GOYDER INSTITUTE FOR WATER RESEARCH
2013–2014 ANNUAL REPORT

GOYDER INSTITUTE FOR WATER RESEARCH

www.goyderinstitute.org

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GOYDER INSTITUTE PARTNERS

The Goyder Institute for Water Research is a partnership between the South Australian Government through the Department of Environment, Water and Natural Resources, CSIRO, Flinders University, the University of Adelaide and the University of South Australia. The Institute will enhance the South Australian Government's capacity to develop and deliver science-based policy solutions in water management. It brings together the best scientists and researchers across Australia to provide expert and independent scientific advice to inform good government water policy and identify future threats and opportunities to water security.

Government of South Australia
Department of Environment, Water and Natural Resources

CSIRO

THE UNIVERSITY of ADELAIDE

University of South Australia

Flinders UNIVERSITY

GOYDER INSTITUTE ASSOCIATES

Goyder Institute Associates typically contribute expertise and capabilities in areas outside of those contributed by the Goyder Institute Partners. Associates may participate in capacity building, knowledge exchange and/or specific research projects, and invest in the Goyder Institute Research program with in-kind commitments in the same manner as Goyder Institute Partners. The following Associate organisations have contributed to the outcomes of the Goyder Institute in 2013-14.

SA Water

SARDI RESEARCH AND DEVELOPMENT

Enquires should be addressed to:
Goyder Institute for Water Research
Level 1, Torrens Building, 220 Victoria Square, Adelaide, SA, 5000
tel: 08 8303 8952 e-mail: enquiries@goyderinstitute.org

Photographs by Claire Punter.

ACHIEVEMENTS AT A GLANCE

RESEARCH PROGRESS

Seven new projects were established including

- Lake Eyre Basin Environmental Indicators
- Second phase of Finding Long-Term Outback Water Supplies focussed on the Eyre Peninsula
- South East Regional Water Balance Phase 2
- Modelling River Murray Floodplain Salt Dynamics
- Assessing the operations of floodplain environmental infrastructure

Seven projects were completed including

- Murray Flood Ecology
- Phase 1 of Finding Long-Term Outback Water Supplies in the Musgrave Ranges
- South East Regional Water Balance Phase 1

POLICY IMPACT

- State Government Water Sensistive Urban Design Strategy launched in October 2013, supported by Goyder Institute Science
- Avoidance of closure of the Torrens Lake due to algal blooms – a strategy implemented based on Goyder Institute science
- Finding Long-Term Outback Water Supplies research supporting exploration and development potential in Outback SA
- New science from understanding the ecological response to flooding following drought and determining environmental water requirements for in-stream habitats is informing environmental watering plans as required under the Murray Darling Basin Plan.

CAPABILITY

- 25 PhD Students supported by the Goyder Institute
- Five PhD Students completed their studies and have secured positions around the globe
- Two ANZSOG Visiting Professors, Professor Steve Rayner from Oxford University and Professor Bruce Mitchell from the University of Waterloo
- 104 scientists researching SA water issues
- 14 State and Local Government organisations providing policy and technical support
- The Managed Aquifer Recharge and Stormwater Use Options project ran a Managed Aquifer Recharge short course training program for MAR practitioners in partnership with the National Centre for Groundwater Research and Training
- Prof Graeme Dandy – Winner 2014 Australian Water Professional of the Year

SCIENCE COMMUNICATION

- 18 new technical reports
- 38 new journal publications

Major events and conferences

- Science Alive! 2013
- 2013 SA Australian Water Association Branch Conference
- 2013 Annual Water Forum
- Modelling and Simulation 2013
- NRM Science Showcase 2014
- OzWater 2014
- Singapore International Water Week 2014
- Goyder Institute Science Seminars

- Flickr presence showcasing water management photos across the State
- Nature publication from the Climate Change Downscaling project

MESSAGE FROM THE CHAIR

DR IAN CHESSELL

The Goyder Institute has made very significant contributions to the development of water policy and water resource management for South Australia in the past year. A number of research projects have now been completed or have moved to a second phase and the coverage of the research program has broadened as new priorities for the State have been identified. The Goyder institute is responding to the Government's newly developed Strategic Priorities for State development and our research program is being adjusted to reflect our support for these Priorities.

We have been focusing on ensuring research findings are transformed into policy impact and this emphasis is proving successful. We have commissioned an external review of the impact of the Goyder Institute research in the first three and a half years of its operation and the findings are now available, which demonstrate very significant impacts.

The unique Goyder Institute model of partnership between Government and researchers has matured in the past twelve months and is now proving its value, delivering the highest quality research teams to address the research priorities identified by Government. The Goyder Institute Research Advisory Committee (RAC) plays a key role in this brokerage process and I want to particularly acknowledge the contribution they have made to the Institute's success and to thank the members.

The past year has seen significant change within the Goyder Institute with the departure of the inaugural Director, Dr Tony Minns, who has returned to Europe to head a water consultancy company. Dr Minns made a major contribution to the Institute and laid the foundations for its role and initial research program. The Board has been very pleased to appoint Dr Michele Akeroyd as the Institute's second Director and note the progress being made under her leadership with focused research projects and strengthening partner relationships.

Finally I would like to thank all involved in making this year again a successful one for the Goyder Institute and I look forward to our making further valuable contributions to the State's development in the coming year.

GOYDER INSTITUTE MANAGEMENT BOARD

The Management Board meets quarterly to set the strategic vision and direction for the Goyder Institute and to monitor its implementation and outcomes. The Board reviewed and approved annual research programs and budgets, and monitored the effective delivery of the research projects.

The Board comprises an Independent Chair, the Director of the Goyder Institute, two representatives from CSIRO, two representatives from the State Government, and one representative from Flinders University, the University of Adelaide and the University of South Australia.

The Members of the Goyder Management Board from July 2013 until June 2014 were:

Dr Ian Chessell, Independent Chair

Dr Michele Akeroyd, Director, Goyder Institute

Prof David Day, Flinders University

Prof Richard Head, UniSA

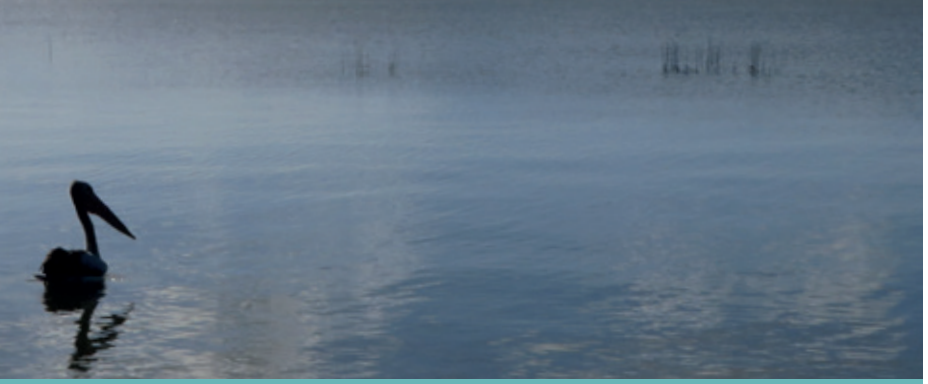
Prof Bob Hill, The University of Adelaide

Dr Carol Couch, CSIRO

Mr Scott Keyworth, CSIRO

Mr Tim Goodes, Dept. Environment, Water and Natural Resources

Mr Jim Hallion, Dept. Premier and Cabinet



GOYDER INSTITUTE RESEARCH ADVISORY COMMITTEE

The RAC met six times in 2013–14 to advise the Management Board on progress, milestones and implementation of Goyder Institute research activities, and to consider the strategic direction for the research projects into the next years of the Institute. It reviewed and approved several reports for inclusion in the Technical Report Series and formulated recommendations to the Board regarding the direction, content and quality of project plans, and expressions of interest for various research activities proposed by Goyder Institute research partners.

The RAC is chaired by the Goyder Institute Director and comprises a research coordinator from each research partner, up to two representatives from agencies as determined by the State, a representative of SARDI, a representative of SA Water, and up to three specialists as agreed by the Management Board.

The Members of the RAC from July 2013 until June 2014 were:

Dr Michele Akeroyd, (Chair), Goyder Institute

Neil Power, DEWNR

Sandy Carruthers, DEWNR

Dr Peter Cook, Flinders University

Prof Chris Saint, UniSA

Assoc. Prof Justin Brookes, The University of Adelaide

Assoc. Prof Mike Burch, SA Water

Prof Jim Cox, SARDI

Karen Rouse, CSIRO

INSTITUTE DIRECTOR'S REPORT

DR MICHELE AKEROYD

After four years of dedicated research, we are starting to produce some significant results from the complex portfolio of research investment. This research has made a substantial contribution to the development of water policy and water resource management for South Australia. While we are at the point of consolidating the research program and targeting investment to maximise the outcomes of previous research activities, the Goyder institute is continuing to respond to the Government's Strategic Priorities for State development. Engagement with our researchers, collaborators, end-users and the public is gaining momentum and this Annual Report describes some of the highlights from 2013/14.

The Goyder Institute for Water Research is committed to bringing together the best scientists and researchers across Australia to provide expert and independent scientific advice which will shape our state's water management strategies in the future. Key to this commitment is not only collaborating with established and experienced water experts of today, but also developing the careers of the next generation of water research scientists, to ensure continuous knowledge development in the sector.

The diversity of the PhD projects and quality of our PhD students is remarkable and highlights the wide range of career options available in the water sector. From testing our lakes and river catchments, understanding climate change impacts, to examining our native fish population, a career in water can offer far more than a lab coat and petri dish. I hope that our efforts in promoting the water sector at events such as Science Alive! has encouraged the next generation of school children to consider careers in water and science more generally.

I would also like to acknowledge all of those involved in the Goyder Institute activities, from our research teams, government collaborators and communciation teams. Without the commitment to the Goyder Institute model and its objectives, the successes of the Institute would not have been realised. Nonetheless, these achievements have not been without plenty of blood, sweat and tears and a great deal of satisfaction. It is a true team effort from every person and organisation involved in the Institute that has made the Institute the success that it is.

The initial term of the Goyder Institute ends in June 2015, and we are currently exploring the opportunities with our key stakeholders to examine the possibilities to extend the work of the Institute and to continue to make an impact on resource management in South Australia. The next 12 months of the Goyder Institute will see the culmination of the research effort of a five year $50 million program and bring to fruition the returns of that investment to all of the Institute's research partners.

I look forward to leading the Goyder Institute at this very exciting time in what will be an action packed year.

ABOUT THE GOYDER INSTITUTE FOR WATER RESEARCH

This vital importance of water to the quality of life and the economic interests of the people of South Australia was recognised by the South Australian Government in establishing the Goyder Institute for Water Research in July 2010 and the development of a $50 million, 5-year strategic research plan. The Goyder Institute is a collaborative model that brings together the South Australian Government with the State's leading water research capabilities at the University of Adelaide, Flinders University and UniSA, in collaboration with CSIRO, into a single, comprehensive research institute.

The research effort funded by the Goyder Institute is focussed across four enduring Research Themes:

- Urban Water
- Water for Industry
- Environmental Water
- Climate Change

The Goyder Institute Strategic Research Plan 2011-2015 details the long-term strategic outcomes for a research program that will help ensure the water resources of the State are sustainably managed for economic, social and environmental benefits.

The role of the Goyder Institute is to develop and execute a research program that provides the science and research for specific water management outcomes and/or policy directions that have been identified by the South Australian Government in its strategic policy plans, Government Agencies and other stakeholders.

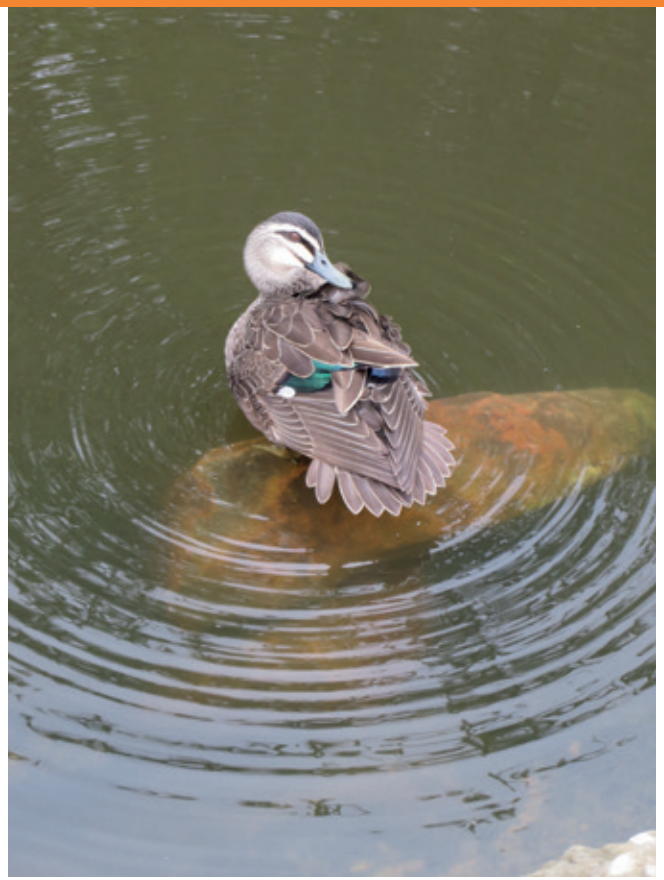
The ongoing development of our research program and associated strategic roadmaps takes place in consultation with research partners, stakeholders and the water industry to identify existing expertise, ongoing strategic developments, and any gaps-in-knowledge that need to be addressed in order to achieve specified outcomes.

During its first four years the Goyder Institute has established itself as an independent expert science advisor providing quality, evidence based knowledge on water management issues important for South Australia. The knowledge being developed cuts across all sectors of water management, from environmental science to water reliant industries, urban water and climate change. These outcomes are supporting the State Government in considering the best available science relevant for South Australia in its policy and decision making processes.

As we move forward, the greatest challenge facing the Goyder Institute is to ensure that the powerful knowledge base is available to all stakeholders locally, nationally and internationally. This will ensure the Institute continues to inform policy and decision-making, identifies future threats to water security and assists in an integrated approach to water management in South Australia and beyond.

“Since its inception four years ago, the Goyder Institute has proved its importance and value in providing independent and expert advice to Government on issues related to water resource management and planning. This has strengthened the position of Government in negotiating with other jurisdictions, and built further community confidence in the approach to resource management.”

Tim Goodes, Dept. Environment, Water and Natural Resources



PARTNERSHIPS

> “We look forward to continuing to work with the Goyder Institute and Research Partners to deliver practical and usable outcomes that assist in our goals of maintaining clean, liveable urban environments and supporting the development of sustainable urban industries.”
>
> Bruce Naumann, Manager Salisbury Water

The collaborative model of the Goyder Institute has brought together a critical mass of water expertise from organisations and disciplines throughout Australia to focus on South Australia’s water challenges.

RESEARCH PARTNERS

CSIRO
The University of Adelaide
Flinders University
UniSA
SARDI
Australian Water Quality Centre

GOVERNMENT PARTNERS

Department of Environment, Water and Natural Resources
SA Water
Department of State Development
EPA

INDUSTRY

Water Industry Alliance
Exploration Industry
Adelaide Resources
Uranium SA
Archer Exploration
Lincoln Minerals
Cameco
Marmota Energy
Monax Mining
Musgrave Minerals Ltd
Pepinnini Minerals Ltd
Uranium One
Cameco Ltd
UraniumSA Limited
Callabonna Uranium
Stellar Resources

STATE ORGANISATIONS

Natural Resource Management Boards:

- South East
- Adelaide Mt Lofty Ranges
- Murray Darling Basin
- SA Arid Lands

City of Adelaide
City of Holdfast Bay
City of Marion
City of Salisbury
Department of Planning, Transport and Infrastructure
Local Government Association
South East Drainage Board

NATIONAL ORGANISATIONS

University of Sydney
National Centre for Groundwater Research and Training
National Centre of Excellence in Desalination Australia
Australian Water Recycling Centre of Excellence
National Water Commission
Water Research Australia
Australian Water Association
Australian and New Zealand School of Government
Murray Darling Basin Authority
Lake Eyre Basin Scientific Advisory Panel

INTERNATIONAL ORGANISATIONS

University of Central Florida
Oxford University
University of Waterloo
University of Idaho
Durham University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POLICY IMPACT

Goyder Institute research is continuing to support decision making and policy development at the local, state and national level. The value of the Goyder Institute model to State Government is that it harnesses the best expertise from the research partners working collaboratively with the State Government agencies to provide independent, timely and quality science advice. This maximises the use of resources, reduces duplication and ensures that research is targeted to address the considerable water resource challenges faced by the state.

URBAN WATER

The Institute has undertaken a suite of research that is aligned with *Water for Good*, the strategic water management plan for South Australia. As such, the Institute's focus has been to support water security measures, including assessment of fit-for-purpose use of stormwater, recycled water and optimising the diversified water sources now available to supply Adelaide and South Australia more broadly. There are a number of areas where the Institute's research is making an impact on policy and decision making.

The review of Water Sensitive Urban Design (WSUD) Targets undertaken by the Goyder Institute provided science advice to underpin the State Government's WSUD policy that was released in October 2013.

The Managed Aquifer Recharge and Stormwater Use Options (MARSUO) project has evaluated the options for stormwater use and managed aquifer recharge using the City of Salisbury as a case study site to undertake a detailed investigation of the technical, social and economic aspects of stormwater recycling. The outcomes of this project have informed the development of national environmental and public health risk assessment guidelines.

As part of the Optimal Water Resources Mix project the Household Water Use study has identified patterns of use in different households, clearly demonstrating that teenagers are unfairly blamed for being large consumers of water in households. Full details are in the technical report available on the Goyder Institute website.

WATER FOR INDUSTRY

The intent of the Water for Industry Theme is to develop sustainable water management practices for communities and industries (e.g. food, wine, forestry and mining) that are heavily reliant on safe and secure water supplies. The Institute's research investment is focussed on those complex issues that require multi-disciplinary teams to solve them, including characterisation of regional water resources, identification of community and industry water needs, environmental water requirements and cultural values associated with water.

The Goyder Institute Finding Long-term Outback Water Solutions project has developed new hydrogeological and airborne geophysical techniques to locate groundwater supplies in the outback. These techniques have been successfully applied by two mineral exploration companies to locate an initial water supply for a proposed nickel mine adjacent APY Lands in Western Australia and to define a silver deposit on Eyre Peninsula. The second stage is now underway on the Northern Eyre Peninsula to ground truth the methodology. This will further support mining companies to identify water resources during their feasibility assessments whilst balancing the needs of other existing landowners.

Together with the irrigation industry and the support of the Australian Water Recycling Centre of Excellence, research is being undertaken to assess the application of recycled water to crops to enhance the quantity and quality of yields, reduce the accumulation of salt in the soil and most cost effectively utilise the different sources of water available to growers. This in turn facilitates industry expansion and competitiveness.

The past three years have seen the establishment of a city scale experiment to assess the effectiveness of dilution flows to improve water quality of the Torrens Lake. While the results were not always as anticipated, the new knowledge and scientific analysis has provided an evidence base to determine management triggers and implementation of flow strategies. For the first time in several years, there was no algal bloom on the Torrens Lake – an excellent result for the opening of the new Adelaide Oval.

ENVIRONMENTAL WATER

Research being undertaken within the Environmental Water theme has focussed on developing a detailed understanding of the ecosystems of the State's major water resources like the River Murray and the wetland systems of the South East. These systems contain several RAMSAR wetlands of international importance which require a robust integrated management approach to maintain the environmental values of these regions while also achieving social and economic outcomes.

The Institute was also able to respond quickly to the breaking of the drought and mobilise research teams to investigate the ecological response of the SA River Murray to flooding after the prolonged drought. Research teams from the Institute have also provided science advice to determine environmental water requirements of the River Murray in-stream habitat. This research is now contributing to new thinking into the annual and long term environmental watering plans required by the Murray Darling Basin Plan and the management of environmental water, to achieve ecological outcomes that sustain the River Murray's health.

Development of a regional groundwater model for the South East, incorporating new mapping of historic land use for improved recharge estimates, as a foundation for expanded water trading to increase the potential for increased agricultural productivity. In addition, ecological response models and operational tools have been developed to manage flow volumes in drains in the South East to provide water to key wetlands and to the southern Coorong as well as removing saline groundwater to reclaim productive farmland. Supplementary research is being undertaken to assess the causes of alkalinity issues in the drainage network in order to identify management strategies and to assess the water quality risks to RAMSAR clear water wetlands in the lower South East.

CLIMATE CHANGE

This is a cross-cutting research theme to support the incorporation of climate adaption policy into the research outcomes from the Urban Water, Environmental Water and Water for Industry research themes. The largest investment in the nation focussed on climate change downscaling and projections is being undertaken by the Goyder Institute.

Climate projections information produced from the Climate Change Downscaling project is now being utilised as part of the business processes of government. Some examples include:

- Assessment of potential changes to rainfall and its influence on depth to groundwater, a consideration in the design of the Torrens Road to River Torrens South Road upgrade project.
- Modelling of the effect on water quality of the localised climate projections, in particular cyanobacteria growth, to explore the possible implications for investment in water treatment infrastructure.
- Detailed hydrologic modelling to determine the potential impact of climate change on the surface water resources of Kangaroo Island. Rainfall and evaporation data were used to model flow for the Middle River. The results of this work will help with future planning and management of water availability for businesses and the community on Kangaroo Island.
- Modelling to improve predictions of the impacts of climate change on groundwater dependent ecosystems like wetlands in the South East NRM region. The results of this work will help improve water planning and management and make better decisions about future conservation of important wetland systems.

RESEARCH FOCUS

OUTBACK WATER

The Lake Eyre Basin is a complex environmental system that is spread across a wide geographic region and has extreme hydrologic events. The Lake Eyre Basin (LEB) project aims to research and develop scientific indicators of environmental condition for the aquatic ecosystems of the LEB. The project will contribute expert science and develop relationships and linkages under the LEB Ministerial Forum.

CLIMATE CHANGE

Investment in this project has been focused on downscaling climate projections to provide an agreed set of climate projections for South Australia. The climate projections for each of the eight natural management regions will support proactive responses to climate change in water resource planning and management. Potential climate change impacts are a critical scenario affecting future water availability and will be incorporated in each of the regional water demand and supply statements as well as the design of infrastructure.

DIVERSIFIED WATER SUPPLIES

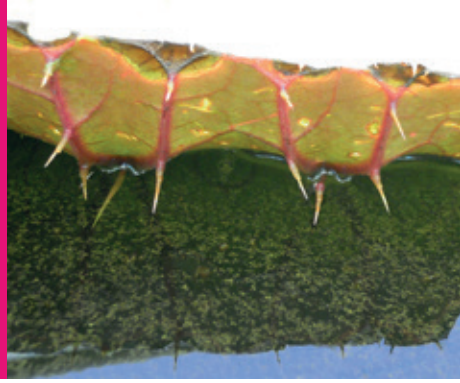
The MARSUO project assessed the risks associated with different stormwater use options. It also informed the assessment of the net public benefits of potable and non-potable water options and to determine the level of community support for these options.

Studies of satellite sites in Australia and overseas were undertaken to compare storm water quality and treatment requirements for potable use and to allow interpretation of the relevance of the results from Salisbury in SA. This project was jointly funded by the National Water Commission.

GROUNDWATER DEPENDENT WETLANDS

A suite of projects are investigating the groundwater dependent wetlands of the South East. The particular focus is to understand the environmental water requirements of a range of characteristics representing groundwater dependence, salinity and other water quality characteristics. In addition, the cause of alkalinity of drains and nutrient loads to iconic wetlands to understand these risks is also being undertaken. The outcomes of this research will support water allocation planning and management of groundwater dependent wetlands.

Since 2010 the Goyder Institute for Water Research has made cash and in-kind investments of some $40.6M in 30 research projects with a further $3.3M to be committed to 10 additional projects expected to be completed by June 2015. These projects are notable because they are large scale in scope and focus, require the formation of multi-disciplinary, multi-organisational teams to deliver, have led to "step" changes in practice and policy and importantly continue to promote South Australia as a leader in best practice for water research, management and implementation.



SOUTH EAST

A regional water balance model is being developed for the South East that brings together a conceptual model of the complex surface water- groundwater interactions in the region, including historical recharge information that has never before been available and groundwater dependent wetlands. In addition, a detailed study in predicting flow volumes in the drains of the South East will complement this larger project and support operators of the system manage water flows in the drains to achieve environmental flow outcomes and protection of agricultural land.

GROUNDWATER SCIENCE

An assessment of the groundwater resources of the Adelaide Plains is being undertaken, including developing an upgraded and improved groundwater model to assess future management strategies and opportunities to use the deep aquifers underneath Adelaide as an underground storage of water to further provide water security for the Adelaide Metropolitan region.

WSUD

The Water Sensitive Urban Design (WSUD) project has evaluated existing systems across South Australia together with identifying the impediments and opportunities for greater use and adoption of WSUD within the State. The project has developed a database of the effectiveness of hundreds of WSUD schemes across the State, each varying in complexity and size.

WATER ALLOCATION PLANNING

The Mt Lofty Ranges is being used as test-bed for the development of an integrated catchment water modelling support system. This project aims to provide data to improve the evaluation and planning for risks of water extraction both on catchment water resources and water dependent ecosystems. The project will develop ecological response models to test ecological outcomes under a range of hydrological scenarios using new field monitoring data.

WATER AND AGRICULTURE

The Salinity Management of Irrigating with Recycled Water project is in collaboration with local viticulture and horticulture businesses and the Australian Water Recycling Centre of Excellence to demonstrate the economic and environmental value of water recycling to Australia's agri-food industry. More specifically this project tested whether re-directing rain falling on the mid-row, to the soils immediately under the vines, will reduce the salinity pressure on vines and will assess how the changing concentrations of salt, in the various soils being assessed, affect plant response in terms of vigour, yield and crop quality.

WATER FOR MINING

Research undertaken by the G-Flows (Finding Long-Term Outback Water Solutions) project is building a knowledge base on the location and characteristics of aquifers and their relationship to environmental and cultural assets to support water management in the State's far north. The project supplements existing knowledge and information developed by DEWNR and has provided key techniques to inform the accessibility, viability and sustainability of the State's groundwater resources and aquifer characteristics for the mining sector. This project has developed new analysis techniques to reinterpret airborne data sets and other historical information to build a hydrogeological framework for the detection of potential regional groundwater resources and for the optimal design of airborne geophysical surveys to detect potential mineral deposits.

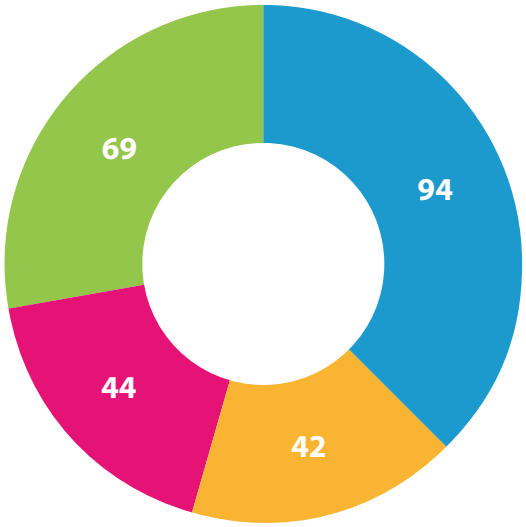
RIVER MURRAY

The Murray Flood Ecology project investigated the ecological responses to flooding in the Lower Murray following drought and has led to an improved understanding of the ecological response along the South Australian section of the River Murray. This critical new knowledge is informing the management of environmental watering required under the new Murray Darling Basin Plan.

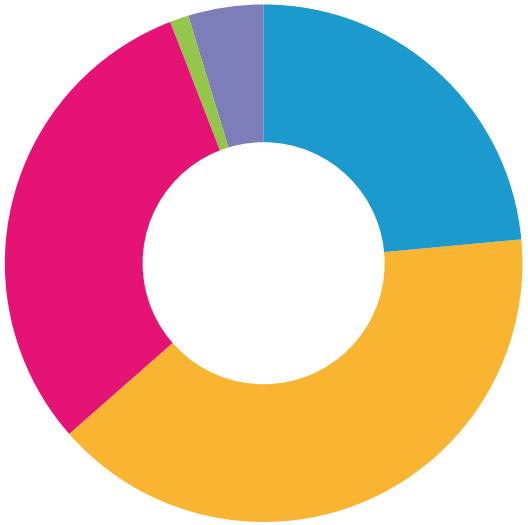
Other areas of investigations in the River Murray include studies into riverbank collapse, the development of a model to simulate the movement of salt across the floodplain and validation of the key water quality and fish ecology assumptions underpinning the operations of the Chowilla Environmental regulator.

SCIENCE QUALITY

PROJECT PUBLICATIONS JULY 2010 – JUNE 2014

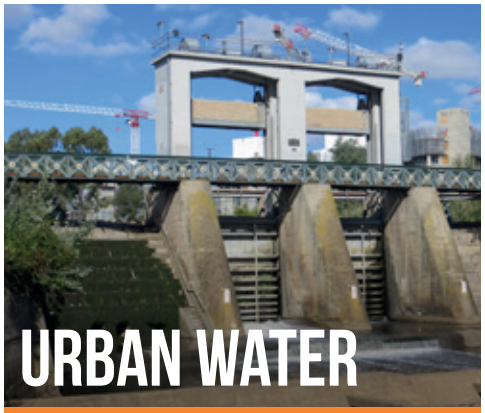


GOYDER INSTITUTE PUBLICATIONS JOURNAL IMPACT FACTORS



Journal Impact Factors >10 are high profile journals such as Nature or Science

The Institute has been recognised for its science quality, innovation and impact by being short-listed as a Finalist in several State and National Awards, including being a Finalist in the Adelaide Innovation Champions Award for 2014.



URBAN WATER

Projects in the Urban Water theme have produced 19 papers in journals and nine technical reports have been published in 2013–2014.

Prof Graeme Dandy 2014 was named "Water Professional of the Year."

MARSUO – 2014 Finalist Stormwater Association Research and Innovation Excellence Award.

Household Water Use Study – 2014 Finalist Stormwater Association Research and Innovation Excellence Award.

ENVIRONMENTAL WATER

Projects in the Environmental Water theme have produced a total of eight papers in journals and six technical reports in 2013–2014.

2014 Finalist Women in Innovation and Technology, Environment and Primary Industries.

WATER FOR INDUSTRY

Projects in the Water for Industry theme have produced one journal paper and three technical reports in 2013–2014.

GFLOWS – 2014 Finalist Mining Australia Prospect Awards for Excellence in Environmental Management.

CLIMATE CHANGE

Since 2010, 43 journal papers have been published from the Climate Change theme including four in the highly prestigious, international journal Nature.

The journal Nature has cited Cai et al (2014) in a Nature Editorial. In addition, it has featured it in two Nature news items and in a Nature Climate Change article on the expected doubling of extreme El Nino events as the globe warms.

CAPACITY BUILDING

The Goyder Institute supports building new capability in water management through its PhD supplement program and is bringing in international expertise through its ANZSOG–Goyder Institute Visiting Professor program. These initiatives are growing our capability base and extending our thinking towards the complex water management issues facing the State.

VISITING PROFESSOR PROGRAM

Flinders University, the Australia and New Zealand School of Government (ANZSOG) and the Goyder Institute for Water Research have pooled resources to create a Visiting Professor Program aimed at developing the nation's knowledge and skills base in the policy and management of finite resources, particularly water resources. The program's main focus is on the role of public policy and public sector management in maximising opportunities for collaboration and cooperation in the use and re-use of finite resources. In 2013/14 two Visiting Professors were part of this program.

Professor Steve Rayner – Oxford University (UK), November 2013 to February 2014

Professor Rayner collected data for a South Australia case study to contribute to a larger project of the Oxford Martin School of Oxford University on the use and usability of weather and climate information in resource management.

Professor Bruce Mitchell – University of Waterloo (Canada), January 2014 to May 2014

Professor Mitchell's investigation focused on assessing the evolution of increasingly integrated approaches to managing water and natural resources in South Australia between the early 1990s and 2014.

PHD PROGRAM

The Goyder Institute awards PhD Supplements to outstanding PhD candidates from each of the University partners. Eight supplements commenced in 2011, nine in 2012 and eight were awarded in 2013.

Five of the Goyder Institute PhD Candidates have completed their studies and have been successful in gaining positions around the globe.

Dr Jessica Liggett, previously Flinders University, has moved to a position as a hydrogeologist with the Alberta Geological Survey (AGS) in Canada.

Dr Saskia Noorduijn, previously Flinders University, is now a Post Doctorate Fellow at the University of Calgary, Canada.

Dr Sina Alaghmand, previously UniSA, is now a Lecturer at Monash University based in Kuala Lumpur, Malaysia.

Dr Deborah Furst, Adelaide University, is now a Post Doctorate Fellow at The University of Adelaide and continues to be involved in Goyder Institute projects.

Dr Hamideh Nouri, UniSA, is now a Research Assistant at UniSA.

SCIENCE COMMUNICATION

Science communication is becoming a greater focus of the Institute to enhance integration of science into policy and further embed the Institute partnerships and collaborations. The Institute endeavours to partner with other organisations to host events and undertake activities that support science communication. Part of the annual budget is targeted towards activities that facilitate knowledge management and stakeholder engagement. During 2013/14 these activities have included issues based workshops; the Annual Goyder Institute Water Forum; national and international conferences and the Goyder Institute's own science seminars.

7,700+ website visitors
23,000+ web page views
16 events
18 technical reports
38 journal publications

SHOWCASING THE INSTITUTE'S SCIENCE

Science Alive! 2013

Major sponsor of Science Alive! 2013 – bringing together the Goyder Institute, DEWNR, SA Water and SARDI in one exhibition showcasing South Australian water research.

Australian Water Association SA Branch Conference 2013

Silver Sponsor of the 2013 SA AWA Branch Conference – Building resilience in South Australia's urban water systems. The Institute's urban water portfolio of projects from MARSUO to WSUD to Optimal Water Resources Mix – were presented at this conference. In addition three of the Institute's PhD students also presented in the concurrent PhD stream.

Goyder Institute Water Forum

The second Water Forum was held in October 2013, with the Hon. Ian Hunter, Minister for Water and The River Murray, opening the forum. The presentations and discussions were focussed on looking forward to the future of the Institute and facilitating research through the innovation pipeline.

Modelling and Simulation Congress 2013

Gold Sponsor of MODSIM 2013 – The Director, Michele Akeroyd, presented the opening key note address of MODSIM 2013. A number of modelling related Goyder Institute projects were showcased at this conference including Climate Change Downscaling, Optimal Water Resources Mix and Mt Lofty Ranges.

Climate Change Workshop

The Goyder Institute held a *Climate Change Projections Stakeholder Workshop* in November 2014 with more than 50 representatives from Government, industry and university. The workshop focused on presenting the Goyder Institute climate change projections information and seeking feedback from key stakeholders regarding effective strategies to disseminate this information to support its use in the long term.

2013 Science Seminar Series

The Institute initiated its Science Seminar Series for the first time focussing on three key projects: Murray Flood Ecology, Climate Change Downscaling and Goyder Facilitating Long-term Outback Water Solutions.

SA Climate Change Showcase

Sponsorship of the DEWNR SA Climate Change Showcase in February 2014 that featured presentations from the Climate Change Downscaling project and the Visiting Professor, Professor Steve Rayner.

NRM Science Showcase

Goyder Institute projects were profiled throughout the DEWNR NRM Science Showcase in April 2014.

Managed Aquifer Recharge Workshop

A national forum was held in Adelaide in March 2014 to bring together stakeholders involved in the latest research being undertaken in relation to Managed Aquifer Recharge and to discuss the adoption of research into policy and practice.

OzWater 2014

The Institute hosted the Australian Water R&D Coalition Workshop at OzWater 2014 in Brisbane in May 2014 that focussed on the National future of urban water research.

Water Industry Alliance Smart Water Awards

The Goyder Institute was a silver sponsor at the annual Water Industry Alliance Smart Water Awards ceremony in May 2014. The smart water awards highlight the expertise and capability of South Australia's water industry and recognises the State's leading edge expertise and innovation.

PERFORMANCE REPORT

RESEARCH PROGRAM

The 2013/14 financial year, the fourth for the Goyder Institute for Water Research, was the largest in terms of finances since the Institute's inception. As at 30 June 2014, the South Australian Government has invested $19.45m cash to research projects with in-kind contributions totalling $20.62m provided by research partners CSIRO, Flinders University, University of Adelaide and University of South Australia as well as State research providers SARDI and AWQC. Collective life-to-date investment across the 35 approved research projects now stands at $40.07m.

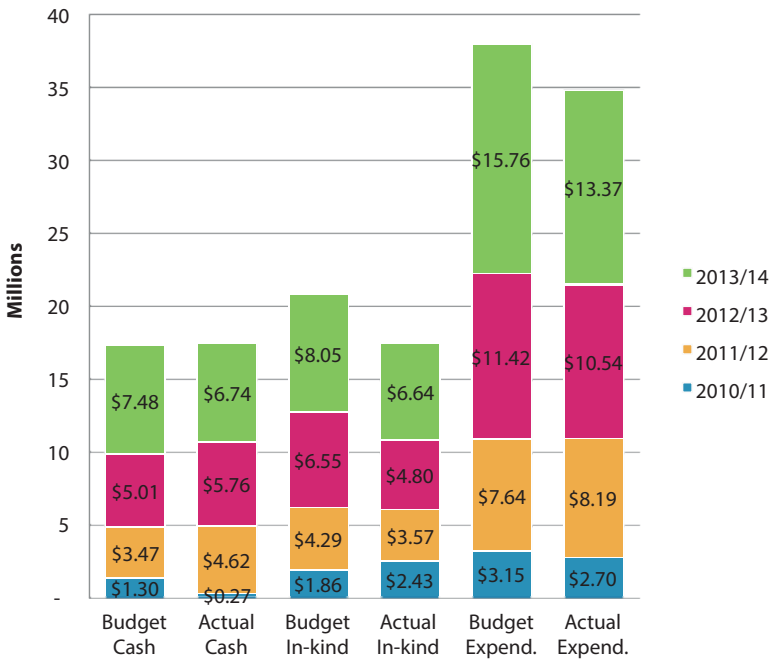
ADMINISTRATION PROGRAM

The total budget for Institute administration for 2013/14 was $1.00m. The administration program is funded in accordance with the agreement with the South Australian Government contributing all the cash and each of the research partners contributing matching in-kind based on their participating interest. The universities' contribution is in the form of PhD students and CSIRO contributes the Director's salary expenses. Total expenditure in 2013/14 was $0.88m. Overall, the administration program is tracking very close to budget on a whole of life basis.

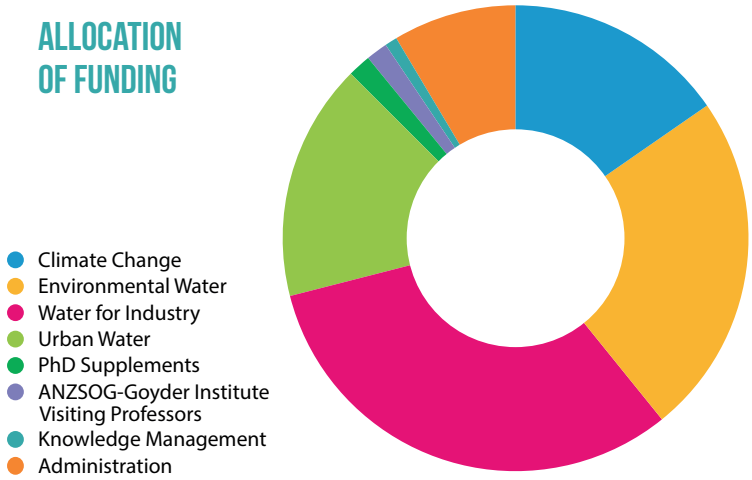
INSTITUTE TRUST ACCOUNT

The closing balance of the Trust account at 30 June 2014 was $3,454,617. During the course of the year, the Trust received $5,000,000 in cash from the State and earned $190,835 in interest. The Trust paid CSIRO $634,119 for Administration and Knowledge Management expenses (excludes Directors salary), paid $5,937,403 to the research participants which includes PhD supplements of $175,000 and paid $164,818 to the ANZSOG/ Goyder Institute Visiting Professor Program administered by Flinders University.

OVERALL BUDGET BY YEAR



ALLOCATION OF FUNDING

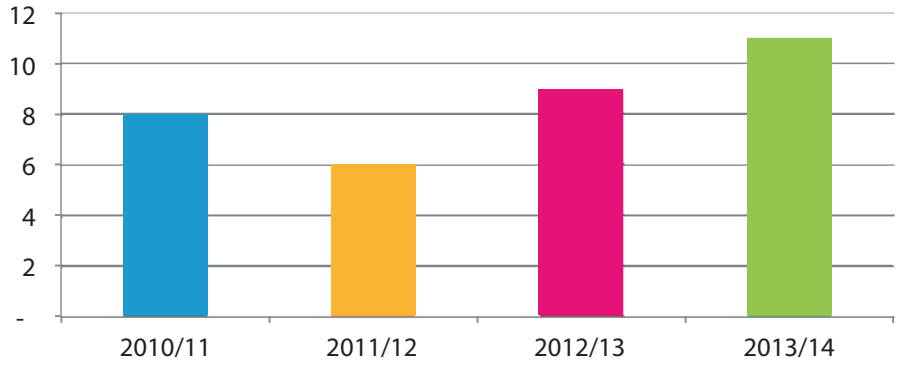


RESEARCH PROJECTS

Ten new research projects commenced in the 2013/14 financial year which helped to bring whole of life actual expenses to $29.18m compared to a budget of $32.25m. This variance will be corrected in the 2014/15 financial year.

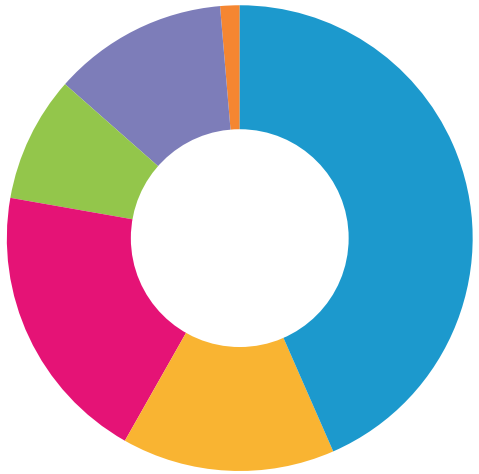
Research cash payments were at their highest level ever in 2013/14 totalling $5.76m. These included initial payments for new projects, scheduled milestone payments and delayed milestone payments from the previous financial year.

PROJECT APPROVALS BY YEAR



WHOLE-OF-LIFE RESEARCH ALLOCATION – PARTNERS

WHOLE-OF-LIFE RESEARCH ALLOCATION – ALL PARTICIPANTS



RESEARCH PROGRESS

At the end of 2013/14 there were a total of 35 projects initiated through the Goyder Institute. The spread of these across the four research themes is presented in the adjacent chart.

During 2013/14 there were 22 active projects. Of these, seven were new projects initiated during the year. These projects were:

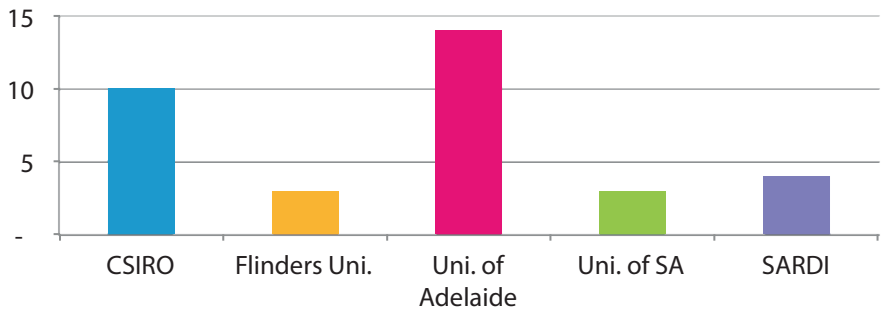
- E.1.11. Modelling Floodplain Salt Dynamics
- E.1.12. Assessing Operations of Floodplain Environmental Regulators – water quality
- E.1.13. Monitoring Strategy for Environmental Water
- E.2.6. South East Regional Water Balance Phase 2
- E.2.7. South East Water Quality Risk Assessment
- I.1.2. GFLOWS2
- I.1.3. Lake Eyre Basin Environmental Indicators

A further seven projects were completed during 2013/14. These projects were:

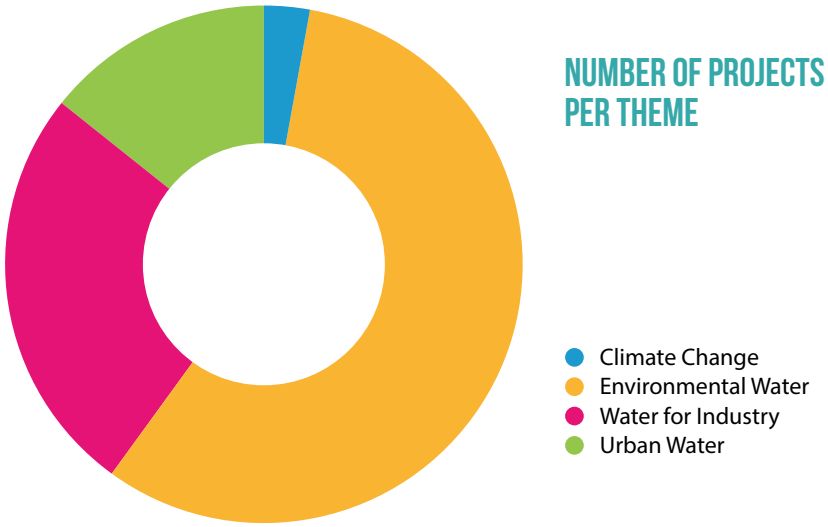
- E.1.3. Murray Flood Ecology
- E.1.5. River Murray Scoping
- E.1.9. River Channel Environmental Water Requirements
- E.1.10. SDL Adjustment Mechanism
- E.2.3. South East Regional Water Balance Phase 1
- I.1.5. Torrens Lake Amenity Trial 2012/13
- I.2.1. GFLOWS1

Full details regarding each research project can be found in the 2014/15 Research and Development Plan at www.goyderinstitute.org

PROJECT LEADERSHIP



NUMBER OF PROJECTS PER THEME



OUR PEOPLE

INSTITUTE OFFICE

Dr Michele Akeroyd, Director
Danni Oliver, Research Manager
Alison Bowman,
Marketing and Comms Manager
Claire Punter, Executive Assistant
Neil Power,
Director State Research Coordination

PROJECT LEADERS

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A/ Prof. Justin Brookes,
University of Adelaide
Dr Todd Wallace, University of Adelaide
Dr Mat Gilfedder, CSIRO
Prof. Simon Beecham, UniSA
Dr. Juliette Woods, Flinders University
Dr Deborah Furst, Adelaide University
Prof. Jennifer McKay, UniSA
Sue Cuddy, CSIRO
Prof. Mark Jaksa, Adelaide University
Tim Pitt, SARDI
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Dr Nikki Harrington, Flinders University
Dr Ashok Sharma, CSIRO
Dr Peter Dillon, CSIRO
David Pezzaniti, UniSA
Dr Qifeng Ye, SARDI
Dr Matt Gibbs, Adelaide University
Dr Kane Aldridge, Adelaide University
Dr Tim Munday, CSIRO

ANZSOG-GOYDER INSTITUTE VISITING PROFESSORS

Professor Steve Rayner, Oxford
Professor Bruce Mitchell, Waterloo

STEERING COMMITTEES

Adelaide Plains Groundwater
Steve Smith, DEWNR
Neil Power, DEWNR
Graham Green, DEWNR
Adrian Costan, DEWNR
Peter Cook, Flinders University

MLR Water Allocation Planning
Glen Walker, CSIRO
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Jacqueline Frizenschaf, SA Water
Steve Smith, AMLR NRMB

GFLOWS
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LEB
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Department of Environment

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Bruce Naumann, City of Salisbury
Steve Gatti, AMLR-NRMB
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Chris Wright, DEWNR
Tony Herbert, DEWNR
Graham Green, DEWNR
Linda Vears, DEWNR
Okke Batelaan, Flinders University

Recycled Water and Salinity
Michele Akeroyd, Goyder Institute
John Radcliffe, CSIRO
Mara Wolkenhauer, AWRCoE
Ben Robinson, Member of PAC for Recycled Water and Salinity

South East Coordinating Committee
Tim Bond, SE NRM Board
Neil Power, DEWNR
Graeme Green, DEWNR
Glen Walker, CSIRO
Peter Cook, Flinders University

Urban Water reference panel
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Grace Jennings, SA Water
Steve Gatti, AMLR NRMB
Andrew Solomon, EPA
Sharon Wyatt, DPTI
Simon Thompson, LGA
Phil Donaldson, Renewal SA

WSUD stakeholder reference group
Sam Phillips, AMLR NRM Board
Andrew King, West Torrens Local Government
Simon Thompson, LGA
Ruth Ward, EPA
Sharon Wyatt, DPTI
Sharon McKay, DPC
Martin Allen, DEWNR
Greg Ingleton, SA Water

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Government of South Australia
Department of Environment, Water and Natural Resources

CSIRO

THE UNIVERSITY of ADELAIDE

University of South Australia

Flinders UNIVERSITY

The Goyder Institute for Water Research is a partnership between the South Australian Government through the Department of Environment, Water and Natural Resources, CSIRO, Flinders University, the University of Adelaide and the University of South Australia.