83,149**	58,213	**76,815**	52,077
Less: impairment allowance for trade and other receivables	**(202)**	(354)	**(202)**	(354)
Total trade and other receivables (net)	**82,947**	57,859	**76,613**	51,723
Trade and other receivables (gross) aged as follows				
Not overdue	**71,492**	49,049	**65,159**	43,207
Overdue by				
0 to 30 days	**7,727**	4,135	**7,727**	4,111
31 to 60 days	**2,129**	3,498	**2,129**	3,498
61 to 90 days	**232**	889	**231**	889
More than 90 days	**1,569**	642	**1,569**	372
Total receivables (gross)	**83,149**	58,213	**76,815**	52,077
Reconciliation of impairment allowance				
Opening balance	**354**	276	**354**	276
Increase /(decrease) recognised in net surplus	**(152)**	78	**(152)**	78
Closing balance	**202**	354	**202**	354

Accounting Policy

Loans and Receivables

Receivables for goods and services, which have 30 day terms, are recognised at the nominal amounts due less any impairment allowance. Collectability of debts is reviewed on an ongoing basis and allowances are made when collectability of the debt is no longer probable. All trade and other receivables are expected to be recovered in no more than 12 months.

Impairment of Financial Assets

Financial assets are assessed for impairment at the end of each reporting period. Where there is objective evidence that an impairment loss has been incurred for loans and receivables, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the Statement of Comprehensive Income.

Note 2.1B: Other Investments

Listed companies	**3,455**	4,023	**3,455**	4,023
Unlisted companies	**22,992**	7,363	**16,601**	5,423
Innovation Fund	**-**	-	**40,000**	30,000
Uniseed Investment	**9,765**	10,000	**9,765**	10,000
Total investments	**36,212**	21,386	**69,821**	49,446

Accounting Policy

CSIRO has investments in a number of unlisted start-up companies over which it does not have significant influence or control. These companies have been established for the purpose of commercialisation of CSIRO's intellectual property. CSIRO also has some investments in companies which have been listed on the Australian Stock Exchange.

CSIRO's investments in listed and unlisted companies are accounted for in accordance with AASB 139 *Financial Instruments: Recognition and Measurement*, and have been designated as 'available-for-sale' financial assets. See note 4.2 for further information.

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2.2. Non-Financial Assets

Note 2.2A: Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles

(a) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles for 2017 - Consolidated

	Land	Buildings	Total land and buildings	Plant and equipment	Heritage and Cultural	Intangibles	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000
As at 1 July 2016							
Gross book value	384,674	2,675,023	3,059,697	1,130,985	11,947	58,908	4,261,537
Accumulated depreciation and amortisation	-	(1,454,361)	(1,454,361)	(550,107)	(7,741)	(38,221)	(2,050,430)
Net book value as at 1 July 2016	384,674	1,220,662	1,605,336	580,878	4,206	20,687	2,211,107
Additions:							
By purchase	-	63,252	63,252	72,731	-	4,632	140,615
Assets first recognised through a gain in net cost of services	-	-	-	-	-	-	-
Reclassification	-	750	750	(971)	-	221	-
Revaluations recognised in other comprehensive income	-	-	-	-	-	-	-
Impairments recognised in net cost of services	-	-	-	(879)	-	(230)	(1,109)
Depreciation expense	-	(92,972)	(92,972)	(73,864)	-	(5,330)	(172,166)
Disposals	(185)	(295)	(480)	(5,488)	-	(200)	(6,168)
Other Movements	-	-	-	(7)	-	-	(7)
Net book value as at 30 June 2017	384,489	1,191,397	1,575,886	572,400	4,206	19,780	2,172,272
Net book value as at 30 June 2017 represented by:							
Gross book value	384,489	2,738,327	3,122,816	1,152,126	11,947	53,280	4,340,169
Accumulated depreciation and amortisation	-	(1,546,930)	(1,546,930)	(579,726)	(7,741)	(33,500)	(2,167,897)
	384,489	1,191,397	1,575,886	572,400	4,206	19,780	2,172,272

(b) Reconciliation of the opening and closing balances of Land and Buildings, Plant and Equipment and Intangibles for 2017 - CSIRO

	Land	Buildings	Total land and buildings	Plant and equipment	Heritage and Cultural	Intangibles	Total
	$'000	$'000	$'000	$'000	$'000	$'000	$'000
As at 1 July 2016							
Gross book value	384,674	2,670,081	3,054,755	1,107,276	11,947	57,588	4,231,566
Accumulated depreciation and amortisation	-	(1,453,087)	(1,453,087)	(531,801)	(7,741)	(36,908)	(2,029,537)
Net book value as at 1 July 2016	384,674	1,216,994	1,601,668	575,475	4,206	20,680	2,202,029
Additions:							
By purchase	-	62,532	62,532	72,732	-	4,632	139,896
Assets first recognised through a gain in net cost of services	-	-	-	-	-	-	-
Reclassification	-	750	750	(971)	-	221	-
Revaluations recognised in other comprehensive income	-	-	-	-	-	-	-
Impairments recognised in net cost of services	-	-	-	(879)	-	(230)	(1,109)
Depreciation expense	-	(92,972)	(92,972)	(73,725)	-	(5,330)	(172,027)
Disposals	(185)	(287)	(472)	(5,376)	-	(200)	(6,048)
Other Movements (NICTA Asset Transfer)	-	4,380	4,380	4,759	-	7	9,146
Net book value as at 30 June 2017	384,489	1,191,397	1,575,886	572,015	4,206	19,780	2,171,887
Net book value as at 30 June 2017 represented by:							
Gross book value	384,489	2,738,327	3,122,816	1,151,430	11,947	53,280	4,339,473
Accumulated depreciation and amortisation	-	(1,546,930)	(1,546,930)	(579,415)	(7,741)	(33,500)	(2,167,586)
	384,489	1,191,397	1,575,886	572,015	4,206	19,780	2,171,887

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Contractual commitments for fixed assets:				
Capital commitments comprise outstanding payments for buildings under construction and commitments for purchase of plant and equipment. Commitments are reported inclusive of GST.				
Land and buildings	**42,020**	21,532	**42,020**	19,959
Plant and equipment	**3,954**	1,807	**3,954**	1,807
Total commitments payable	**45,974**	23,339	**45,974**	21,766
Within 1 year	**45,974**	20,889	**45,974**	19,316
Between 1 to 5 years	**-**	2,450	**-**	2,450
More than 5 years	**-**	-	**-**	-
Total commitments payable	**45,974**	23,339	**45,974**	21,766

Accounting Policy

Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets are initially measured at their fair value plus transaction costs where appropriate.

Assets acquired at no cost or for nominal considerations are initially recognised as assets and revenues at their fair value at the date of acquisition. Property, plant and equipment which are purchased from contract research funds and where the control and subsequent sale proceeds are refunded to contributors under the terms of the agreements, are expensed during the year of purchase.

Asset Recognition Threshold

Purchases of property, plant and equipment are recognised initially at cost in the Statement of Financial Position, except for purchases costing less than $3,000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

Revaluations

Following initial recognition at cost, property, plant and equipment, including assets under finance leases are carried at fair value less accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure the carrying amount of assets do not differ materially from the assets' fair value as at reporting date. The regularity of valuation depends upon the volatility of movements in the market values for the relevant assets.

Revaluation adjustments are made on a class basis. Any revaluation increment is credited to equity under asset revaluation reserve, except to the extent that it reverses a previous revaluation decrement of the same asset class that was previously recognised in the surplus or deficit. Revaluation decrements for a class of assets are recognised directly through the statement of compressive income except to the extent that they reverse a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date is restated proportionately with the change in the gross carrying amount of the asset so that the carrying amount of the asset after revaluation equals its revalued amount.

Fair value for each class of asset is determined as follows:

- Land, which will continue to be used for research activity, is valued by independent valuers at fair value (highest and best use). Highest and best use is determined from the perspective of market participants. An entity's current use of a non-financial asset is presumed to be its highest and best use unless market or other factors suggest otherwise. Land underwent a full revaluation as at 30 June 2015 by Savills.
- Buildings and leasehold improvements, which will continue to be used for research activities, are valued by independent valuers at fair value (highest and best use). Building valuations include plant, fit-outs, fixtures and fittings, which form an integral part of buildings. Buildings underwent a full revaluation as at 30 June 2015 by Savills.
- Plant and equipment which will continue to be used for research activities are valued by independent valuers at fair value (highest and best use). Plant and equipment assets were revalued as at 30 June 2016 by Australian Valuation Solutions.
- Properties held for sale are valued at fair value annually by independent valuers. The property held for sale is valued at its contracted sale price.
- Heritage and cultural assets are valued by independent valuers at their depreciated replacement cost. Heritage assets underwent a full revaluation as at 30 June 2015 by Savills.

Depreciation and Amortisation

Depreciable property, plant and equipment assets are written-off to their estimated residual values over their estimated useful lives using, in all cases, the straight-line method of depreciation. Leasehold improvements are depreciated on a straight-line basis over the lesser of the estimated useful life of the improvements or the unexpired period of the lease. Land is not depreciated.

Depreciation/amortisation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation rates applying to each class of depreciable asset are based on the following useful lives:

Buildings on freehold land	40 to 80 years
Leasehold improvements	Lease term
Buildings under finance lease	Lease term
Passenger vehicles	7 years
Agricultural and transport equipment	8 to 20 years
Computing equipment	2 to 5 years
Scientific equipment	5 to 20 years
Furniture and office equipment	5 to 15 years
Workshop equipment	20 to 25 years
Research vessel	25 years
Australia telescope	15 to 58 years
Heritage and cultural assets	Indefinite

Impairment

All assets were assessed for impairment as at 30 June 2017. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs to sell and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the entity were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

Derecognition

An item of property, plant and equipment is derecognised upon disposal or when no further future economic benefits are expected from its use or disposal.

Heritage and Cultural Assets

Heritage and cultural items include buildings of historical or cultural significance. CSIRO has classified them as heritage and cultural assets as they are primarily used for purposes that relate to their cultural significance and original purpose. Heritage and cultural assets are stored and managed in ways to preserve their heritage and cultural value over time. Where conservation and preservation activities, specified in an asset's Heritage Management Plan, demonstrate that an asset will be maintained for an indefinite period, these items are considered to have indefinite useful lives and therefore, not subject to depreciation. Copies of the Heritage Management Plans may be obtained by contacting csiroenquiries@csiro.au.

Intangibles

Intangibles comprise licenses and internally developed and acquired software for internal use. These assets are carried at cost, less accumulated amortisation and impairment losses, except where the estimated cost of software is less than the $250,000 threshold and expensed in the year of acquisition. Licenses and software are amortised on a straight-line basis over their anticipated useful lives. The useful lives are 2 to 10 years (2016: 2 to 10 years). All software assets were assessed for indications of impairment as at 30 June 2017.

Properties Held for Sale

Properties which are expected to be recovered primarily through sale rather than through continuing use are classified as 'properties held for sale'. Immediately before classification, the properties are remeasured in accordance with the Group's accounting policies. Thereafter, at reporting date the properties are measured at the lower of their carrying amount and fair value less cost to sell.

Impairment losses on initial classification as held for sale and subsequent gains or losses on re-measurement are recognised in the Statement of Comprehensive Income.

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Note 2.2B: Investment properties				
Reconciliation of the opening and closing balances of investment properties				
As at 1 July	**50,222**	49,292	**50,222**	49,292
Net gain/(loss) from fair value adjustments	**888**	930	**888**	930
Total as at 30 June	**51,110**	50,222	**51,110**	50,222

Commitments from investment properties:

Commitments comprise rental income receivable from CSIRO's investment properties

Within 1 year	**3,159**	738	**3,159**	738
Between 1 to 5 years	**1,050**	1,200	**1,050**	1,200
More than 5 years	**-**	350	**-**	350
Total commitment receivable	**4,209**	2,288	**4,209**	2,288

No indicators of impairment were identified for investment properties.

Accounting Policy

Investment properties are recorded at their fair value, which is assessed annually by independent valuers. Investment properties were valued as at 30 June 2017 by Colliers. Revaluation increments are recorded as a gain or loss in the Statements of Comprehensive Income as disclosed in Note 1.3. Rental income from investment properties is included in the rental income disclosed in Note 1.2 and was $3.3m for 2017 (2016:$3.1m). Operating costs that are recoverable amounted to $1.0m (2016: $1.0m)

Note 2.2C: Other non-financial assets				
Contract research work in progress - at cost	**28,322**	31,566	**28,322**	31,566
Capital prepayments	**-**	1,266	**-**	1,266
Other prepayments	**13,015**	13,036	**13,077**	13,016
Total other non-financial assets	**41,337**	45,868	**41,399**	45,848

No indicators of impairment were identified for other non-financial assets.

Accounting Policy

Accounting policy for contract research work in progress is contained in Note 1.2.

2.3. Payables

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Note 2.3A: Suppliers				
Suppliers payable	**73,590**	62,176	**70,661**	60,135
Total	**73,590**	62,176	**70,661**	60,135

Suppliers payable are expected to be settled within 12 months.
Settlement is usually made within 30 days.

Note 2.3B: Other Payables				
Accrued salaries and wages	**6,232**	3,779	**6,229**	3,667
Contract research revenue received in advance	**105,734**	99,558	**105,734**	99,558
Other revenue received in advance	**14,975**	16,258	**10,407**	12,466
Other creditors and accrued expenses	**2,302**	8,225	**2,439**	6,533
Total other payables	**129,243**	127,820	**124,809**	122,224

Accounting Policy

Accounting policy for contract revenue received in advance is contained in Note 1.2.

2.4. Interest Bearing Liabilities

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Note 2.4A: Finance Leases				
Lease payments are expected to be settled:				
Within one year				
Minimum lease payments	**5,480**	5,814	**5,480**	5,814
Deduct: future finance charges	**(1,643)**	(1,547)	**(1,643)**	(1,547)
Total payable within one year (current)	**3,837**	4,267	**3,837**	4,267
In one to five years				
Minimum lease payments	**23,649**	22,641	**23,649**	22,641
Deduct: future finance charges	**(4,245)**	(5,462)	**(4,245)**	(5,462)
Total payable within one to five years	**19,404**	17,179	**19,404**	17,179
In more than five years				
Minimum lease payments	**15,044**	21,896	**15,044**	21,896
Deduct: future finance charges	**(530)**	(1,320)	**(530)**	(1,320)
Total payable in more than five years	**14,514**	20,576	**14,514**	20,576
Total finance lease liability recognised on the Statement of Financial Position	**37,755**	42,022	**37,755**	42,022

Finance leases exist in relation to certain buildings and major equipment assets. The leases are non-cancellable and for fixed terms ranging from 17 to 25 years. CSIRO guarantees the residual values of all assets leased. There are no contingent rentals. The interest rate implicit in the leases averaged 5% per annum (2016: 4% per annum). The lease liabilities are secured by the lease assets.

Accounting Policy

Accounting policies for leases is contained in Note 1.1B.

Note 2.4B: Deposits

Deposits represent monies held on behalf of the following third parties:				
Goyder Institute of Water Research	**3,491**	3,253	**3,491**	3,253
Others	**1,687**	2,545	**4,854**	3,595
Total deposits	**5,178**	5,798	**8,345**	6,848

3. People and Relationships

This section describes a range of employment and post employment benefits provided to our people and our relationship with other key people.

3.1. Employee Provisions

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Note 3.1A: Employee Provisions				
Annual leave	**54,405**	58,143	**54,319**	55,068
Long service leave	**133,684**	145,952	**133,684**	143,498
Severance pay	**5,553**	6,655	**5,553**	5,121
Redundancies	**23,522**	27,984	**23,522**	27,984
Total employee provisions	**217,164**	238,734	**217,078**	231,671

Accounting Policy

Liabilities for short-term employee benefits (as defined in AASB 119 *Employee Benefits*) and termination benefits due within twelve months of the end of the reporting period are measured at their nominal amounts. The nominal amount is calculated with regard to the rate expected to be paid on settlement of the liability.

Other long-term employee benefit liabilities are measured at the present value of the estimated future cash outflows to be made in respect of services provided by employees up to the reporting date.

Leave

The liability for employee benefits includes provisions for annual leave, long service leave and severance payments. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees is estimated to be less than the annual entitlement for sick leave.

The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that will apply at the time the leave is taken, including the employer superannuation contribution rates to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability at 30 June for long service leave and annual leave has been determined by the short hand method and reference to the work of the Australian Government Actuary (AGA). The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

Separation and Redundancy

Provision is made for separation and redundancy benefit payments. A CSIRO plan of termination is binding when the following criteria are met:

- actions required to complete the plan indicate that it is unlikely that significant changes to the plan will be made;
- the plan identifies the number of employees whose employment is to be terminated; and
- the plan established the termination benefits that employees will receive.

Superannuation

Employees of CSIRO are members of the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS), or the PSS accumulation plan (PSSap). The CSS and PSS are defined benefit schemes for the Australian Government. The PSSap is a defined contribution scheme.

The liability for defined benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported by the Department of Finance as an administered item.

CSIRO makes employer contributions to the employee superannuation schemes at rates determined by an actuary to be sufficient to meet the cost to the Government of the superannuation entitlements of the Group's employees. CSIRO accounts for the contributions as if they were contributions to defined contribution plans.

The liability for superannuation recognised as at 30 June represents outstanding contributions for the financial year.

3.2. Key Management Personnel Remuneration

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Short-term employee benefits				
Salary	**5,552**	6,166	**5,292**	5,425
Performance bonuses	**574**	590	**574**	590
Additional allowances	**276**	272	**275**	271
Total short-term employee benefits	**6,402**	7,028	**6,141**	6,286
Post-employment benefits				
Superannuation	**687**	722	**687**	690
Total post-employment benefits	**687**	722	**687**	690
Other long-term employee benefits				
Annual leave accrued	**435**	424	**411**	396
Long-service leave accrued	**194**	219	**194**	219
Total other long-term benefits	**629**	643	**605**	615
Termination benefits				
Termination benefits	**-**	891	**-**	478
Total termination benefits	**-**	891	**-**	478
Total senior executive remuneration expenses	**7,718**	9,284	**7,433**	8,069

The total number of senior management personnel that are included in the above table for CSIRO is 21 (2016: 20) and for the Group is 22 (2016: 23). The increase in the staff numbers and associated costs for the Group in 2016 is due to the first time inclusion of NICTA. As at 1 July 2016, all NICTA staff had transferred to CSIRO or left the organisation.

This note has been prepared on an accrual basis for substantive and long term acting senior management personnel during the period.

* Note: the comparative figures have been restated to reflect salaries calculated for the period on an accrual basis.

3.3. Remuneration of Auditors

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$	$	**$**	$
Amounts received or due and receivable by the Group's auditors for:				
Audit of the financial statements[1]	**309,520**	404,983	**198,000**	199,000
Other non-audit related[2]	**-**	92,703	**-**	-
	309,520	497,686	**198,000**	199,000

[1] The Group's auditor (except for the Fundacion) is the Australian National Audit Office (ANAO) who has appointed RSM to assist with the assignment since 2015-16. The Fundacion is audited by Ernst & Young. NICTA was also audited in 2015-16 by Ernst & Young.

[2] These services are performed by the audit firm directly. In 2015-16, Ernst & Young provided other assurance services to NICTA during the year.

3.4. Remuneration of Board Members

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$	$	**$**	$
Remuneration and superannuation benefits received or due and receivable by full-time and part-time Board Members, excluding the Chief Executive Officer were:				
Board Members' remuneration	**720,890**	825,469	**671,477**	541,896
Payments to superannuation funds for Board Members	**57,483**	72,074	**57,483**	49,261
Total remuneration	**778,373**	897,543	**728,960**	591,157

The remuneration of the Chief Executive Officer, who is also a Board Member of the Group is reported under Note 3.2 Key Management Personnel Remuneration. The total headcount of Board members that are included in the above table for CSIRO is 9 (2016: 11). The headcount was higher in 2015-16 due to changes in Board personnel during the year (equivalent FTE figures were 2017: 8.3, 2016: 6.5).

For the Group the total head count of Board members was 11 (2016: 27). The higher head count of the Board personnel and remuneration for the Group in 2016 was due to the inclusion of the NICTA Board remuneration for that year. In 2016-17 the NICTA Board was reduced to 3 members, all of whom are CSIRO staff who do not receive additional remuneration for their services on the Board.

* Note: the comparative figures have been restated to reflect salaries calculated for the period on an accrual basis.

3.5. Meetings of the Board and Board Committees

During the financial year 2016-17, 7 Board meetings (1 out of session), 4 Board Audit & Risk Committee meetings, 4 Board People, Health & Safety Committee meetings and 4 Board Science Excellence Committee meetings were held. The number of meetings attended by each of the Board members was as follows:

Board member	CSIRO Board		CSIRO Board Audit & Risk Committee		CSIRO Board People, Health & Safety Committee		CSIRO Board Science Excellence Committee	
	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended	Number eligible to attend as a member	Number attended
Michele Allan	7	5	-	-	-	2	4	3
Edwina Cornish AO	7	6	4	3	-	3	4	4
Shirley In't Veld	7	7	4	3	4	3	-	3
David Knox	7	7	-	3	3	4	4	4
Larry Marshall	7	7	-	4	-	4	-	4
Tanya Monro	7	7	-	3	4	4	4	4
Hutch Ranck	7	7	-	-	4	4	-	4
Peter Riddles	7	7	4	4	1	3	4	4
David Thodey AO	7	7	-	4	-	4	-	4
Brian Watson*	1	-	2	2	-	-	-	-

* Mr Watson resigned October 2016.

3.6. Related Party Disclosures

(a) Controlled Entities

SIEF was established under the *Science and Industry Endowment Act 1926*. The principal activity of the SIEF Trust is to provide assistance to persons engaged in scientific research and in training of students in scientific research. The SIEF Trustee is the CSIRO Chief Executive and SIEF is a wholly controlled entity. The SIEF's separate financial statements are reported in the CSIRO Annual Report.

WLAN is a small proprietary company limited by shares, which are solely held by CSIRO. The principal activity of WLAN is to provide services to CSIRO. WLAN was established in 2005 and is anticipated to go through voluntary deregistration in 2017-18.

The Fundación was established in October 2013. The Fundación is a controlled entity governed by a Board in accordance with the Constitution of the Fundación. The Fundación is working with industry and leading Chilean Universities to develop cutting-edge technologies to reduce the environmental impact of mining and increase productivity.

NICTA is Australia's ICT Research Centre of Excellence and undertakes internationally recognised research in partnership with industry, government and researchers to create national benefit and wealth for Australia. NICTA is the parent entity of NICTA IPR Pty Ltd and a small number of minor proprietary limited companies that exist to hold intellectual property and commercialise research. CSIRO obtained full control of NICTA on 28 August 2015, when the members of the NICTA Board resolved to adopt a revised company constitution which provided CSIRO with effective control over NICTA.

As part of the National Innovation and Science Agenda announced by the Australian Government in December 2015, CSIRO has established an Innovation Fund to invest in the development of early stage technology opportunities from the public research sector, to increase their translation into commercial opportunities to be taken up by Australian industry. The Fund has been established through a structure of seven entities whose purpose is to manage and operate the Fund. These entities are:

- CSIRO Innovation Fund 1, LP is an incorporated limited partnership formed under the Partnership Act 1892 (NSW) and has applied to AusIndustry for registration as an Early Stage Venture Capital Limited Partnership. It was established in January 2017.
- CSIRO Management Partnership Pty Ltd is an incorporated limited partnership formed under the Partnership Act 1892 (NSW). It was established in January 2017 and acts as the General Partner of the CSIRO Innovation Fund 1, LP.
- CSIRO General Partner 2 Pty Ltd was established in December 2016 and is a small proprietary company limited by shares, which are solely held by CSIRO. This company acts as the general partner of CSIRO Management Partnership Pty Ltd.
- CSIRO Fund of Funds, LP is an incorporated limited partnership formed under the Partnership Act 1892 (NSW) and has applied to Innovation Australia for conditional registration as an Australian Venture Capital Fund of Funds. It was established in May 2016.
- CSIRO General Partner Pty Ltd was established in May 2016 and is a small proprietary company limited by shares, which are solely held by CSIRO. It acts as the general partner of CSIRO Fund of Funds LP.
- CSIRO Financial Services Pty Ltd was established in December 2015 and is a small proprietary company limited by shares, which are solely held by CSIRO. The company has applied to the Australian Securities and Investments Commission for an Australian Financial Services License.
- CSIRO Innovation Services Pty Ltd was established in October 2016 and is a small proprietary company limited by shares, which are solely held by CSIRO.

All of the above entities are under the sole control of the CSIRO. The above entities (with the exception of CSIRO Financial Services Pty Ltd and CSIRO Innovation Services Pty Ltd) sit outside the General Government Sector.

CSIRO USA LLC and CSIRO Innovations LLC were established in February 2017 to support the establishment of a CSIRO presence in the United States. Both entities are incorporated within Delaware and are wholly controlled by the CSIRO.

(b) Related party relationships

The entity is an Australian Government controlled entity. Related parties to this entity are the Board, Key Management Personnel including the Portfolio Minister and Executive, and other Australian Government entities.

Transactions with related parties:

Given the breadth of Government activities, related parties may transact with the government sector in the same capacity as ordinary citizens. Such transactions include the payment or refund of taxes, receipt of a Medicare rebate or higher education loans. These transactions have not been separately disclosed in this note.

Significant transactions with related parties can include:

- the payments of grants or loans;
- purchases of goods and services;
- asset purchases, sales transfers or leases;
- debts forgiven; and
- guarantees.

Giving consideration to relationships with related entities, and transactions entered into during the reporting period by the entity, it has been determined that there are no related party transactions to be separately disclosed.

4. Managing Uncertainties

This section analyses how CSIRO manages financial risk within its operating environment.

4.1. Contingent Assets and Liabilities

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Quantifiable Contingencies				
Contingent assets				
Insurance claims	**1,808**	2,323	**1,808**	2,323
Bank guarantees received from suppliers	**20,689**	38,353	**20,689**	38,353
Total contingent assets	**22,497**	40,676	**22,497**	40,676
Contingent liabilities				
Estimated legal claims[1]	**-**	-	**-**	-
Total contingent liabilities	**-**	-	**-**	-
Total net contingent asset/(liability)	**22,497**	40,676	**22,497**	40,676

Depending on the materiality of risks involved with certain commercial transactions, CSIRO has requested bank guarantees where necessary to mitigate such risks, notably where substantial advance payments were made.

[1]Estimated legal claims arising from employment, motor vehicle accidents, commercial and patent disputes. The Group has denied liability and is defending the claims. The estimate is based on precedent in such cases.

Unquantifiable contingencies

CSIRO has no identified unquantifiable contingencies to report.

Accounting Policy

Contingent liabilities and contingent assets are not recognised in the Statement of Financial Position. They may arise from uncertainty as to the existence of a liability or asset, or represent a liability or asset in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

4.2. Financial Instruments

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Note 4.2A: Categories of financial instruments				
Financial Assets				
Available for sale financial assets				
Investments	**36,212**	21,386	**69,821**	49,446
Loans and receivables				
Cash at bank	**129,641**	139,127	**31,071**	76,827
Term deposits	**170,226**	162,969	**120,000**	100,000
Receivable for goods and services	**76,167**	44,683	**72,495**	44,805
Other receivables	**3,221**	7,670	**712**	2,244
Carrying amount of financial assets	**415,467**	375,835	**294,099**	273,322
Financial Liabilities				
Finance lease liabilities	**37,755**	42,022	**37,755**	42,022
Trade creditors	**73,590**	62,176	**70,661**	60,135
Research revenue received in advance	**105,734**	99,558	**105,734**	99,558
Deposits	**5,178**	5,798	**8,345**	6,848
Other creditors	**23,509**	28,262	**19,075**	22,666
Carrying amount of financial liabilities	**245,766**	237,816	**241,570**	231,229

Accounting Policy

Financial Assets

CSIRO classifies its financial assets in the following categories: available for sale financial assets and loans and receivables. The classification depends on the nature and the purpose of financial assets and is determined at the time of initial recognition. Financial assets are recognised and derecognised upon trade date.

Available-for-Sale Financial Assets

Available-for-sale financial assets are non-derivatives that are either designated in this category or not classified in any of the other categories. Available-for-sale financial assets are recorded at fair value. Gains and losses arising from changes in fair value are recognised directly in the reserves (equity) with the exception of impairment losses. Interest is calculated using the effective interest method and foreign exchange gains and losses on monetary assets are recognised directly in profit or loss. Where the asset is disposed of or is determined to be impaired, part (or all) of the cumulative gain or loss previously recognised in the reserve is included in the operating result for the period.

Effective Interest Method

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset or, where appropriate, a shorter period.

Income is recognised on an effective interest rate basis, except for financial assets that are recognised at fair value through profit and loss.

Fair value of Investments in Listed Companies

The fair value of investments in listed companies has been determined by reference to their closing bid price at the reporting date.

Fair value of Investments in Unlisted Companies

For investments in unlisted companies where there is no readily available market pricing for the equity instruments, the fair value has been determined by applying valuation techniques in line with the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation (IPEV) Guidelines'.

Where recent transactions for the unlisted companies' equity have taken place, these equity transaction prices are used to value CSIRO's investment.

For unlisted companies that have not had any recent equity transactions, other IPEV valuation techniques are used such as discounted cash flows and share of net assets.

In addition, independent valuations are performed as at reporting date for unlisted companies that are considered to have a material impact on CSIRO's investment portfolio.

Investments in special purpose entities are either valued at cost or share of net realisable assets since a reliable estimate of fair value cannot be established. These entities have been set up primarily to gain access to research facilities/networks, or to provide services to owners. Hence, there is no 'active market' for these equity investments. CSIRO is a long-term shareholder and is unlikely to dispose of its interest in these investments.

Loans and Receivables

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market, are classified as 'loans and receivables'. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate. All trade and other receivables are expected to be recovered in no more than 12 months.

Impairment of Financial Assets

Financial assets are assessed for impairment at the end of each reporting period.

Financial assets held at amortised cost- Where there is objective evidence that an impairment loss has been incurred for loans and receivables, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the Statement of Comprehensive Income.

Available-for-sale financial assets– Where there is objective evidence that an impairment loss on an available-for-sale financial asset has been incurred, the amount of the difference between its cost, less principal repayments and amortisation, and its current fair value, less any impairment loss previously recognised in expenses, is transferred from equity to the Statement of Comprehensive Income.

Available-for-sale financial assets (held at cost)- Where there is objective evidence that an impairment loss has been incurred, the amount of the impairment loss is the difference between the carrying amount of the asset and the present value of the estimated future cash flows discounted at the current market rate for similar assets.

Financial Liabilities

Financial liabilities are recognised and derecognised upon trade date. Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

	Consolidated		CSIRO	
	2017	2016	**2017**	2016
	$'000	$'000	**$'000**	$'000
Note 4.2B: Net income and expense from financial assets				
Cash at bank and term deposits				
Interest revenue	**8,752**	9,296	**6,264**	6,457
Net gain from financial assets	**8,752**	9,296	**6,264**	6,457

Note 4.2C: Net income and expense from financial liabilities				
Finance leases				
Interest expense	**2,332**	2,201	**2,321**	2,178
Net loss from financial liabilities	**2,332**	2,201	**2,321**	2,178

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4.3. Fair value measurement

Significant Accounting Judgements and Estimates

In the process of applying the accounting policies listed in this note, CSIRO has made the following judgements that have the most significant impact on the amounts recorded in the financial statements:

- The fair value of properties classified as 'properties held for sale' has been taken to be the market value (level 1 inputs), and for 'investment properties' has been taken to be the market value (level 2 inputs), of similar properties as determined by an independent valuer;
- The fair value of land which will continue to be used for research activities, and buildings held for specialised purposes and where there is no readily available market price has been taken to be Fair Value- Highest and Best Use (level 3 inputs), as determined by an independent valuer;
- The fair value of plant and equipment has been taken to be Fair Value – Highest and Best Use (level 3 inputs) as they mainly comprise of specialised research equipment. Fair value is determined by an independent valuer; and
- The fair value of listed companies is assessed at market value (level 1 inputs); whereas unlisted companies and commercial vehicles are assessed at fair value using the best information available (level 1 and 3 inputs). For investments in unlisted companies where there is no readily available market pricing, the fair value has been determined by applying valuation techniques in line with the generally accepted valuation guidelines 'International Private Equity and Venture Capital Valuation Guidelines (IPEV).' Where recent transactions for the unlisted companies' equity have taken place, these equity transaction prices are used to value CSIRO's investment. For unlisted companies that have not had any recent equity transactions, other IPEV valuation techniques are used such as discounted cash flows and share of net assets. Investments in special purpose entities are either valued at cost of share of net realisable assets since a reliable estimate of fair value cannot be established. These entities have been set up primarily to gain access to research facilities/networks, or to provide services to owners. Hence, there is not 'active market' for these equity investments.

No accounting assumptions and estimates have been identified that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next reporting period.

Note 4.3A: Fair value measurement

	Fair value measurements at the end of the reporting period	
	2017	**2016**
	$'000	**$'000**
Financial assets		
Available for sale financial assets	**36,212**	21,386
Total financial assets	**36,212**	21,386
Non-financial assets		
Land	**384,489**	384,674
Buildings	**1,191,397**	1,220,662
Plant and equipment	**572,400**	580,878
Investment Properties	**51,110**	50,222
Properties Held For Sale	**5,200**	5,200
Heritage and cultural	**4,206**	4,206
Total non-financial assets	**2,208,802**	2,245,842
Total fair value measurements (assets)	**2,245,014**	2,267,228

The above disclosure represents the consolidated financial position of the Group.

5. Other information

5.1. Cooperative Research Centres (CRCs)

All CRCs have been classified as joint operations as the purpose is for the pursuit of collaborative scientific research where participants share in the scientific outcomes and outputs of the CRCs. In the event that CRC research results in a move to commercialisation, a separate legal entity is established and the CSIRO's share of the new entity is treated either as subsidiary, joint venture or associate in the Statement of Financial Position as appropriate.

CSIRO's total cash and in-kind contribution (e.g. staff and use of assets) to CRCs from its own resources was $13.9 million for the year (2016: $9.1 million). Contributions made by CSIRO are expensed as incurred and these are included in the Statement of Comprehensive Income.

No contingent liabilities were reported by the CRC's in which CSIRO is a participant.

CSIRO is a participant in the following CRCs as at 30 June 2017.

Name of CRC	Scheduled Termination Date
Alertness Safety & Productivity	30/06/20
Antarctic Climate and Ecosystems	30/06/19
Automotive Australia 2020	30/06/17
Bushfire and Natural Hazards	31/12/17
Cancer Therapeutics	30/06/20
Contaminated Assessment and Remediation of the Environment (CRC for CARE)	30/06/20
Deep Exploration Technologies CRC	30/06/18
Defence Materials Technology Centre	30/06/17
High Integrity Australian Pork	30/06/19
Innovative Manufacturing	30/06/21
Invasive Animals	30/06/17
Low Carbon Living	30/06/19
Mental Health	30/06/18
Optimising Resource Extraction	30/06/21
Plant Biosecurity	30/06/18
Polymers CRC	30/06/17
Poultry	30/06/17
Rail Manufacturing CRC	30/06/21
Remote Economic Participation CRC	30/06/17

Accounting Policy

Joint Operations – Cooperative Research Centres (CRCs)

The proportionate interests in CRCs regarded as joint operations are disclosed in the financial statements under appropriate headings. Their primary source of funding is from the Australian Government and funding is progressively drawn down over the life of the CRCs and distributed to participants, including CSIRO and universities, for research and development purposes. CSIRO's contributions to the CRCs are expensed as incurred and funds received from CRCs are recognised as revenue to the extent that work has been performed in the Statement of Comprehensive Income. CSIRO has been a participant in 19 CRCs during the financial year.

5.2. Monies Held in Trust

	2017 $'000	2016 $'000
Monies held in trust represented by cash, deposits and investments for the benefit of the Group which are not included in the Statement of Financial Position are:		
The Sir Ian McLennan Achievement for Industry Award - established to award outstanding contributions by the Group's scientists and engineers to national development.	**377**	353
The Elwood and Hannah Zimmerman Trust Fund - established to fund weevil research and the curation of the Australian National Insect Collection (ANIC) weevil collection.	**4,821**	4,905
The Schlinger Trust - established to research the taxonomy, biosystematics, general biology and biogeography of Australasian Diptera conducted by the Australian National Insect Collection.	**2,307**	2,364
Total monies held in trust as at 30 June	**7,505**	7,622

Summary of movements:	**McLennan $'000**	**Zimmerman $'000**	**Schlinger $'000**	**Total $'000**
Balance as at 1 July 2016	**353**	**4,905**	**2,364**	**7,622**
Interest and distribution	**24**	**142**	**33**	**199**
Expenditure	**-**	**(226)**	**(90)**	**(316)**
Balance as at 30 June 2017	**377**	**4,821**	**2,307**	**7,505**

5.3. Collections

CSIRO is the custodian of several collections used for scientific research. These collections have been established over time and document an extensive range of Australian flora and fauna species. The collections are irreplaceable, bear scientific and historical value and are not reliably measurable in monetary terms. Therefore, CSIRO has not recognised them as an asset in its financial statements.

The main collections held by CSIRO are:

- Australian National Herbarium (ANH) – With a focus on the Australian flora and that of neighbouring regions such as New Guinea and the Pacific, the ANH has over 1 million herbarium specimens, with additional holdings at the Australian Tropical Herbarium (ATH) in Cairns, Queensland. The ANH collections include the Dadswell Memorial Wood Collection and comprehensive holdings of a number of groups, including cryptogams, eucalypts and orchids.

- Australian National Insect Collection (ANIC) – Specialising in Australian terrestrial invertebrates, ANIC houses over 12 million specimens and is the world's largest collection of Australian insects, as well as groups such as mites, spiders, earthworms, nematodes and centipedes. ANIC is an important research collection used by CSIRO researchers, university staff, and students, and scientists from Australian and international research organisations.

- Australian National Wildlife Collection (ANWC) – Specialising in terrestrial vertebrates, ANWC contains specimens of most species of Australian mammals, birds, reptiles, and amphibians. It is particularly rich in specimens of birds from New Guinea. ANWC is a valuable asset for biologists engaged in biodiversity research. Its research library holds 60,000 recordings of wildlife sounds, more than a thousand tissue samples, and the egg collections from more than 300 bird species.

- Australian National Fish Collection (ANFC) – Specialising in marine fishes, the ANFC contains almost 150,000 specimens representing more than 3,000 species from the Indo-Pacific region. It is an invaluable resource for biodiversity and biogeographic research on Australian and Indo-Pacific fishes. Its major strengths are sharks, rays, and deep-water fishes. It also contains a large collection of images and radiographs of Australian fishes.

- Australian Tree Seed Centre (ATSC) – The ATSC is managed as a collection and research centre for Australian native tree species. For over 50 years the centre has been collecting, researching and supplying quality, fully documented tree seed to both domestic and overseas customers. Collections of seed are sourced from wild populations and genetically improved seed from our domestication and improvement programs.

- Australian National Algae Culture Collection (ANACC) – The ANACC consists of more than 300 microalgae species and is a resource for research on algal diversity, distribution, richness, and taxonomic relationships, including those of economic importance and environmental concern. Aligned with the collection is the National Algae Supply Service, which provides microalgae strains as starter cultures to industry, research, organisations and educational institutions in over 70 countries.

6. Budgetary Reports and Explanations of Major Variances

The following provides a comparison of the original budget as presented in the 2015-16 Portfolio Budget Statements to the actual outcome reported for 2016-17. The intention of this variance analysis is to provide the reader with information relevant to assessing the performance of CSIRO, including the accountability for the resources entrusted to it.

Statement of Comprehensive Income
for the period ended 30 June 2017

	Actual 2017 $'000	Consolidated Original Budget 2017 $'000	Variance 2017 $'000
NET COST OF SERVICES			
Expenses			
Employee benefits	**693,211**	**733,339**	(40,128)
Suppliers	**429,404**	**447,982**	(18,578)
Depreciation and amortisation	**172,166**	**167,999**	4,167
Finance costs	**2,332**	**2,302**	30
Write-down and impairment of assets	**1,890**	**-**	1,890
Foreign exchange losses	**1,578**	**-**	1,578
Losses from asset sales	**2,929**	**-**	2,929
Total expenses	**1,303,510**	**1,351,622**	(48,112)
Own-Source Income			
Own-source revenue			
Sale of goods and rendering of services	**367,532**	**425,759**	(58,227)
Interest	**8,752**	**7,581**	1,171
Rental income	**12,207**	**-**	12,207
Royalties and licence fees	**51,107**	**40,196**	10,911
Other revenues	**61,911**	**20,426**	41,485
Sale of equity investments and intellectual property	**8,258**	**-**	8,258
Total own-source revenue	**509,767**	**493,962**	15,805
Gains			
Net gain from sales of assets	**-**	**6,000**	(6,000)
Foreign exchange gains	**-**	**-**	-
Gain on revaluation of investment properties	**888**	**-**	888
Total gains	**888**	**6,000**	(5,112)
Total own-source income	**510,655**	**499,962**	10,693
Net cost of services	**(792,855)**	**(851,660)**	58,805
Revenue from Government	**787,267**	**787,267**	-
Share of net operating surplus/(deficit) of joint venture accounted for using equity method	**-**	**-**	-
Surplus on continuing operation	**787,267**	**787,267**	-
Surplus/(Deficit) attributable to the Australian Government	**(5,588)**	**(64,393)**	58,805
OTHER COMPREHENSIVE INCOME			
Items not subject to subsequent reclassification to net cost of services			
Increase/(decrease) in asset revaluation reserves	**-**	**-**	-
Items subject to subsequent reclassification to net cost of services			
Increase/(decrease) in other reserves	**6,478**	**-**	6,478
Total other comprehensive income	**6,478**	**-**	6,478
Total comprehensive income/(loss) attributable to the Australian Government	**890**	**(64,393)**	65,283

Statement of Financial Position
as at 30 June 2017

	Actual 2017 $'000	Consolidated Original Budget 2017 $'000	Variance 2017 $'000
ASSETS			
Financial Assets			
Cash and cash equivalents	**299,867**	**152,452**	147,415
Trade and other receivables	**82,947**	**57,176**	25,771
Investments accounted for using the equity method	**-**	**50,010**	(50,010)
Other investments	**36,212**	**14,540**	21,672
Total financial assets	**419,026**	**274,178**	144,848
Non-Financial Assets			
Land and buildings	**1,575,886**	**1,563,460**	12,426
Plant and equipment	**572,400**	**575,678**	(3,278)
Heritage and cultural	**4,206**	**-**	4,206
Intangibles	**19,780**	**18,811**	969
Investment properties	**51,110**	**49,292**	1,818
Inventories	**1,474**	**1,235**	239
Other non-financial assets	**41,337**	**42,814**	(1,477)
Total non-financial assets	**2,266,193**	**2,251,290**	14,903
Properties held for sale	**5,200**	**-**	5,200
Total assets	**2,690,419**	**2,525,468**	164,951
LIABILITIES			
Payables			
Suppliers	**73,590**	**32,188**	41,402
Other payables	**129,243**	**133,739**	(4,496)
Total payables	**202,833**	**165,927**	36,906
Interest Bearing Liabilities			
Leases	**37,755**	**37,755**	-
Deposits	**5,178**	**5,559**	(381)
Total Interest bearing liabilities	**42,933**	**43,314**	(381)
Provisions			
Employee provisions	**217,164**	**196,817**	20,347
Provision for remediation	**28,665**	**-**	28,665
Total provisions	**245,829**	**196,817**	49,012
Total liabilities	**491,595**	**406,058**	85,537
Net assets	**2,198,824**	**2,119,410**	79,414
EQUITY			
Contributed equity	**280,954**	**299,737**	(18,783)
Asset revaluation reserves	**1,381,732**	**1,388,626**	(6,894)
Other reserves	**5,376**	**-**	5,376
Retained surplus	**530,762**	**431,047**	99,715
Total equity	**2,198,824**	**2,119,410**	79,414

Statement of Changes in Equity

for the period ended 30 June 2017

	Retained earnings			Asset revaluation reserve			Other reserves			Contributed equity/capital			Total equity		
	Actual	Original Budget	Variance	Actual	Original Budget	Variance	Actual	Original Budget	Variance	Actual	Original Budget	Variance	Actual	Original Budget	Variance
	2017	**2017**	2017	**2017**	**2017**	2017	**2017**	**2017**	2017	**2017**	**2017**	2017	**2017**	**2017**	2017
	$'000	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000	**$'000**	**$'000**	$'000
Opening balance	**532,021**	**495,440**	36,581	**1,387,548**	**1,389,371**	(1,823)	**(1,704)**	**(745)**	(959)	**270,954**	**291,684**	(20,730)	**2,188,819**	**2,175,750**	13,069
Comprehensive income															
Other comprehensive income	-	-	-	-	-	-	**7,080**	-	7,080	-	-	-	**7,080**	-	7,080
Surplus/(deficit) for the period	**(5,588)**	**(64,393)**	58,805	-	-	-	-	-	-	-	-	-	**(5,588)**	**(64,393)**	58,805
Total comprehensive income	**(5,588)**	**(64,393)**	58,805	-	-	-	**7,080**	-	7,080	-	-	-	**1,492**	**(64,393)**	65,885
Other Movements (NICTA Transfer)	**4,329**		4,329			-			-	-		-	**(1,487)**	-	(1,487)
Contributions by owners															
Equity injection	-	-	-	-	-	-	-	-	-	**10,000**	**10,000**	-	**10,000**	**10,000**	-
Contributions by owners – other	-	-	-	-	-	-	-	-	-	-	**(1,947)**	1,947	-	**(1,947)**	1,947
Closing balance	**530,762**	**431,047**	99,715	**1,387,548**	**1,389,371**	(1,823)	**5,376**	**(745)**	6,121	**280,954**	**299,737**	(20,730)	**2,198,824**	**2,119,410**	79,414

Cash Flow Statement

for the period ended 30 June 2017

	Actual 2017 $'000	Original Budget 2017 $'000	Variance 2017 $'000
OPERATING ACTIVITIES			
Cash received			
Receipts from Government	**787,267**	**787,267**	-
Goods and services	**505,642**	**460,274**	45,368
Interest	**8,952**	**8,588**	364
Net GST received	**19,728**	**45,006**	(25,278)
Deposits	**-**	**-**	-
Other	**-**	**16,875**	(16,875)
Total cash received	**1,321,589**	**1,318,010**	3,579
Cash used			
Employees	**712,103**	**761,924**	(49,821)
Suppliers	**481,898**	**475,350**	6,548
Finance costs	**2,332**	**2,050**	282
Deposits	**587**	**-**	587
Net GST paid	**-**	**41,939**	(41,939)
Other	**-**	**613**	(613)
Total cash used	**1,196,920**	**1,281,876**	(84,956)
Net cash from operating activities	**124,669**	**36,134**	88,535
INVESTING ACTIVITIES			
Cash received			
Proceeds from sales of property, plant and equipment	**3,298**	**46,300**	(43,002)
Proceeds from sales of equity investments and intellectual property	**6,508**	**-**	6,508
Total cash received	**9,806**	**46,300**	(36,494)
Cash used			
Purchase of property, plant and equipment	**139,692**	**111,926**	27,766
Equity investments	**2,686**	**10,000**	(7,314)
Other selling costs	**59**	**-**	59
Total cash used	**142,437**	**121,926**	20,511
Net cash from (used by) investing activities	**(132,631)**	**(75,626)**	(57,005)
FINANCING ACTIVITIES			
Cash received			
Contributed equity	**10,000**	**10,000**	-
Other	**-**	**-**	-
Total cash received	**10,000**	**10,000**	-
Cash used			
Finance leases	**4,267**	**-**	4,267
Total cash used	**4,267**	**-**	4,267
Net cash from financing activities	**5,733**	**10,000**	(4,267)
Net increase (decrease) in cash held	**(2,229)**	**(29,492)**	27,263
Cash and cash equivalents at the beginning of the reporting period	**302,096**	**181,943**	120,153
Cash and cash equivalents at the end of the reporting period	**299,867**	**152,451**	147,416

Explanation of Major Variances

Australian Accounting Standard AASB 1055 *Budgetary Reporting* requires variance explanations of major variances between the original budget as presented in the 2016-17 Portfolio Budget Statements and the actual outcome as reported in these financial statements. CSIRO considers that major variances are those greater than 10% of the original estimate and that are relevant to an assessment of the discharge of accountability and to an analysis of the performance of the entity. Variances below this threshold are not included unless considered significant by their nature.

It should be noted that the original budget was prepared before the 2015-16 actual figures could be known. As a consequence the opening balance of the 2016-17 Statement of Financial Position needed to be estimated and in some cases, variances between 2016-17 actuals and budget numbers can be, at least in part, attributed to unanticipated movements in the prior period figures. Variances attributable to factors which would not reasonably have been identifiable at the time of the budget preparation, such as the revaluation of plant and equipment and investment properties, sale of equity investments, and impairment of assets, have not been included as part of the explanation.

The Budget is not audited.

Statement of Comprehensive Income

CSIRO's *employee benefits* were $40.1m below budget, due to CSIRO's actual average staffing levels throughout the year being below what was included in the budget, as well as movements in the bond rate which could not be foreseen in the budget.

The Science Industry Endowment Fund entered into a contract with the NSW Government, providing $25m of unbudgeted *other revenue* to create the NSW STEM (science, technology, engineering and mathematics) Foundation Initiatives' Program to increase the supply of STEM skilled labour to meet the current and future needs of New South Wales.

Actual *royalties and licensing* revenues was higher than expected due to additional licensing revenues not foreseen at the time of preparing the budget. *Sale of good and rendering of services* revenue was below budget due to tightening external market conditions in some sectors.

Statement of Financial Position

The Portfolio Budget Statements are prepared on the basis of only including General Government Sector (GGS) entities, whereas, the Financial Statements for CSIRO include the results of CSIRO and all controlled entities, regardless of whether they are within the GGS or not. Therefore, there is a difference in accounting treatment between the two, resulting in the budget containing the Innovation Fund investment as an *Investment accounted for using the equity method*, while the Financial Statements account for this investment in the consolidation as *Cash and cash* equivalents held by a controlled entity.

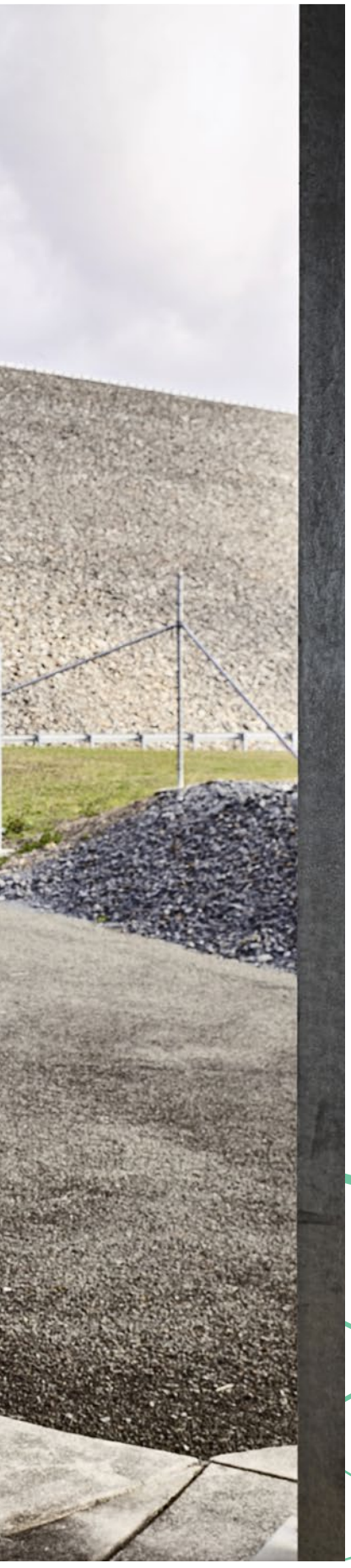
Properties held for sale was expected to be $0 at the time of the budget, due to the expectation that the sale of the CSIRO Belmont site would have been finalised by June 2017, however, this has been delayed until 2017-18.

A *provision for remediation* of $28.7m remains from 2016 for the clean-up of waste materials at a remote facility and was not factored into the budget.

Cash Flow Statement

Variances relating to cash flows occur because of the factors detailed under Income Statement and Balance Sheet.

Our research aims to help Australia better manage its river basins and groundwater resources, and improve social, economic and environmental benefits from water resources management.



Part 5
Appendices

Appendix 1: Service charter

CSIRO's service charter describes the standards of service we aim to deliver to our customers and our commitment to ensuring that these standards are maintained.

In summary:

- We believe our customers and partners are essential to our success.
- We maintain relevance in our work through input from the public, government, industry and the research community.
- We communicate with our customers in a courteous, helpful and professional manner.
- We respect customer confidentiality.
- We evaluate our services to ensure the highest standards.

Our full service charter is available at: www.csiro.au/Service-Charter.

CSIRO welcomes feedback on its performance. Contact the CSIRO officer with whom you have been dealing or CSIRO Enquiries, who can direct your feedback to the relevant person:

Private Bag 10, Clayton South VIC 3169
t 1300 363 400
e csiroenquiries@csiro.au

Appendix 2: Administrative law

The *Freedom of Information Act 1982* (FOI Act) provides the public with a general right of access to documents held by Australian Government agencies, including CSIRO. The general right is limited by exceptions to protect essential public interests, and the privacy or business affairs of those who give information to the agency. In the reporting year to 30 June 2017, CSIRO received 47 requests for information under the FOI Act.

General information about CSIRO FOI procedures, including how to make an FOI request is at: www.csiro.au/en/About/Access-to-information/Freedom-of-Information.

Part V of the FOI Act confers a right to request CSIRO to amend a document to which lawful access has been granted, where the applicant claims that information in the document:

- relates to his or her personal affairs
- is incomplete, incorrect, out of date or misleading
- has been used, is being used or is available for use by the agency or Minister for an administrative purpose.

During 2016–2017, CSIRO received no requests for amendments of personal information under the FOI Act.

INFORMATION PUBLICATION SCHEME

CSIRO is required to publish information to the public as part of the Information Publication Scheme. This requirement is in Part II of the FOI Act and has replaced the former requirement to publish a section 8 statement in an annual report. CSIRO provides a plan on its website showing what information it publishes in accordance with the Information Publication Scheme requirements.

Members of the public may obtain access to scientific and technical publications from CSIRO Publishing (www.publish.csiro.au) and the ePublish Repository (publications.csiro.au). Research data used by CSIRO is routinely published on the CSIRO Data Access Portal (data.csiro.au/dap/browse).

ARCHIVES, PRIVACY AND ADMINISTRATIVE DECISIONS

CSIRO maintains an archives collection that includes material from the Council for Science and Industrial Research, the predecessor of CSIRO, dating from 1926. Certain CSIRO records are held by the National Archives of Australia.

Disposal arrangements for CSIRO records are made in accordance with the *Archives Act 1983*. Access to records over 20 years old is provided in accordance with that Act.

The *Privacy Act 1988* provides for Australian Privacy Principles. During 2016–17, the Office of the Australian Information Commissioner undertook no investigations under section 36 of the *Privacy Act 1988* in relation to CSIRO.

The *Administrative Decisions (Judicial Review) Act 1977* enables a person aggrieved by certain classes of administrative decisions made by Australian Government agencies, including CSIRO, to obtain reasons for or to challenge those decisions. During 2016–17, CSIRO received no challenges or requests for statements of reasons under the Act.

CONTACT

All enquiries under the above legislation (including FOI requests) should be directed to:

FOI, CSIRO
GPO Box 1700
Canberra ACT 2601
t 02 6276 6431
e FOI@csiro.au

PUBLIC INTEREST DISCLOSURE

The *Public Interest Disclosure Act 2013* (PID Act) came into effect on 15 January 2014. Internal procedures have been implemented to meet compliance through a Public Interest Disclosure (PID) Scheme. The PID Scheme promotes integrity and accountability by encouraging the disclosure of information about suspected wrongdoing, protecting people who make disclosures and ensuring we takes appropriate action. CSIRO has contributed to the Commonwealth Ombudsman's annual report on the PID, as required in section 76(3) of the Act. In 2016–17, CSIRO assessed five matters as public interest disclosures under s26 of the PID Act. Two matters proceeded to investigation under s47 of the Act.

Appendix 3: Consultancy services

CSIRO engages consultants where it lacks specialist expertise or when independent research, review or assessment is required. Consultants are typically engaged to investigate or diagnose a defined issue or problem; carry out defined reviews or evaluations; or provide independent advice, information or creative solutions to assist in our decision-making.

Before engaging consultants, CSIRO takes into account the skills and resources required for the task, the skills available internally and the cost-effectiveness of engaging external expertise. The decision to engage a consultant is made in accordance with the Commonwealth Procurement Rules (CPRs), CSIRO's procurement policy and other relevant internal policies.

CSIRO's policy on selection and engagement of consultants is based on the principles of[40]:

- value for money
- open and effective competition
- ethics and fair dealing
- accountability and reporting
- national competitiveness and industry development
- support for other Australian Government policies.

Tables 5.1, 5.2 and 5.3 summarise the consultancies, annual spend and let, the reason for the consultancy and the procurement method. All values include goods and services tax.

TABLE 5.1: ANNUAL SPEND ON CONSULTANCIES

YEAR	SPENT ($)	LET ($) (ESTIMATED WHOLE OF LIFE)
2012–13	1,104,000	1,417,754
2013–14	5,294,552	5,796,633
2014–15	630,870	737,617
2015–16	373,751	853,957
2016–17	1,642,455	1,440,220
TOTAL	**9,045,628**	**10,246,181**

40 These principles are included within CSIRO's Procurement Policy and Procedures.

TABLE 5.2: SUMMARY BY REASON CODE

CATEGORY CODE	REASON FOR CONSULTANCY	NUMBER OF CONSULTANCIES	VALUE ($)
IS	Need for independent study/evaluation	9	905,209
PA	Need for professional assistance to manage and facilitate change and its consequence	0	0
SS	Specialist skills were not otherwise available	6	535,011
TOTAL		**15**	**1,440,220**

TABLE 5.3: SUMMARY BY PROCUREMENT METHOD CODE

CATEGORY CODE	PROCUREMENT METHOD	NUMBER OF CONSULTANCIES	VALUE ($)
OT	Tenders sought from the marketplace through Open Approach (Request for Proposal, Request for Tender, Expressions of Interest).	0	0
PM	An existing panel member—this category includes standing offers, common use arrangements and approved supplier panels.	11	1,048,474
ST	Tenders being sought from suppliers who have pre-qualified through some form of previous competitive process.	0	0
RQ	Purchasing was undertaken in accordance with Division 1 of the CPRs and procurement did not require application of Division 2 of the CPRs.	4	391,746
EX	Exemption applied that saw CSIRO undertake the procurement as a Limited Tender as defined in Division 2 of the CPRs.	0	0
TOTAL		**15**	**1,440,220**

Appendix 4: Science and Industry Endowment Fund Annual Report 2016–17

TRUSTEE'S REPORT

As the Science and Industry Endowment Fund (SIEF) enters its 90th year, I'm honoured to have led it through a period of exciting change, as we completed projects funded under the 2009 CSIRO gift and embraced the exciting new prospects of fresh funding sources.

SIEF begins the new year with programs like STEM+ Business Fellowships, which builds deeper collaboration between researchers and SMEs, and the Experimental Development Program, which accelerates research into applications as diverse as prawn farming, cropping, drone mapping and navigation, hydrogen fuels and dry ice manufacture.

The impacts of SIEF's investment in the national innovation system are significant and, this year, we welcomed the outcomes of an evaluation of the impact and value of SIEF activities. The Impact Review considers not only return-on-investment measures, but the full scale and scope of SIEF's impacts and the associated value. The report evaluated the prospective benefits of five representative SIEF-funded research projects (Energy Waste, Early Nutrition, Plant Breeding, RAFT for medical applications and Distal Footprints), and a sixth, eReefs, previously analysed as part of an impact assessment.

The review found that while SIEF has invested $153.2 million in strategic scientific research since 2009, it has delivered more than 20 times that value in the six case studies alone, with a net present value of $3.5 billion. In fact, benefits resulting from just the three highest yielding projects would largely offset the full amount spent by SIEF across all its programs.

SIEF's contribution to Australia is not just scientific and economic, it also supporting the growth of our STEM workforce capacity and capability. Over the period 2010 to 2016, SIEF has supported the development of five leading-edge, strategic and cross-disciplinary research facilities. SIEF has also supported 302 ECRs through its Promotion of Science and Research Projects programs, with almost 40 per cent of them being women. ECRs surveyed as part of the Impact Review said the SIEF program provided them with mentoring and general advice, helped them to develop collaborative relationships and improved their career mobility and research and non-research skills. This, in turn, has helped ECRs develop their research track record and establish their research careers. All this significantly contributes to the capacity and quality of research and development undertaken in the Australian innovation system.

SIEF Experimental Development Program projects

Hydrogen as fuel

As it enters its second year, the Experimental Development Program (EDP) is funding a new project to address the growing global demand for clean hydrogen fuel. The two-year project builds on CSIRO's expertise in separating pure hydrogen from mixed gas streams and converting ammonia to high-purity hydrogen. By using ammonia produced in Australia, renewable hydrogen can be distributed to new markets in Japan, Korea and Europe using existing infrastructure. This research is a significant opportunity to bridge the gap in the technology chain for a device that can efficiently and inexpensively convert ammonia into high-purity hydrogen at or near the point of use. This has great potential to establish an Australian renewable hydrogen export industry.

Spray-on polymer membrane

The Spray-on Polymer Membrane EDP project supports the development of a product that improves the retention of water in soils using a sprayable membrane that is applied to the soil surface to improve crop productivity. Efficiencies are achieved by reducing soil evaporation so more water is retained in the soil. It also inhibits weed growth so competition for the water in the soil is reduced. The saved water is used by the crop plants through the transpiration process to produce greater yields, more income and improved farm profitability. The polymer membrane is biodegradable and does not pollute soil and water systems. The membrane is the result of research in CSIRO's Agriculture and Manufacturing teams and was further developed through CSIRO's ON accelerator.

Collaborations between researchers and SMEs

SIEF's STEM+ Business Fellowship program teamed 19 SMEs from across Australia with some of the brightest and best early-career researchers in science, technology, engineering and mathematics to work on business-relevant innovation projects.

The program is forging closer links between research and industry, a key objective of the National Innovation and Science Agenda. The STEM+ Business Fellowship Program provides grants of up to $105,000 per annum to 2-3 year research projects that will create industry savvy early-career researchers for the future.

Supporting early-career scientists

The inspiring Lindau Nobel Laureate Meetings, held annually in Germany since 1951, introduce Nobel Prize winners in chemistry, physiology, medicine and physics to younger generations of scientists. Since 2013, SIEF has worked with the Australian Academy of Science (AAS) to provide fellowships for Australian-based early-career scientists to attend the Lindau Meetings. This unique experience allows attendees to interact with their science heroes, exchange ideas, gain exposure to areas in their chosen disciplines and establish new contacts and networks with their peers. The 67th meeting of Nobel Laureates focused on chemistry and was attended by a SIEF-AAS delegation of nine outstanding young Australian scientists. This was followed by a once-in-a-lifetime study tour of world class chemistry research facilities and equipment.

The Australian delegation with Nobel Laureate Marty Chalfie. Image: Australian Academy of Science

SIEF advisory bodies

Advisory Council

Prof Alan Robson (Chair)
Mr Nigel Poole
Dr Peter Riddles
Dr Ezio Rizzardo
Prof Margaret Sheil
Prof Tom Spurling

Expert Panel

Prof Tom Spurling (Chair)
Dr Oliver Mayo
Dr Trevor Powell
Dr Ezio Rizzardo
Prof Elaine Sadler

EDP Review Panels

Dr Peter Riddles (Chair)
Mr Nigel Poole

In addition to the advisory bodies, a large number of reviewers continue to generously contribute their time and expertise, for which I am very grateful. As another year closes on my role as Trustee of SIEF, I couldn't be prouder of the demonstrable gains we've made. SIEF continues to be a vital endowment at every stage of the science cycle, from supporting STEM education, growing early-career scientists, to strengthening science and industry partnerships. It is a crucial and valuable part of the national innovation system that secures the future innovation of our nation and the world.

Dr Larry Marshall
SIEF Trustee

INDEPENDENT AUDITOR'S REPORT

To the Trustee of the Science and Industry Endowment Fund

Opinion

In my opinion, the financial report of the Science and Industry Endowment Fund for the year ended 30 June 2017:

(a) gives a true and fair view of the financial position of the Science and Industry Endowment Fund as at 30 June 2017 and its financial performance and cash flows for the year then ended; and

(b) complies with Australian Accounting Standards.

The financial report of the Science and Industry Endowment Fund, which I have audited, comprise the following statements as at 30 June 2017 and for the year then ended:

- Statement by the Trustee and Chief Finance Officer of Commonwealth Scientific and Industrial Research Organisation (CSIRO) as Service Provider to the Science and Industry Endowment Fund;
- Statement of Comprehensive Income;
- Statement of Financial Position;
- Statement of Changes in Equity;
- Cash Flow Statement; and
- Notes to and forming part of the financial report, including a Summary of Significant Accounting Policies.

Basis for Opinion

I conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. My responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of my report. I am independent of the Science and Industry Endowment Fund in accordance with the relevant ethical requirements for financial statement audits conducted by the Auditor-General and his delegates. These include the relevant independence requirements of the Accounting Professional and Ethical Standards Board's APES 110 *Code of Ethics for Professional Accountants* to the extent that they are not in conflict with the *Auditor-General Act 1997* (the Code). I have also fulfilled my other responsibilities in accordance with the Code. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my opinion.

Trustee's Responsibility for the Financial Statements

The Trustee of the Science and Industry Endowment Fund is responsible for the preparation of a financial report that gives a true and fair view and that comply with Australian Accounting Standards. The Trustee is also responsible for such internal control as they determine is necessary to enable the preparation of a financial report that gives a true and fair view and that is free from material misstatement, whether due to fraud or error.

In preparing the financial report, the Trustee is responsible for assessing the Science and Industry Endowment Fund's ability to continue as a going concern, disclosing matters related to going concern as applicable and using the going concern basis of accounting unless the Trustee either intends to liquidate the entity or to cease operations, or has no realistic alternative but to do so.

GPO Box 707 CANBERRA ACT 2601
19 National Circuit BARTON ACT
Phone (02) 6203 7300 Fax (02) 6203 7777

Auditor's Responsibilities for the Audit of the Financial Statements

My objective is to obtain reasonable assurance about whether the financial report as a whole is free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes my opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with the Australian National Audit Office Auditing Standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of the financial statements.

As part of an audit in accordance with the Australian National Audit Office Auditing Standards, I exercise professional judgement and maintain professional scepticism throughout the audit. I also:

- identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for my opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control;
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control;
- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by the Trustee;
- conclude on the appropriateness of the Trustee's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the entity's ability to continue as a going concern. If I conclude that a material uncertainty exists, I am required to draw attention in my auditor's report to the related disclosures in the financial report or, if such disclosures are inadequate, to modify my opinion. My conclusions are based on the audit evidence obtained up to the date of my auditor's report. However, future events or conditions may cause the entity to cease to continue as a going concern; and
- evaluate the overall presentation, structure and content of the financial report, including the disclosures, and whether the financial report represents the underlying transactions and events in a manner that achieves fair presentation.

I communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that I identify during my audit.

Australian National Audit Office

Lesa Craswell
Acting Executive Director

Delegate of the Auditor-General

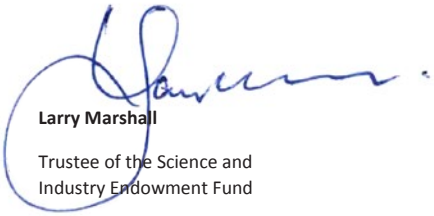
Canberra
14 August 2017

SCIENCE AND INDUSTRY ENDOWMENT FUND

STATEMENT BY TRUSTEE AND CHIEF FINANCE OFFICER OF COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION (CSIRO) AS SERVICE PROVIDER TO THE SCIENCE AND INDUSTRY ENDOWMENT FUND

In our opinion, the attached financial report for the year ended 30 June 2017 has been prepared based on properly maintained financial records and in accordance with Australian Accounting Standards and other mandatory financial reporting requirements in Australia, and give a true and fair view of the financial position of the Science and Industry Endowment Fund as at 30 June 2017 and of its performance for the year then ended.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Science and Industry Endowment Fund will be able to pay its debts as and when they become due and payable.



Larry Marshall

Trustee of the Science and Industry Endowment Fund

14 August 2017

Tom Munyard

Chief Finance Officer of CSIRO as service provider to the Science and Industry Endowment Fund

14 August 2017

SCIENCE AND INDUSTRY ENDOWMENT FUND

STATEMENT OF COMPREHENSIVE INCOME

For the period ended as at 30 June 2017

	Notes	2017	2016
		$	$
EXPENSES			
Scientific research grants	1	**17,672,851**	14,833,647
Service fee under Services Agreement with CSIRO		**525,718**	424,789
Consulting fees		**178,891**	60,000
Audit fees		**15,000**	15,000
Advertising and approval fees	2	**-**	5,343
Other fees		**6**	35
Total expenses		**18,392,466**	15,338,814
LESS:			
REVENUE			
NSW Government Endowment contribution		**25,000,000**	-
Scientific grant program refunds		**71,352**	78,359
Interest	4	**1,723,749**	2,240,969
Resources received free of charge	2	**-**	5,343
Total revenue		**26,795,101**	2,324,671
Net profit/ (deficit)		**8,402,635**	(13,014,143)
Other comprehensive income		-	-
Total comprehensive profit/ (loss)		**8,402,635**	(13,014,143)

The above statement should be read in conjunction with the accompanying notes.

SCIENCE AND INDUSTRY ENDOWMENT FUND

STATEMENT OF FINANCIAL POSITION

For the period ended as at 30 June 2017

	Notes	2017	2016
		$	$
ASSETS			
Cash	5	**75,804,536**	67,135,320
Interest receivable	6	**439,736**	450,752
GST receivable	6	**152,119**	412,589
Other receivables	6	**14,223**	40,480
Total Assets		**76,410,614**	68,039,141
LIABILITIES			
Payables			
Shared service fee payable		**113,220**	124,865
Accrued expenses	7	**15,000**	34,517
Total payables		**128,220**	159,382
Total liabilities		**128,220**	159,382
Net assets		**76,282,394**	67,879,759
EQUITY			
Contributed equity		**200,000**	200,000
Retained surplus		**76,082,394**	67,679,759
Total equity		**76,282,394**	67,879,759

SCIENCE AND INDUSTRY ENDOWMENT FUND

STATEMENT OF CHANGES IN EQUITY

For the period ended as at 30 June 2017

	Retained Surplus		Contributed Equity		Total Equity	
	2017	2016	**2017**	2016	**2017**	2016
	$	$	**$**	$	**$**	$
Opening Balance	**67,679,759**	80,693,902	**200,000**	200,000	**67,879,759**	80,893,902
Net profit/ (deficit)	**8,402,635**	(13,014,143)	**-**	-	**8,402,635**	(13,014,143)
Closing Balance	**76,082,394**	67,679,759	**200,000**	200,000	**76,282,394**	67,879,759

The above statement should be read in conjunction with the accompanying notes

SCIENCE AND INDUSTRY ENDOWMENT FUND

CASH FLOW STATEMENT

For the period ended as at 30 June 2017

	Notes	2017	2016
		$	$
OPERATING ACTIVITIES			
Cash received			
Scientific research grant refunds		**111,832**	37,879
Interest received		**1,734,764**	2,537,673
NSW Government Endowment contribution		**25,000,000**	-
Net GST received		**2,072,115**	1,708,280
Total cash received		**28,918,711**	4,283,832
Cash used			
Payments to grantees		**19,590,962**	17,250,665
Other payments		**658,529**	522,603
Bank fees paid		**4**	35
Total cash used		**20,249,495**	17,773,303
Net cash provided/(used) by operating activities	8	**8,669,216**	(13,489,471)
Net increase/(decrease) in cash held		**8,669,216**	(13,489,471)
Cash at the beginning of the reporting period		**67,135,320**	80,624,791
Cash at the end of the reporting period		**75,804,536**	67,135,320

The above statement should be read in conjunction with the accompanying notes

SCIENCE AND INDUSTRY ENDOWMENT FUND

NOTES TO AND FORMING PART OF THE FINANCIAL REPORT

For the period ended as at 30 June 2017

Overview

The Science and Industry Endowment Fund (referred to as the Fund) was established under the *Science and Industry Endowment Act 1926* with the Trustee of the Fund being the CSIRO Chief Executive and is a not-for-profit entity. An appropriation of 100 000 pounds was received at the time the Fund was established. The principal activity of the Fund is to provide assistance to persons engaged in scientific research and in the training of students in scientific research.

In October 2009 the Minister for Innovation, Industry, Science and Research announced a gift of $150 million to be donated by CSIRO to the Fund. The gift is intended to be used for scientific research for the purposes of assisting Australian industry, furthering the interests of the Australian community or contributing to the achievement of Australian national objectives. The gift was made subject to the terms of a Deed of Gift between the Trustee and CSIRO dated 15 October 2009. The maximum amount to be disbursed from the Gift Fund in any one financial year does not exceed $25 million Goods and Services Tax (GST) exclusive. The total cash payments made in 2016-17 under the Deed of Gift was $18,406,981.

In June 2017, the NSW STEM Foundation Initiatives' Program was created to establish and implement a program of activities including research, to increase the supply of STEM (science, technology, engineering and mathematics) skilled labour to meet the current and future needs of New South Wales.

Basis of Preparation of the Financial Statements

The financial statements for the Fund are general purpose financial statements and are required by section 10 of the *Science and Industry Endowment Act 1926.* They have been prepared in accordance with Australian Accounting Standards, Australian Accounting Interpretations, and other authoritative pronouncements of the Australian Accounting Standards Board.

The financial statements have been prepared on an accrual basis and are in accordance with the historical cost convention. No allowance is made for the effect of changing prices on the results or the financial position.

Assets and liabilities are recognised in the Statement of Financial Position when, and only when, it is probable that future economic benefits will flow and the amounts of the assets or liabilities can be reliably measured.

Revenues and expenses are recognised in the Statement of Comprehensive Income when, and only when, the flow or consumption or loss of economic benefits has occurred and can be reliably measured.

The financial report is presented in Australian Dollars and values are rounded to the nearest dollar unless otherwise specified.

Significant Accounting Judgements and Estimates and New Accounting Standards

No accounting assumptions or estimates have been identified that have a significant impact on the amounts recorded in the financial statements.

The Fund has reviewed new standards, revised standards and interpretations/amending standards issued prior to the signing of the financial statements and has implemented the revised disclosure requirements under AASB 124 Related Parties Disclosures.

Events after the Reporting Period

At the time of completion of this note, the Trustee is not aware of any significant events occurring after the reporting date that could impact on the financial report.

Taxation

The Fund is exempt from all forms of taxation except the GST.

SCIENCE AND INDUSTRY ENDOWMENT FUND

NOTES TO AND FORMING PART OF THE FINANCIAL REPORT

For the period ended as at 30 June 2017

Note 1 Scientific research grants

	2017 $	2016 $
CREST Program awards	-	17,417
Macquarie University Joint Chair In Wireless Communication	**288,347**	277,256
Scholarships and Fellowships	**6,068,600**	1,436,630
Research Infrastructure Investment	**5,706,000**	3,325,000
Special Research Program	-	1,000,000
Research Project Grants	**3,755,107**	8,577,344
Experimental Development Program	**1,854,797**	200,000
Total	**17,672,851**	14,833,647

The Fund is a subsidiary entity of the Commonwealth Scientific and Industrial Research Organisation (CSIRO). For the 2016-17 financial year, the Fund has recognised $12m in grant expenses as transferred directly to CSIRO to support scientific research and infrastructure projects within CSIRO and/or collaborative projects with external organisations (2015-16: $6m).

Note 2 Estimated value of resources provided free of charge by CSIRO are as follows

Advertising and approval fees	-	5,343
Total	-	5,343

Resources received free of charge are recognised as gains when and only when a fair value can be reliably determined and the services would have been purchased if they had not been donated. Use of these resources is recognised as an expense.

Note 3 NSW Government Endowment contribution

In June 2017, the NSW Government acting through the NSW Department of Industry provided a $25m endowment to SIEF. The contribution was recognised as income when SIEF gained control of the endowment. The endowment will be used on the NSW STEM Foundation Initiatives' Program in accordance with the deed of endowment. At the end of the financial year 2016-17, the entirety of the $25m contribution remains unspent.

Note 4 Interest Revenue

Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement.*

Note 5 Cash

Cash at bank	**25,578,861**	4,166,070
Term deposits	**50,225,675**	62,969,250
Total	**75,804,536**	67,135,320

Cash and cash equivalents includes cash on hand and demand deposits in bank accounts with an original maturity of twelve months or less that are readily convertible to known amounts of cash and subject to insignificant risk of change in value. Cash is recognised at its nominal amount.

Note 6 Receivables

Interest receivable	**439,736**	450,752
GST Receivable	**152,119**	412,589
Other receivables	**14,223**	40,480
Total receivables	**606,078**	903,821

SCIENCE AND INDUSTRY ENDOWMENT FUND

NOTES TO AND FORMING PART OF THE FINANCIAL REPORT

For the period ended as at 30 June 2017

Note 7 Accrued expenses	**2017 $**	**2016 $**
CREST Program awards	**-**	19,517
Audit fee	**15,000**	15,000
Total	**15,000**	34,517

Note 8 Cash flow reconciliation

Reconciliation of operating surplus to net cash from/(used by) operating activities:

Operating surplus/(deficit)	**8,402,635**	(13,014,143)
Changes in assets and liabilities		
(Increase)/decrease in receivables	**297,743**	445,042
Increase/(decrease) in payables	**(31,162)**	(920,370)
Net cash from/(used by) operating activities	**8,669,216**	(13,489,471)

Note 9 Schedule of commitments

The below table shows the monies SIEF is committed to pay on its executed grant funding agreements as at 30 June 2017, subject to grantees meeting funding milestones.

BY TYPE		
Grants commitments payable	**16,531,775**	31,044,258
GST receivable on grants payable	**(1,500,707)**	(2,813,478)
Total net commitments by type	**15,031,068**	28,230,780
BY MATURITY		
Grant commitments payable		
One year or less	**14,223,434**	17,814,547
From one to five years	**2,308,341**	13,229,712
Total grants payable	**16,531,775**	31,044,259
GST commitments receivable		
One year or less	**(1,290,858)**	(1,612,232)
From one to five years	**(209,849)**	(1,201,247)
Total commitments receivable	**(1,500,707)**	(2,813,479)
Net commitments by maturity	**15,031,068**	28,230,780

Note 10 Contingent assets and liabilities

No contingent assets or liabilities existed as at 30 June 2017 (2016: nil).

Note 11 Financial instruments

The Fund's financial assets are cash and interest receivable on cash. The net value is equivalent to the carrying amount. Financial liabilities are suppliers and grants payable. Due to the nature of SIEFs operations and its large cash holdings it is not exposed to credit risk, liquidity risk or market risk.

Interest rate risk

The Fund maintains an operating bank account and short term deposits which are subject to short term interest rates. Funds are maintained in term deposits for short periods. In 2016-17 the average return on cash and short term deposits was 2.90% (2016: 3.00%).

Note 12 Related Party Disclosures

The fund is a wholly controlled subsidiary of CSIRO. The trustee is the Chief Executive Officer of CSIRO who is remunerated through CSIRO and not paid an additional salary for his role as trustee of the fund. There were no transactions during the reporting period between the trustee and the fund. Related parties to this entity other than the trustee are other Australian Government entities.

Significant transactions with related parties can include the payment of grants, the purchase of goods and services. Given consideration to relationships with related entities, and transactions entered into during the reporting period by the entity, it has been determined that there are no related party transactions to be separately disclosed. Grants are awarded based on assessment against a set of established selection criteria prior to approval. All eligible applications are assessed equally.

Appendix 5: Full list of CSIRO locations

At 30 June 2017, CSIRO had 59 locations across Australia and overseas.

Australian Capital Territory

- Acton
- Black Mountain
- Canberra City
- Crace
- Ginninderra
- Tidbinbilla
- Yarralumla

New South Wales

- Armidale
- Australian Technology Park
- Kensington
- Mopra
- Myall Vale
- Narrabri
- Newcastle
- Parkes
- Sydney
  - Lindfield
  - Lucas Heights
  - Marsfield
  - North Ryde

Northern Territory

- Alice Springs
- Darwin

Queensland

- Atherton
- Bribie Island
- Brisbane
  - Coopers Plains
  - Dutton Park
  - Herston
  - Pullenvale
  - Fortitude Valley
  - St Lucia
- Cairns
- Gatton
- Toowoomba
- Townsville
  - Townsville Australian Tropical Science and Innovation Precinct
  - Woodstock

South Australia

- Adelaide
  - Kintore Avenue
  - South Australian Health and Medical Research Institute
  - Waite Campus

Tasmania

- Hobart
- Sandy Bay

Victoria

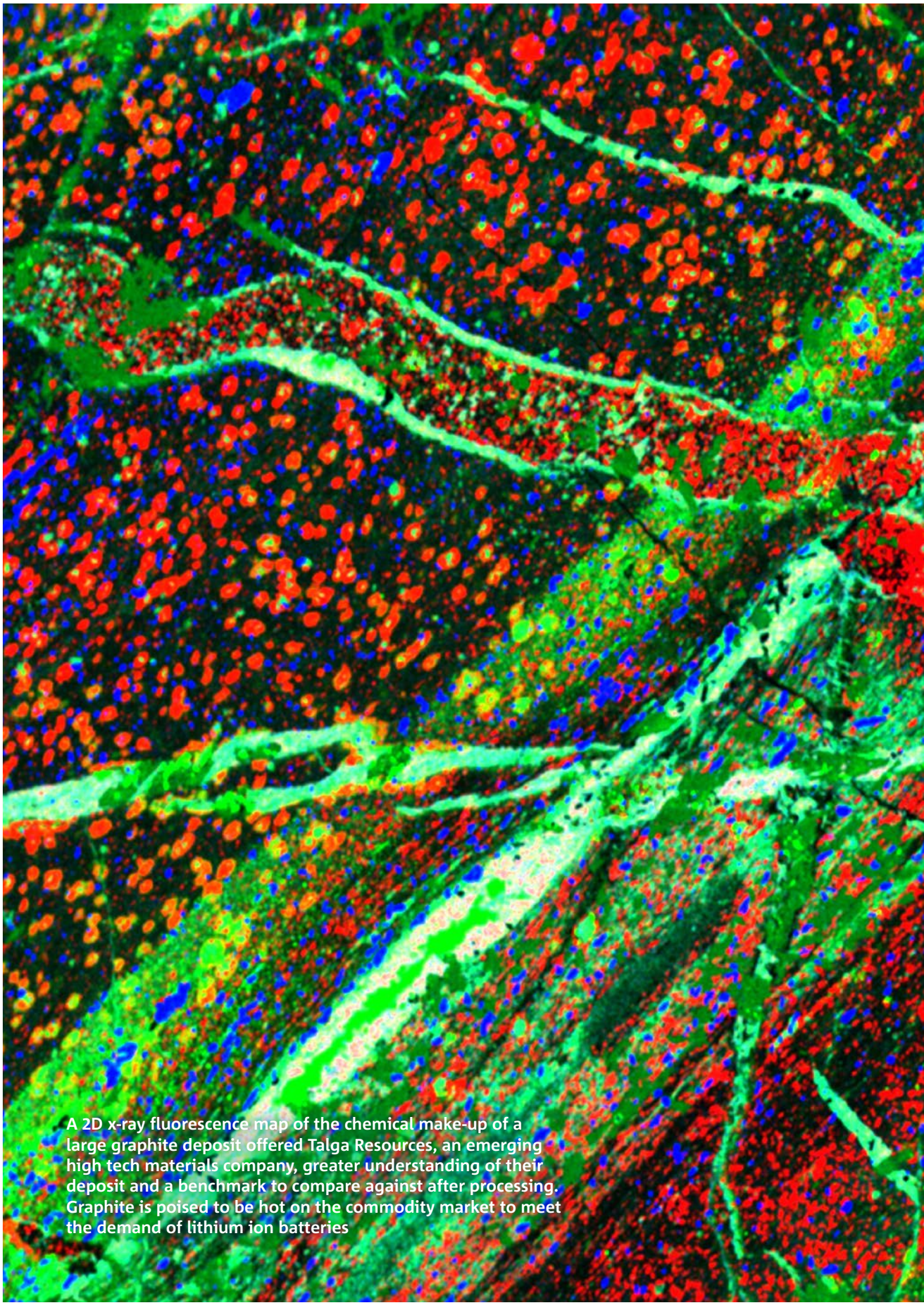
- Docklands
- Geelong
  - Australian Animal Health Laboratory
  - Belmont
  - Waurn Ponds
- Irymple
- Melbourne
  - Aspendale
  - Clayton
  - Highett
  - Parkville
- Werribee
  - Sneydes Road
  - South Road
- Wodonga

Western Australia

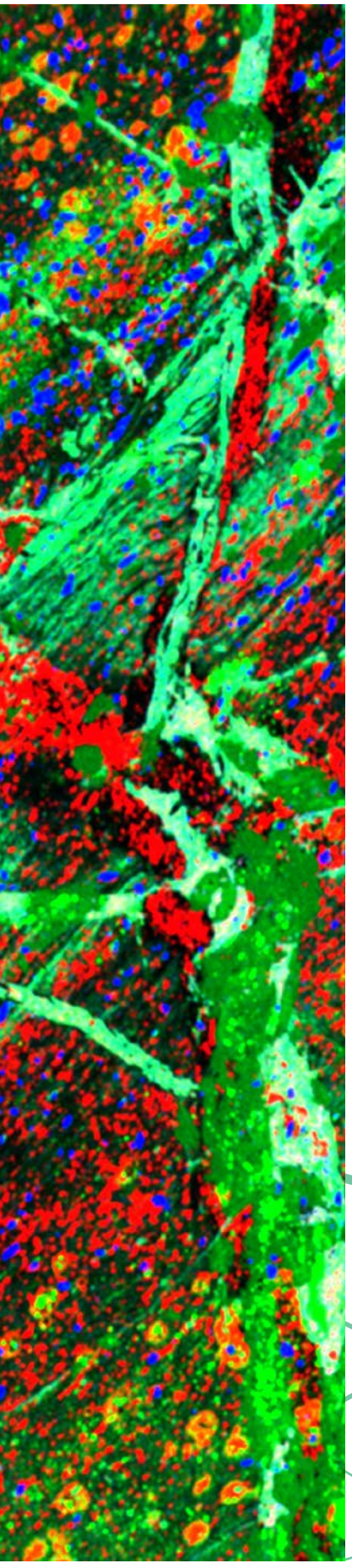
- Geraldton
- Murchison
- Perth
  - Floreat
  - Indian Ocean Marine Research Centre
  - Kensington
  - Waterford

International

- France
  - Montpellier
- Chile
  - Santiago



A 2D x-ray fluorescence map of the chemical make-up of a large graphite deposit offered Talga Resources, an emerging high tech materials company, greater understanding of their deposit and a benchmark to compare against after processing. Graphite is poised to be hot on the commodity market to meet the demand of lithium ion batteries



Part 6
Indexes

Acronyms

AAHL	Australian Animal Health Laboratory
AAS	Australian Academy of Science
ADJR Act	*Administrative Decisions (Judicial Review) Act 1977*
AEC	Animal research ethics committees
AEHRC	Australian e-Health Research Centre
AHS	Australian Hydrographic Survey
ALA	Atlas of Living Australia
ANACC	Australian National Algae Culture Collection
ANAO	Australian National Audit Office
ANASS	Australian National Algae Supply Service
ANFC	Australian National Fish Collection
ANH	Australian National Herbarium
ANIC	Australian National Insect Collection
ANU	Australian National University
ANWC	Australian National Wildlife Collection
APS	Australian Public Service
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
ASKAP	Australian Square Kilometre Array Pathfinder
ASX	Australian Securities Exchange
ATCA	Australia Telescope Compact Array
ATNF	Australia Telescope National Facility
ATSC	Australian Tree Seed Centre
AWRA	Australian Water Resources Assessment
BHPBSEA	BHP Billiton Science and Engineering Awards
BOM	Bureau of Meteorology
BU	Business Unit
CAPSTAN	Collaborative Australian Postgraduate Sea Training Alliance Network
CDSCC	Canberra Deep Space Communication Complex
CIF	CSIRO Innovation Fund 1, LP
COAG	Council of Australian Governments
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalent
CPRs	Commonwealth procurement rules
CRC	Cooperative research centre
CREST	CREativity in Science and Technology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAWR	Department of Agriculture and Water Resources
DELWP	Department of Environment, Land, Water and Planning
DET CRC	Deep exploration technologies cooperative research centre
ECR	Early-career researcher
EDP	SIEF Experimental Development Program
ET	CSIRO Executive Team
FHIR	Fast Healthcare Interoperability Resources
FOI Act	*Freedom of Information Act 1982*
FMD	Foot-and-mouth disease
FRB	Fast radio bursts
FSP	Future Science Platform
FTE	Full-time equivalent
GV	Granted voyages
HSE	Health, safety and environment

ICT	Information and communication technology
IP	Intellectual property
ISEF	Intel International Science and Engineering Fair
ISO	International Organization for Standardization
KPIs	Key performance indicators
LBA	Long Baseline Array
LGBTI	Lesbian, gay, bisexual, trans, and/or intersex
MNF	Marine National Facility
MOU	Memorandum of understanding
MTC	Major Transactions Committee
MWA	Murchison Wideband Array
NASA	National Aeronautics and Space Administration
NCTS	National Clinical Terminology Service
NCRIS	National Collaborative Research Infrastructure Strategy
NICTA	National ICT Australia Ltd
NPS	Net Promoter Score
NPV	Net present value
NRCA	National Research Collections Australia
OIE	World Organisation for Animal Health
PAF	Phased-array feed
PBS	Portfolio Budget Statements
PCT	Patent cooperation treaty
PGPA Act	*Public Governance, Performance and Accountability Act 2013*
PID Act	*Public Interest Disclosure Act 2013*
PV	Photovoltaic
PwC	PricewaterhouseCoopers
R&D	Research and development
RIFR	Recordable Injury Frequency Rate
SAGE	Science in Australia Gender Equity
SCADA	System Control and Data Acquisition
SICOM	Science, Strategy, Investment and Impact Committee
SIEF	Science and Industry Endowment Fund
SIR Act	*Science and Industry Research Act 1949*
SME	Small-to-medium enterprise
SMiS	Scientists and Mathematicians in Schools
SNOMED CT	Systematized Nomenclature of Medicine-Clinical Terms
SoE	Statement of Expectations
SPV	Special purpose vehicles
STEM	Science, engineering, technology and mathematics
UFV	User funded voyages
WALLABY	Widefield ASKAP L-Band Legacy All-sky Blind surveY
WIRADA	Water Information Research and Development Alliance
WHS Act	*Work Health and Safety Act 2011*

Glossary

Books and chapters: Includes monographs, complete or individual chapters, usually published by a commercial publisher.

Conference papers: Includes published conference papers and edited proceedings.

Ecosystem services: The important benefits for human beings that arise from healthily functioning ecosystems, notably production of oxygen, soil genesis, and water detoxification.

Germination sheets: Provide full details of a seed's germination test, plus additional information, such as timing of start of germination, and how germination has progressed over the germination period.

Granted patents: Once a patent application has been examined and satisfies various patentability criteria, it becomes a granted patent. It remains a granted patent until the end of the patent period (normally 20 years), provided renewal fees are paid.

Inventions: This is the number of inventions where one or more patent/applications are current. Accordingly, an invention might include a granted patent that is near the end of its life (for example, 20 years), or it might include a provisional patent application that has only recently been filed. Further, one invention might relate to a patent application in one country only, or it might relate to over 20 patents/applications in different countries covering the one invention.

Journal articles: Includes journal articles and other items published as part of a journal (for example, an editorial or book review).

Live patent cases: A live patent case is where either a patent application or a granted patent exists. It does not include cases that have lapsed, expired or been withdrawn. Applications may include provisional applications, Patent Cooperation Treaty (PCT) applications and applications pending in Australia or foreign jurisdictions.

New inventions: This is the number of new inventions where an application (normally an Australian provisional application) is filed for the first time to protect that invention. A major implication of filing the provisional application is that it provides the applicant with an internationally recognised priority date. A small percentage of CSIRO's new inventions are filed as United States provisional applications.

Phased array: A set of multiple connected antennas which work together as a single antenna. CSIRO's phased array feeds are made up of 188 individual receivers, positioned in a chequerboard-like arrangement. Alongside the receivers are low-noise amplifiers, which greatly enhance the weak radio wave signals received.

PC laboratory: A physical containment (PC) laboratory is specifically constructed to prevent the contamination of the worker or the environment by harmful organisms. Depending on the level of risk associated with the microbial work, different levels of containment are certified by regulators, the highest containment level being PC4, which involves work with life-threatening diseases, such as involving the Ebola virus.

PCT applications: International PCT applications are a 'temporary' phase in any international patenting process and these have a life span of 18 months. This type of application is very common in major international corporations and is used by CSIRO when it considers its invention may have wide commercial application. In view of the 18-month time span, it is reasonable to approximate that two-thirds of the reported number were filed in the previous 12-month period.

Pulsar: A rotating neutron star that emits a focused beam of electromagnetic radiation.

Recordable Injury Frequency Rate: This is calculated as the sum of Lost Time Injuries per million hours worked plus Medical Treatment Injuries per million hours worked.

Record cards: Technical data about a biological specimen, such as collection site information, fumigation records and oil profiles.

Science excellence: An assessment of the competitiveness of CSIRO's research capabilities. It recognises CSIRO's science (for example, total citations) and excellence (for example, citation rates). It tends to be output-oriented and includes lagging metrics relating to research publication performance (bibliometrics), esteem measures, such as awards, and expert-peer reviews.

Sponsored students: Students are deemed to be sponsored if they receive a full or partial scholarship paid from CSIRO funds to pursue a research project leading to a PhD or Honours/Master's degree. This excludes CSIRO employees, whose study expenses are considered to be training and development.

Supervised students: Students are deemed to be supervised if they have a CSIRO staff member appointed officially by the university as the supervisor for their research project. Normally, CSIRO staff are joint supervisors in conjunction with a university academic.

Technical reports: Includes individually authored chapters as well as whole reports that are subject to peer review and usually publicly released.

Technological output: An assessment of the organisation's excellence in delivering relevant research results to its users. This involves working on the right problems, doing projects well and excellence in transferring our research results. One metric for this, given this context, is CSIRO's patenting activity, as this provides an understanding of its technological output and potential impact.

Type specimen: The specimen that was originally used to name a species or subspecies or that was later designated as the basis for that name.

Wide-field phased-array feeds: Radio telescopes use specialised cameras, called receivers, to detect and amplify radio waves from space. Receivers with a larger field-of-view are called wide-field. 'Phased array feed' receivers are made up of 188 individual receivers, positioned in a chequerboard-like arrangement. Alongside the receivers are low-noise amplifiers, which greatly enhance the weak radio wave signals received.

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Statement of Expectations Index

Compliance index: statutory reporting requirements

The index below shows compliance with information requirements contained in section 46 of the *Public Governance and Accountability Act 2013* (PGPA Act), *Public Governance, Performance and Accountability Rule 2014* (PGPA Rule) and the *Science and Industry Research Act 1949* (SIR Act).

This annual report complies with parliamentary standards of presentation and printing, and uses plain English and clear design.

REQUIREMENT	SOURCE	PAGE
Public Governance, Performance and Accountability Act 2013		
The accountable authority of the entity must prepare and give an annual report to the entity's responsible Minister, for presentation to the Parliament, on the entity's activities during the period, by 15 October; or the end of any further period granted under subsection 34C(5) of the Acts Interpretation Act 1901. The annual report must comply with any requirements prescribed by the PGPA Rule.	Section 46	1–176
Includes a copy of the annual performance statements in the entity's annual report that is tabled in the Parliament. The annual performance statements must: (a) provide information about the entity's performance in achieving its purposes (b) comply with any requirements prescribed by the rules.	Section 39 (1) and (2)	16–69
Includes a copy of the annual financial statements and the Auditor-General's report must be included in the Commonwealth entity's annual report that is tabled in the Parliament. The annual financial statements and the audit report must comply, and must state whether, in the accountable authority's and the Auditor-General's opinion respectively, whether, they: (a) comply with the accounting standards and any other requirements prescribed by the rules (b) present fairly the entity's financial position, financial performance and cash flows. If the financial statements do not comply, the accountable authority of the entity must add the information and explanations required to present fairly those matters. Similarly, for the audit report, the Auditor-General must state the reasons, quantify the financial effect and state the amount if possible.	Section 42(1)(b) and 43(4)	100–141
Public Governance, Performance and Accountability Rule 2014		
The annual report must be approved and signed by the accountable authority, and include details of how and when approval was given. It must state that the accountable authority is responsible for preparing and delivering the annual report in accordance with the section 46 of the PGPA Act.	Section 17BB	ii
The annual report complies with the guidelines for presenting documents to the Parliament	Section 17BC	177
The annual report uses plain English and clear design.	Section 17BD	177

REQUIREMENT	SOURCE	PAGE
The annual report must specify the entity's enabling legislation, including a summary of the entity's objects and functions and the purposes of the entity as included in the entity's corporate plan.	Section 17BE (a)-(b)	16
The responsible Minister is specified.	Section 17BE (c)	74
The annual report provides details of: • any direction issued by any Minister under an Act or instrument during the period • any government policy orders that applied to the entity under section 22 of the PGPA Act • particulars of non-compliance with any of the above directions or orders.	Section 17BE (d)-(f)	74
The annual report must include the annual performance statements for the entity for the period in accordance with paragraph 39(1)(b) of the Act and section 16F of this rule. If such a statement is included, the annual report must include an outline of the action that has been taken to remedy non-compliance.	Section 17BE (g)	16–69
The annual report must include a statement of any significant issue reported to the responsible Minister under paragraph19(1)(e) of the Act that relates to non-compliance with the finance law in relation to the entity.	Section 17BE (h)-(i)	74
Information about directors is provided, including names, qualifications, experience, attendance at Board meetings and whether the director is an executive or non-executive member.	Section 17BE (j)	75, 82, 127
The annual report provides an outline of:	Section 17BE (k)-(m)	
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• the location of major activities and facilities and provides a statement on governance practices, including details on – board committees and their responsibilities – education and performance review processes for directors – ethics and risk management policies.		12–13, 161, 74–81
The annual report discloses the decision-making process undertaken by the Board in relation to transactions with other entities or if the transaction is more than $10,000 (inclusive of GST). • If the annual report includes any of the above information: • if there is only one transaction—the value of the transaction must be included; and • if there is more than one transaction—the number of transactions and the aggregate value of the transactions must be included.	Section 17BE (n)-(o)	77
The annual report details any key activities and changes that affected the operations or structure, which may include:	Section 17BE (p)	
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• key changes to its status of affairs or principal activities		ii
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REQUIREMENT	SOURCE	PAGE
The annual report includes particulars of: • judicial reviews and decisions of tribunals that have had or may have a significant effect on its operations • reports about the authority made by the Auditor-General (other than one made under section 43 of the PGPA Act), a Parliamentary committee, the Commonwealth Ombudsman, or the Office of the Australian Information Commissioner.	Section 17BE (q)-(r)	 81 81, 145
The annual report includes an explanation if information is missing from a subsidiary that is required to be included in the annual report and states the effect of not having the information in the annual report.	Section 17BE (s)	n/a
The annual report includes details of any indemnity that applied during the period given to an officer against a liability, including premiums paid, or agreed to be paid, for insurance against the officer's liability for legal costs.	Section 17BE (t)	78
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Contacts

LOCATION

CSIRO Corporate Centre
Clunies Ross Street, Black Mountain ACT 2601

POSTAL ADDRESS

GPO Box 1700, Canberra ACT 2601

GENERAL CORRESPONDENCE AND ENQUIRIES

General correspondence and enquiries to CSIRO should be addressed to:

CSIRO ENQUIRIES

Private Bag 10, Clayton South VIC 3169

t 1300 363 400
+61 3 9545 2176
f +61 3 9545 2175
e csiroenquiries@csiro.au
w www.csiro.au

CSIRO Enquiries provides a single point of contact for industry, teachers and students, the research community and the general public. With a mandate to provide information, guidance and referrals, CSIRO Enquiries responds to more than 30,000 enquiries it receives each year. It also supports our outreach activities as custodians of an extensive stakeholder database, and provides outbound e-communication services and online event RSVPs.

MEDIA ENQUIRIES

Huw Morgan
Media Manager, CSIRO Media
GPO Box 1700, Canberra ACT 2601

e huw.morgan@csiro.au
t +61 417 834 547
f +61 8 8303 8857

FEEDBACK

CSIRO welcomes your feedback on our performance. Please contact the CSIRO officer with whom you have been dealing or CSIRO Enquiries, who can direct your feedback to the relevant person:

e csiroenquiries@csiro.au

An electronic version of this report is available at: **www.csiro.au/annualreport2017**

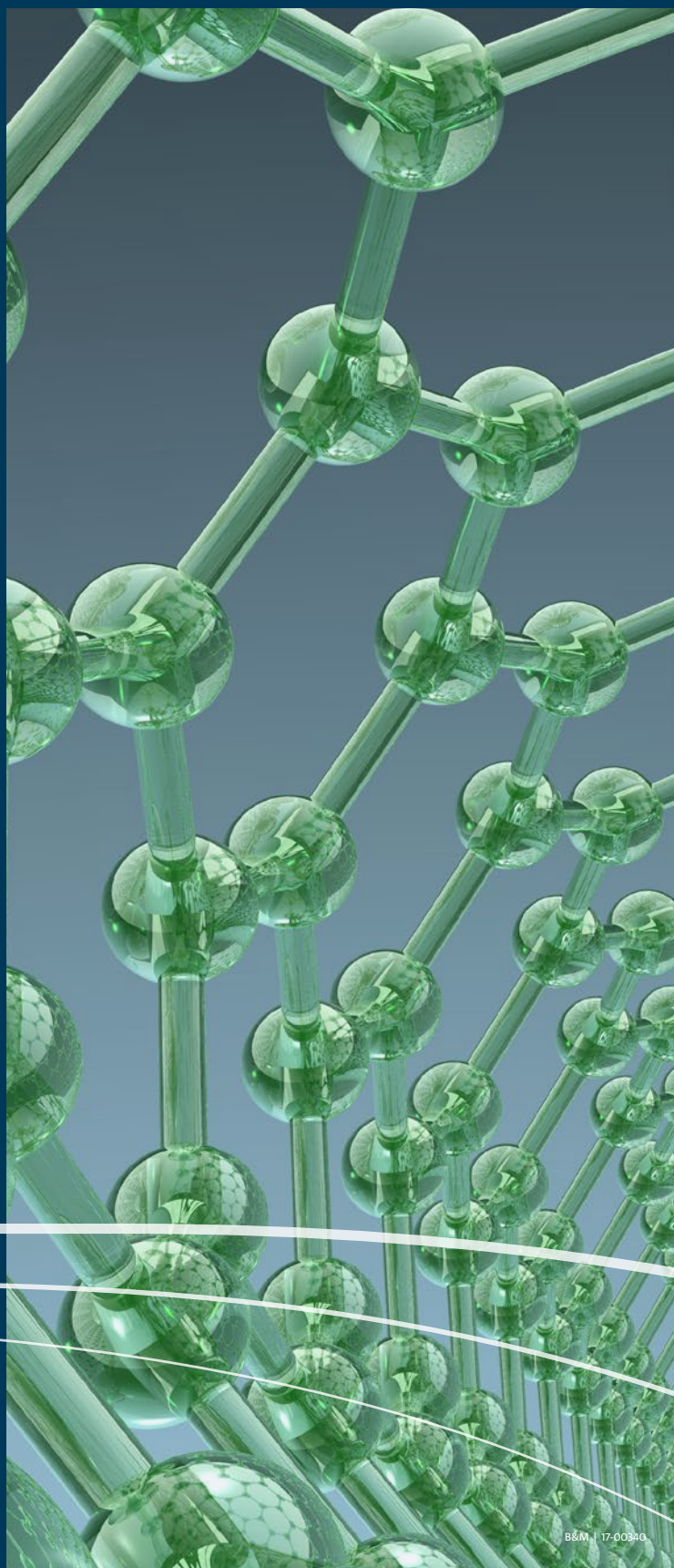
Made from recycled material.

ISSN 1030-4215
Printed in Australia by New Millennium Print.

CONTACT US

t 1300 363 400
f +61 3 9545 2176
e csiroenquiries@csiro.au
w www.csiro.au

FOLLOW US



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