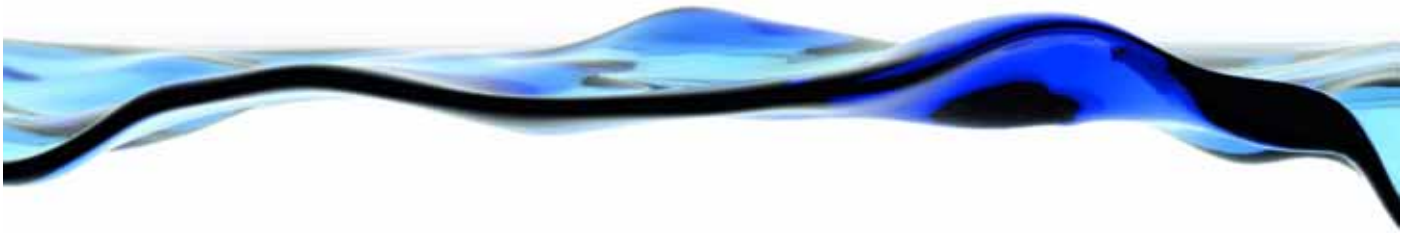
Goyder Institute for Water Research

Annual Report 2010-11



GOYDER INSTITUTE FOR WATER RESEARCH

www.goyderinstitute.org

Photo: Department for Water - Riverland

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About the Goyder Institute for Water Research

The Goyder Institute for Water Research was established in 2010 to support the security and management of South Australia's water supply and contribute to water reform in Australia.

The Institute brings together South Australia's leading water research capabilities, in collaboration with CSIRO, into a single, comprehensive research program aimed at providing expert, independent scientific advice that informs good policy decision-making, identifies future threats to water security and assists in an integrated approach to water management.

It is intended that the Goyder Institute will enhance the South Australian Government's existing capacity to develop and deliver science based policy solutions and in doing so, underpin the sustainable development of the State. It is further intended that this will also strengthen the State's position as an international leader in water resource management and provide the South Australian community with confidence that the best scientific minds available are being targeted at resolving the State's key water resource management issues.

Historically, South Australia has relied on three rain-dependent sources of water – the River Murray, Mt Lofty Ranges and groundwater. However, like much of the southern regions of the continent, many areas of South Australia have experienced a decline in surface water flows and groundwater levels over the past decade compared to long term averages. This has resulted in an increased threat to the security of water supplies for regional communities, industry and the environment. With projected impacts of climate change indicating a generally drier outlook, the State is facing increased water scarcity.

South Australia's future economic growth and resilience is dependent on the provision of sustainable water supplies. In recognition of this, South Australia's Strategic Plan 2007 has a target requiring that *'South Australia's water resources are managed within sustainable limits by 2018*'. The sustainable management of water resources, and those resources yet to be developed, will require strategic alliances between Government, communities and industry, to ensure effective working partnerships for optimal utilisation of all resources.

The *Goyder Institute Strategic Research Plan* details the long-term strategic outcomes for a research program that will help ensure the water resources of the State of South Australia are sustainably managed for economic, social and environmental benefits. The Strategic Research Plan links ongoing and proposed research projects to the strategic outcomes through Roadmaps.

The Strategic Research Plan is guided by a number of policy and implementation documents and agreements, which include the *Natural Resources Management Act 2004,* the *National Water Initiative Intergovernmental Agreement*, *Water for Good* and the *Water Act 2007* (Federal legislation). It is also complementary to the water allocation and natural resources management planning frameworks of the Natural Resources Management (NRM) Boards. The Program is cognisant of industry and community aspirations for state water resources management that is both transparent and provides certainty.

Goyder Institute Strategic Intent
The Goyder Institute will support world leading water resource management in South Australia through excellent science.

Goyder Institute Research Objectives
The Institute will provide knowledge to support:

- the delivery of reliable and resilient urban water supplies that meet future needs;
- the ongoing viability of existing water dependent developments and the identification of future sustainable water resource development opportunities;
- the provision of environmental water to achieve optimal outcomes;
- proactive responses to climate change in water resource management; and
- effective water management policy and decision making with clear and transparent trade-offs.

Goyder Institute Partners

The Goyder Institute for Water Research was established in July 2010 as a partnership between the South Australian Government through the Department for Water, CSIRO, Flinders University, the University of Adelaide and the University of South Australia.

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.

Goyder Institute Associates in 2010-11 were the South Australian Research and Development Institute (SARDI) and SA Water's Australian Water Quality Centre (AWQC).

Photo: www.sxc.hu (Michael Howard – Just a little Dirty)

Governance

Management Board

The key role of the Management Board is to set the strategic vision and direction for the Goyder Institute and to monitor its implementation and outcomes. It also reviews and approves annual research programs and budgets, and oversees the effective delivery of the research programs.

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 Management Board met eight times during the 2010-11 financial year (i.e. 18 August 2010, 30 September 2010, 12 October 2010, 23 November 2010, 24 February 2011, 3 March 2011, 29 April 2011 and 1 June 2011).

During 2010-11 there were two joint strategic planning workshops held with the Research Advisory Committee to consider strategic research priorities.

The Members of the Goyder Management Board for 2010-11 were:

Ian Chessell
Independent Chair

Scott Ashby
Chief Executive, DFW

Jim Hallion
Chief Executive, DP&C
(May-Jun 2011)

Chris Eccles
CEO, DP&C
(Jul 2010-May 2011)

Bill Young
Director, WfHC
Flagship, CSIRO

David Day
DVC (Research),
Flinders University

Mike Young
Director, Environment
Institute, University
of Adelaide

Scott Keyworth
Manager Research
Adoption, WfHC
Flagship, CSIRO

Caroline McMillen
DVC (Research and
Innovation), UniSA

Tony Minns
Director, Goyder
Institute

Research Advisory Committee

The Research Advisory Committee (RAC) assists the Director in the development of the Research and Development Plan of the Goyder Institute and ensures that research is of international quality in areas that will ensure that South Australia's science is being most effectively deployed to manage the water issues facing South Australia. It may conduct periodic reviews of Goyder Institute research project activities and make recommendations about the direction, content and details of future activities.

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 the Australian Water Quality Centre, and up to three specialists as agreed by the Management Board.

The RAC met 10 times in 2010-11 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 year of the program.

The members of the RAC for 2010-11 were:

Tony Minns
Director, Goyder Institute

Jim Cox
Principal Scientist, Water Resources and Irrigated Crops, SARDI

Chris Saint
Manager, Research, Development and Innovation, AWQC

Ben Bruce
Director, Science, Monitoring and Information, DFW

Simon Beecham
Head of School, School of Natural and Built Environments, UniSA

Ian Prosser
Science Director, WfHC Flagship, CSIRO

Justin Brookes
Director, Water Research Centre, University of Adelaide

Craig Simmons
Director, National Centre for Groundwater Research and Training, Flinders University

Neil Power
Director, State Research Coordination, DFW

Message from the Chair

South Australians, since our earliest days, have had a strong sense of living in a dry environment and these feelings have been heightened in recent years when the vulnerability of our limited water resources and our water dependent ecosystems has been starkly revealed. Yet there will be increasing future demands on these resources driven by anticipated population growth, domestic and international demand for food and by our expanding mineral and gas industries.

This vital importance of water to 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 with the objective of providing the excellent science and innovation that will be key to building world leading water resource management in South Australia. We are building a research institute of national and international standing through the partnership model we have adopted for the Goyder Institute. The partnership is between the Government as research client and the very best of scientific research capacities in the State's universities and research institutions, in the CSIRO and beyond. I believe researchers are excited by having real problems to solve and through meeting these challenges, seeing the results of their research put into operation. This excitement is at the centre of the Goyder Institute model and will, if carefully nurtured, ensure its relevance and effectiveness to the State and Nation.

I am delighted at the progress made in our first year of operation. In particular the appointment of our Institute Director, Dr Tony Minns, whom I warmly welcome. Dr Minns, a South Australian by birth and early education, has returned from some 25 years of research and institutional leadership in Europe to take up this position.

I would like to acknowledge and thank the many people who supported and gave of their time, ideas and energy to assist with the creation of the Goyder Institute. The Premier, the Hon. Mike Rann, gave his ongoing support and encouragement from the beginning for our innovative partnership model. The Minister for Water, the Hon. Paul Caica, has been a staunch supporter with ideas and practical advice, as has his Department's CEO, Mr Scott Ashby and his Leadership Team. The CEO of the CSIRO, Dr Megan Clark, has been a strong and influential supporter, and the leaders of the CSIRO Water for a Healthy Country Flagship, together with our university research partners have played a vital role in justifying the resources and defining the research questions for the Goyder. Sincere thanks are also due to many others for valuable contributions and encouragement.

Ian Chessell
Chair, Goyder Institute for Water Research

Photo: Goyder Institute for Water Research launch, 30 March 2011.

From left to right: Dr Ian Chessell, Chair, Goyder Institute for Water Research
The Hon Mike Rann MP, Premier of South Australia
Dr James Bradfield Moody, Executive Director - Development, CSIRO.

Goyder Institute Director's Message

The leadership of the Goyder Institute for Water Research has seen some changes during the 2010/11 financial year with Paul Dalby handing over the Interim Institute Director responsibilities to Neil Power in late February 2011 prior to my appointment as Director at the beginning of May 2011. I would like to take this opportunity to thank Paul and Neil for their tremendous efforts in helping to launch the Goyder Institute for Water Research on 1 July 2010, which was marked by an official ceremony with the Premier of South Australia, Hon Mike Rann and the Minister for Water, Hon Paul Caica on 30 March 2011.

Most of our efforts this year have been devoted to developing the Goyder Institute Strategic Research Plan 2011 – 2015, and establishing the necessary procedures and policies required to manage a $50M research program.

All of the procedures and policies are described in the Goyder Institute Handbook, which is available from the Goyder Institute office.

A great deal of time and effort went into the development of the Goyder Institute strategic roadmaps, which detail the priority research lines for the coming years. Countless workshops and discussions with researchers, government agencies and other stakeholders made it possible to visualise our research priorities in a coherent set of simple diagrams. The roadmaps are now used to help us inform our partners and other interested parties about our research activities. Further on in this Annual Report you will find a complete description of our research themes and associated roadmaps.

You are welcome to make use of these roadmaps to determine the relevance of our research to your own organisation or to identify areas of synergy with your own research activities.

A research plan is of course only as good as the outcomes it produces. The Strategic Research Plan and roadmaps allow us to develop research projects that are specifically aimed at addressing the identified gaps-in-knowledge, that can be expected to contribute to the strategic outcomes, and that will provide the necessary science to underpin policy development and implementation.

A total of nine individual research projects were intiated during this year that address some key priorities of the South Australian Government across our four research themes of Urban Water, Environmental Water, Water for Industry, and Climate Change. Brief reports about each of our ongoing projects are provided further on in this report.

The greatest challenge to the Goyder Institute as we move forward is to ensure that we deliver as promised the science and knowledge to support world-leading water resource management in South Australia and further afield. In the coming years we will be concentrating on quality control procedures and on communication of our results to stakeholders and other interested parties. We will also be actively searching for new opportunities to build collaborative partnerships with the water industry and other research providers both nationally and abroad. The key to uptake of our research outcomes by stakeholders is active participation of the end-users in all phases of project development and execution.

If you feel that your organisation could contribute to our research program, or that you could benefit from the outcomes of our research projects, or that there is synergy to be found with your own ongoing research activities, I would be greatly interested in hearing from you.

Tony Minns
Director, Goyder Institute for Water Research
director@goyderinstitute.org

Goyder Institute Themes & Roadmaps

Research effort funded by the Goyder Institute is focussed across four enduring Research Themes.

- Urban Water;
- Water for Industry;
- Environmental Water; and
- Climate Change.

The Strategic Research Plan links ongoing and proposed research activities to strategic outcomes through Roadmaps.

Within each Theme, one or two Roadmaps have been developed around key research lines. The Roadmaps detail more specifically the science and research requirements for desired outcomes and policy objectives that have been identified by both Government Agencies and other water industry partners. All Goyder Institute research projects are expected to demonstrate how they contribute to a specific Roadmap, and hence how they contribute to a specific policy outcome or identified knowledge gaps. The roadmap shows where research efforts are being concentrated on enabling research; fundamental research; applied research; implementation; and tool development. This enables the Goyder Institute to arrive at a balanced R&D profile in all research programs. In addition, the contributions of other external research activities by associates or other partners can be visualised in the roadmap, thus demonstrating where there is synergy with others and where the Goyder Institute is able to leverage additional financial support for the research program.

The following sections provide a brief description of the Goyder Institute's Research Themes and their associated Roadmaps.

Urban Water

Australia's growing population is becoming increasingly urbanised. In South Australia, the urban population relies heavily on vegetated surface water catchments, but with a warming and drying climate water security in the future has become a major issue.

Major investments on water infrastructure are ongoing or planned. The large investment in seawater desalination plants, the only relatively mature large scale technology implementable at the time of need, and independent of rainfall, is relatively expensive compared with traditional supplies and may increase energy use of water utilities. Other large scale options such as sewage recycling for indirect potable reuse still need to develop appropriate implementation strategies that adequately address public safety perceptions within a political environment. Other options are available that await further investigation.

The Urban Water Theme aims to deliver outcomes that will scientifically underpin government water strategies to ensure reliable, resilient and safe metropolitan and regional urban water supplies that meet future needs. It will develop knowledge necessary for the decision making process for water supply and savings options for the variety of water resources available in South Australia. It will address aspects of reliability, public health, planning and public acceptance.

The Goyder Institute Roadmaps that relate to this Theme are:

U.1 Water Sensitive Urban Design
Objective: Water sensitive urban design as an integral part of urban design

U.2 Water Resources Mix for Adelaide
Objective: An integrated water plan for Greater Adelaide

The indicative outcomes of the Goyder Institute's Urban Water Theme are as follows:

- Contribute to the achievement of key strategic outcomes for urban water management in South Australia.
- Secure, reliable, resilient and safe potable urban water supplies for projected population and industry growth.
- South Australia's urban water supply and use are managed as fit for purpose.
- Improved economic and environmental outcomes from urban water use and management.
- Maximised sustainable reuse opportunities for urban centres.
- Significantly reduced impact of stormwater on coastal receiving waters.
- Clear 'rights' to surface water, including stormwater are established.
- Improved flood management and resilience to flood risk.
- Communities actively utilising alternative water sources and water savings options.

Photo: CSIRO Scienceimage

Water for Industry

The prosperity of South Australia is linked to the success of water-dependent industries such as mining/energy generation, manufacturing, irrigated agriculture and viticulture, forestry, stock and domestic water supply. Policy development to support equitable and sustainable water allocation to this multitude of users requires a very good understanding of hydro-geological and hydro-ecological relationships and their responses to human activities and land-use changes.

The exploitation of new and existing mineral resources in South Australia will require water for workers and communities, and for the extraction and mining operations. This requires improved knowledge about the character and variability of groundwater resources, the sustainability of this resource and its relationship to environmental and cultural assets, particularly in the priority areas for development in South Australia (Musgraves and the north eastern and north western Gawler).

The Water for Industry Theme aims to deliver outcomes that will scientifically underpin government water strategies to ensure the continued development of ecologically sustainable, competitive productive industries in South Australia.

The Goyder Institute Roadmaps that relate to this Theme are:

I.1 Water Allocation Planning & Water Quality Improvement
Objective: Equitable water sharing in multi-use catchments

I.2 Mining and Outback Water
Objective: Water supplies for mining, industry development and communities

The indicative outcomes of the Goyder Institute's Water for Industry Theme are as follows:

- Integrated water resources development in South Australia to support industry, indigenous and outback communities, and the environment.
- A viable irrigation industry that optimises the economic and social outcomes from water use and minimises environmental impacts.
- Industry and communities that are resilient to water resource impacts of climate change, variability and extreme events.
- Successful implementation of water allocation planning to protect watersheds from inappropriate developments and to maintain prescribed water resources.
- Water resource implications associated with industry driven land-use change are understood and management strategies developed.

Photo: www.sxc.hu (Timo Balk – Vineyard)

Environmental Water

South Australia is a state rich in biodiversity, natural resources and economic activity. Water is a major contributor to the State's economy and natural beauty. The regions along the River Murray and in the South East of the State are home to world-class wineries, irrigated horticulture, livestock production and forestry. Numerous wetlands are home to a number of threatened and endemic species and give the region its unique character.

Water managers in the region need to understand the relationship between surface water and groundwater flows, and the ecological response in streams, on the floodplains and in wetlands. This improved ecological understanding must be capable of informing policy and management decisions at a regional as well as local scale.

The Goyder Institute will aid the State to develop the most comprehensive ecological response model ever prepared to support water management in the South East and provide a decision support tool to optimise surface water and groundwater management to meet the wetland health and biodiversity goals of the region.

The Environmental Water Theme aims to deliver outcomes that will scientifically underpin government water strategies to ensure optimal outcomes for the environment while also achieving social and economic outcomes. It will develop knowledge and tools to support the provision of water to environmental assets to ensure resilient, connected and healthy ecosystems.

The Goyder Institute Roadmaps that relate to this Theme are:

E.1 River Murray
Objective: Managing the Murray Darling Basin as an integrated catchment

E.2 Surface Water, Groundwater, Wetland Relationships
Objective: Tools for planning and management of surface water – groundwater connected systems

The indicative outcomes of the Goyder Institute's Environmental Water Theme are as follows:

- Achievement of optimal environmental outcomes while also achieving social and economic outcomes in the context of changing climate and policy arrangements.
- Assist South Australian government with the effective implementation of the Murray Darling Basin Plan.
- Whole of system approach to ecology of aquatic ecosystems.
- Leadership in environmental flow science and in the communication of the research outcomes to environmental managers and wider public.
- An informed public and stakeholders on the environmental benefits and tradeoffs of water management options.
- Provide tools to ensure that South Australia is making the best possible use of available water resources in the State.

Photo: Kane Aldridge (University of Adelaide)

Climate Change

There is a need to understand the risks, vulnerabilities and opportunities related to climate change in South Australia. To this end, it is necessary to bring together policy makers, end-users and leading researchers to develop a consistent cross-government approach to interpreting the effects of climate variability and change on water availability in the State.

The Climate Change Theme aims to deliver outcomes that will scientifically underpin government water strategies to ensure that South Australia has resilient water infrastructure, sufficient environmental water and is able to provide water security for industry and urban settlements. This will aid in the development of effective, region specific adaptation strategies that meet the needs for human supply and natural resources.

The Goyder Institute Roadmap that relates to this Theme is:

C.1 Regional Climate Change Downscaling
Objective: Accounting for climate change in water management practices in South Australia

The indicative outcomes of the Goyder Institute's Climate Change Theme are as follows:

- Develop an agreed set of downscaled climate projections for South Australia to support proactive responses to climate change in water resource planning and management.
- Develop tools that water and environmental managers in South Australia can use to derive the most appropriate mitigation strategies that incorporate an integrated assessment of climate change on water resources.
- Water resource management arrangements are adaptive and responsive to future climates and ongoing variability without further degrading our water ecosystems and the important natural assets and values they provide.
- Communities understand risk management and mitigation options and are resilient to climate trends and extremes.

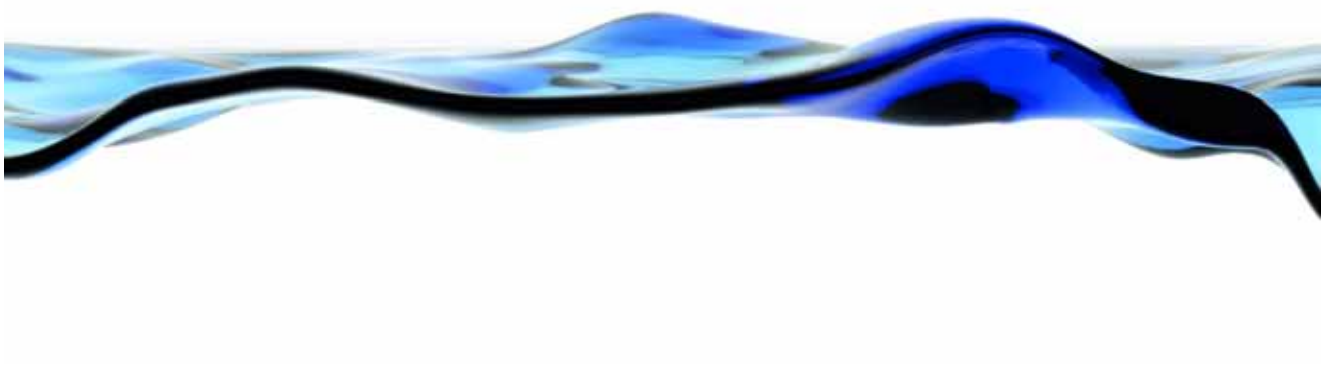
Photo: Simon Beecham (University of South Australia)

Photo: CSIRO Scienceimage

Goyder Projects 2010-11

The following table and diagram provide a summary overview of approved Goyder projects in 2010-11 and how they relate to the Goyder Institute's roadmaps.

Theme	Roadmap	Project #	Project Title
Urban Water	U.1 Water Sensitive Urban Design	U.1.1	WSUD Targets
	U.2 Water Resources Mix for Adelaide	U.2.1	MARSUO
Water for Industry	I.2 Mining and Outback Water	I.2.1	G-FLOWS
Environmental Water	E.1 River Murray	E.1.1	MDB Review
		E.1.2	Murray Flood Ecology Urgent
		E.1.3	Murray Flood Ecology
	E.2 Surface Water, Groundwater, Wetland Relationships	E.2.1	South East Urgent
		E.2.2	South East Phase 1
Climate Change	C.1 Regional Climate Change Downscaling	C.1.1	An agreed set of climate change projections for SA



WATER SENSITIVE URBAN DESIGN (WSUD) TARGETS

Scientific advice for the development of interim and future Water Sensitive Urban Design (WSUD) targets in Greater Adelaide.

GOYDER PROJECT NUMBER:	U.1.1
GOYDER PARTICIPANTS:	CSIRO, University of South Australia, Flinders University
PROJECT LEADER:	David Pezzaniti (University of South Australia)
GOYDER ROADMAP:	U.1 Water Sensitive Urban Design
PROJECT DURATION:	1 April 2011 to 30 August 2011
BUDGET AND EXPENDITURE:	Total Project Budget: $291,896 / Expenditure to 30 June 2011: $95,837

Challenge

The South Australian Government's water security plan, Water for Good, includes a number of commitments to increase the adoption of water sensitive urban design (WSUD), primarily across the Greater Adelaide region. One of these actions requires the Government to introduce targets for WSUD. It is widely accepted that WSUD systems will not exhibit the same performance in different climates and there is a need to take this issue into consideration. Amongst many other technical and scientific factors, there is also a need to consider the requirements of receiving water bodies when setting WSUD targets.

Solution

This project will review current targets from other regions in Australia (e.g. NSW, Victoria, Queensland, Northern Territory, and Western Australia) and assist with the development of appropriate interim water use, urban runoff quantity and runoff quality targets which must be demonstrated by developments in the greater Adelaide region. Interim targets for WSUD will be recommended based on the assessment outcomes. Where possible, recommendations will be consistent with state government agency regulations and initiatives including the Water for Good, The 30 Year Plan, the EPA Water Quality Policy, the Adelaide coastal water quality management plan, and the Adelaide Mount Lofty Ranges NRM Plan. It is anticipated that further detailed analysis and research will be required to finalise these targets by 2013, which is the timeline proposed by *Water for Good* for implementation of WSUD.

Achievements

A presentation has been made to the SA Government Agency WSUD working group on 9 June 2011.

Next Steps/Future Work

A further presentation will be given to SA Gov Agency WSUD working group presentation on 12 September 2011. Comments will be sought from the working group on the draft project report prior to finalisation and opportunities will be identified for the publication of work into the future.

MANAGED AQUIFER RECHARGE AND STORMWATER USE OPTIONS (MARSUO)

Assessment of the safety, public acceptance, economics and environmental impacts of alternative options for stormwater use in Australia through a case study in Adelaide.

GOYDER PROJECT NUMBER:	U.2.1
GOYDER PARTICIPANTS:	CSIRO, University of South Australia, The University of Adelaide, SA Department for Water
AFFILIATE PARNTERS:	National Water Commission, Adelaide and Mount Lofty Ranges NRM Board, City of Salisbury, United Water International
PROJECT LEADER:	Dr Peter Dillon (CSIRO)
GOYDER ROADMAP:	U.2 Water Resource Mix for Adelaide
PROJECT DURATION:	1 January 2011 to 30 June 2014
BUDGET AND EXPENDITURE:	Total Project Budget: $2,242,300 / Expenditure to 30 June 2011: $14,127

Challenge

With Australia's growing and increasingly urbanised population, combined with a warming, and in southern Australia, drying climate, and most cities relying on vegetated surface water catchments, water security is an issue that is currently consuming $1.8b in SA and $30b nationally in new infrastructure. The rate of runoff per unit area in rural catchments is declining more than three times faster than that of both rainfall and runoff rate in urban catchments. With the current expansion of impervious surfaces due to both urban population growth and increasing house sizes, urban area mean runoff is actually increasing in spite of climate change. This represents a significant source of water that is close to the city but can be difficult to harvest unless water sensitive urban design is incorporated in city planning. Use of aquifers to improve water quality, to smooth out water quality variations, and to store water is expected to be a major advantage for part of the Adelaide metropolitan area and parts of other cities.

Solution

This project assesses the safety, public acceptance, economics, and environmental impacts of alternative options for stormwater use in Australia through evaluation of a case study in Adelaide involving managed aquifer recharge and satellite sites to demonstrate extrapolation of the methodology. The project methods and findings will be documented in a series of scientific reports, which will be exposed to review by independent scientists on the Water Safety Expert Panel, and presented in scientific meetings and community meetings in the relevant catchments. In consultation with CSIRO Water for a Healthy Country Flagship and the National Water Commission, this information will provide the basis for a briefing of the Government of SA and be disseminated nationally and internationally.

Achievements

Workshops have been conducted on risk assessment (hub and satellite sites), risk management strategies (hub), and impacts on urban water infrastructure, focus groups and web survey have been conducted, one journal paper has been published, 3 conference papers and a poster have been presented, and links established with prospective satellite sites. A second meeting of the Water Safety Expert Panel was held in June 2011. All milestone reports to date have been completed on time and been accepted by the Steering Committee and the National Water Commission.

Next Steps/Future Work

Work on net benefits has been brought forward to allow integration into community awareness research, and satellite sites research work has also been advanced to enable effective national and international engagement. Next deliverables are due in November 2011 and March 2012, including completion of preliminary reports on public health risk assessment and net benefits of options.

G-FLOWS

Facilitating long term outback water solutions.

GOYDER PROJECT NUMBER:	I.2.1
GOYDER PARTICIPANTS:	CSIRO, The University of Adelaide, Flinders University
GOYDER ASSOCIATES:	SARDI
PROJECT LEADER:	Dr Tim Munday (CSIRO)
GOYDER ROADMAP:	I.2 Mining and Outback Water
PROJECT DURATION:	1 January 2011 to 30 June 2012
BUDGET AND EXPENDITURE:	Total Project Budget: $3,055,986 / Expenditure to 30 June 2011: $466,974

Challenge

Planned and potential mining and energy development in South Australia's far north is set to have significant consequences for the water resources of the region. These sectors generate significant economic value to the State and their support remains a priority for the Government. The scale of the planned developments and the potential from current exploration programs facilitated by the South Australian Government through the Plan for Accelerated Exploration (PACE) Program will result in a substantial increase in infrastructure requirements, including access to water resources and Aboriginal lands for exploration and potential mine developments. Presently, knowledge about the character and variability of groundwater resources, the sustainability of this resource and its relationship to environmental and cultural assets remains very limited, particularly in the Musgraves, the North East and North West Gawler, and parts of the Frome Embayment. Access to water is a key infrastructure need for mining and energy industry development in these regions.

Solution

The G-FLOWS project, through a staged program of research, aims to invest in the development of an integrated water resource management strategy, thereby facilitating the economic growth potential of these priority regions. Drawing on the combined efforts of Goyder Institute participants, State and Federal Government agencies and industry, the project will initially determine the location and characteristics of aquifers, their capacity and the quality and variability of the contained groundwater resources. This knowledge will inform the accessibility and sustainability of the State's groundwater resources that are suitable for mineral processing and energy supply. The outcomes of this project will enable prudent decision making and policies regarding water allocation, accounting, licensing, and sustainable yields whilst ensuring the protection of dependant ecosystems and environmental assets.

Achievements

A major data compilation exercise is underway, with relevant State, Federal and company hydrogeological and geophysical data being collected. Mining companies have embraced conjunctive use of airborne geophysics to inform hydrogeology, and are supplying relevant data sets. Calibration procedures for airborne geophysical data from different systems have been assessed and are being trialled. The full inversion of historical AEM data sets acquired at different times and with different systems from the Musgraves, Frome and Gawler Craton Areas has been completed and an enhanced understanding of the hydrogeology of the Musgrave region developed. A GIS-based diffuse recharge map of northern South Australia has also been prepared.

Next Steps/Future Work

Plans are underway to sample groundwater systems in the APY Lands and SAAL areas of the State to better understand aquifer systems in these regions and groundwater recharge processes at finer scales. Trial AEM data sets will be acquired, processed and interpreted to inform the regional hydrogeology of the Musgrave Block and to help inform Government on options for a broader survey that will be interpreted from a hydrogeological perspective. Reports on this and the hydrogeology of the Musgrave Block are being compiled. Several conference papers are also being prepared. A workshop on Cultural and Ecological Flows, to be held jointly with the DfW and the Alinytjara Wiluara NRM Board, is being planned.

MURRAY DARLING BASIN PLAN REVIEW

GOYDER PROJECT NUMBER:	E.1.1
GOYDER PARTICIPANTS:	CSIRO
PROJECT LEADER:	Dr Sue Cuddy (CSIRO)
GOYDER ROADMAP:	E.1 River Murray
PROJECT DURATION:	1 September 2010 to 30 June 2011
BUDGET AND EXPENDITURE:	Total Project Budget: $315,358 / Expenditure to 30 June 2011: $497,744

Challenge

In October 2010 the Murray–Darling Basin Authority (MDBA) released the Guide to the proposed Basin Plan for public consultation. Within the Guide, the MDBA described scenarios that could 'meet the environmental water requirements (EWR) for the Basin'. The scenarios describe long-term average sustainable diversion limits for the Basin designed to return additional water to the environment and proposes three scenarios that describe Basin-wide reductions in average annual surface water diversions designed to return additional water to the environment of 3000, 3500 and 4000 GL/year. The Guide scenarios result in an increase in average annual volumes across the border to South Australia from 6783 GL/year under current water sharing arrangements to 8661 GL/year, 8996 GL/year or 9290 GL/year under the 3000, 3500 and 4000 scenarios, respectively. The Guide scenarios also include reductions in diversions within South Australia; average annual diversion limits are reduced by 173, 203 and 232 GL/year from the current limit of 665 GL/year as a result of the 3000, 3500 and 4000 scenarios, respectively. The Guide identifies two key environmental assets in South Australia; these are the Riverland-Chowilla, and the Coorong, Lower Lakes, and Murray Mouth (CLLMM). The MDBA and the South Australian Government have both determined environmental water requirements for these assets based on estimates of the flows required by riverine, floodplain-wetland and estuarine ecosystems. The ecological objectives for the environmental assets, and the corresponding environmental water requirements, are broadly consistent between the Guide and the South Australian Government, although the South Australian Government considers more of the ecological communities within the Riverland-Chowilla.

Solution

Prior to the release of the Guide, the South Australian Government invited the Goyder Institute to determine whether the proposed sustainable diversion limits would meet the Government's environmental water requirements and improve or maintain water quality. The review was also to assess the socioeconomic implications of reductions in diversion limits to the major water users within South Australia.

Achievements

This project has produced a synthesis report which describes the findings of the review, with the following four accompanying peer-reviewed technical reports describing the methods and findings of the work undertaken:

- an analysis of the South Australian Government's environmental water and water quality requirements and their delivery under the Guide to the proposed Basin Plan
- an independent peer review of the science underpinning the environmental water requirements of the Coorong, Lower Lakes, and Murray Mouth
- a report on the socioeconomic implications of the Guide to the proposed Basin Plan, and
- a compilation of reports informing a socioeconomic review of the Guide to the proposed Basin Plan.

Next Steps/Future Work

From a methodological perspective and due to time constraints, the approach adopted for the review has only provided a 'yes' or 'no' to whether an EWR is met (or not) under a specific flow scenario. A more comprehensive approach would be to undertake an ecosystem response assessment that can take into account a much broader range of ecological outcomes as well as provide quantitative assessments. An example of the outcomes of this analysis could be the spatial extent of river red gum forests maintained under a specified flow scenario.

MURRAY FLOOD ECOLOGY URGENT

Monitoring the fish spawning response to the flow increase in the Lower River Murray, South Australia.

GOYDER PROJECT NUMBER:	E.1.2
GOYDER ASSOCIATES:	SARDI
PROJECT LEADER:	Dr Katherine Cheshire (SARDI)
GOYDER ROADMAP:	E.1 River Murray
PROJECT DURATION:	1 November 2010 to 31 December 2010
BUDGET AND EXPENDITURE:	Total Project Budget: $41,927 / Expenditure to 30 June 2011: $84,175

Challenge

In the past 10 years the knowledge on fish ecology in the Lower River Murray has developed rapidly as a result of intensive studies on native and exotic fish. Nevertheless, this period has also expressed some of the lowest flows on record in the River Murray, and over bank floods and large within-channel flows have been absent. As such, understanding the spawning of native fish is hydrologically limited. Understanding the impact of changing hydrology on the spawning dynamics of native fish is critical for maintaining sustainable fish populations through water management.

Solution

This project harnesses the occurrence of the October to December 2010 flow events in the Lower River Murray with the aim to monitor the reproductive performance of fish during the spawning season occurring with these flow events. The collection of data during these flow events provides a unique and unprecedented opportunity to fill significant knowledge gaps in current fish spawning models and test a number of hypotheses relating to the conceptual understanding of fish reproductive ecology, as flow events of these magnitude have not been observed in the past 5 years and with uncertainty around water availability into future.

Achievements

The project developed a quantitative sampling protocol for larval and adult fish sampling which has been conducted over a period of two months between October and November 2010. The larval samples were preserved in ethanol and underwent sorting and identification, including related data entry. As far as adult fish reproductive biology is concerned, fish samples were collected and processed. Ovarian samples were preserved for more detailed analysis in the future by histological preparation and microscopic examination. The project findings have been captured in a publication (in review) entitled “From drought to flood: annual variation larval fish assemblages in a heavily regulated lowland river” as referenced in the publication section below.

Next Steps/Future Work

The data and samples collected from this urgent fish spawning project are being utilised in Goyder project E.1.3 Murray Flood Ecology, which undertakes time critical investigations that measure how biological systems respond and recover when water is restored to the system after a long period of drought.

MURRAY FLOOD ECOLOGY

Ecological responses to flooding in the Lower River Murray following a drought.

GOYDER PROJECT NUMBER:	E.1.3
GOYDER PARTICIPANTS:	CSIRO, The University of Adelaide, Flinders University
GOYDER ASSOCIATES:	SARDI
PROJECT LEADER:	Dr Qifeng Ye (SARDI)
GOYDER ROADMAP:	E.1 River Murray
PROJECT DURATION:	1 December 2010 to 30 April 2012
BUDGET AND EXPENDITURE:	Total Project Budget: $1,513,934 / Expenditure to 30 June 2011: $534,083

Challenge

To achieve the greatest ecological benefits from available environmental water in the River Murray, it is vitally important to know how the biological systems respond to various flow scenarios (e.g. timing, volumes, duration, frequency, flow rates etc). Over the last 10 years significant research and monitoring efforts have been undertaken across the lower River Murray. Nevertheless, this has been a protracted drought period resulting in a system with reduced flow volumes, rates and water levels. The current flow represents an over-bank flood that occurred more frequently under natural conditions than it has in recent times, providing hydrological connectivity along thousands of kilometers of the River Murray and returns hydraulic complexity to the weir pools of the lower River Murray.

Solution

This project harnesses the unique opportunity to undertake time critical ecological investigations, measuring how biological systems respond and recover when water is restored to the system after a long period of drought. With this information, government departments will be able to give evidence to the community and Commonwealth Environmental Water Holder of not only the benefits, but also the need to provide environmental flows in SA, and how to maximise the ecological outcomes from available water, particularly the response to an over-bank flood in the context of the proposed Basin Plan. Hence the project aims to (i) generate important knowledge to help SA continue to adapt and thrive in a water-scarce environment and (ii) provide evidence of ecosystem outcomes from this event that can assist SA to assess the implications of the Basin Plan and make recommendations on the desired frequency of such events to meet SA's ecosystem objectives.

Achievements

The Stakeholder Committee and Technical reference panel have been established and the planning of fieldwork is underway for when weather and flow conditions are right to conduct the fieldwork.

Next Steps/Future Work

Additional field work will be undertaken during 2011/12. Data analysis and reporting will occur with a range of hypotheses being tested regarding key ecological processes and communities. Conceptual models of ecological responses will be developed. A series of technical reports associated with project tasks (components) will be prepared by June 2012 with a synthesis report produced by August 2012.

SOUTH EAST URGENT

Using recent wetting events to detect salinity thresholds of aquatic plants in the South East.

GOYDER PROJECT NUMBER:	E.2.1
GOYDER PARTICIPANTS:	The University of Adelaide
GOYDER ASSOCIATES:	SARDI
PROJECT LEADER:	Kane Aldridge (Research Fellow, The University of Adelaide)
GOYDER ROADMAP:	E.2 Surface Water, Groundwater, Wetland Relationships
PROJECT DURATION:	8 November 2010 to 28 February 2011
BUDGET AND EXPENDITURE:	Total Project Budget: $92,522 / Expenditure to 30 June 2011: $30,298

Challenge

Historical data for aquatic plant communities in the South-East of South Australia indicates a shift from plant communities suited to wet, low salinity conditions to drier, more saline conditions. For the management of wetlands and the drainage network in the South-East, there is a critical need to identify salinity threshold values for the condition of wetland ecosystems. This project harnesses the occurrence of the recent wet season in order to fill this knowledge gap. It represents only the second time in the past 10 years that sufficient water has been available in wetlands in the region.

Solution

This project aims to establish a relationship between salinity and the abundance and distribution of key aquatic plant species and communities in the South-East of South Australia. This will be done by carrying out field and laboratory investigations utilising the natural north-south salinity gradient that exists in the South East. This project will provide data that is essential to develop an understanding of the salinity tolerance and threshold values of the key species, which can be used to establish trigger values for management of wetlands and drainage networks in the South-East.

Achievements

This project produced a database that will be available to support policy objectives of the state government, particularly for the provision of environmental water to support ecological objectives. The findings of the study are published as a technical report entitled "*Using recent wetting events to detect salinity thresholds for aquatic plants in the South-East of South Australia*", which is referenced in the publication section below. Whilst only a short-term project, the project supported the careers of three research fellows from the University of Adelaide and SARDI) and one post-graduate student, assisting in building upon important relationships between the two institutions involved.

Next Steps/Future Work

The application of the information obtained in this project will be done within the larger South-East project as outlined in the Goyder Institute Research and Development Plan. The information will be able to be used to determine the likely macrophyte community present in wetlands resulting from particular salinity regimes, as determined by changes in land-use and drainage operation. When coupled with hydrological information, this database will be able to be used to establish salinity trigger values for management of wetlands and drainage networks and understand the likely impacts of alternative management actions. It is envisaged that information produced from the project will be presented in scientific journal publications and at international conferences.

SOUTH EAST (PHASE 1)

A research program to support the sustainable management of water in the South East.

GOYDER PROJECT NUMBER:	E.2.2
GOYDER PARTICIPANTS:	The University of Adelaide, CSIRO, Flinders University
GOYDER ASSOCIATES:	SARDI
PROJECT LEADER:	Associate Prof Justin Brookes (The University of Adelaide)
GOYDER ROADMAP:	E.2 Surface Water, Groundwater, Wetland Relationships
PROJECT DURATION:	2 May 2011 to 2 November 2012
BUDGET AND EXPENDITURE:	Total Project Budget: $801,817 / Expenditure to 30 June 2011: $189,419

Challenge

Sustainable water management in the South East (SE) of South Australia is supported by at least 18 natural resource management policies. These include the Lower Limestone Coast Water Allocation Plan and various programs that sit beneath the Upper South East Act, all of which require better knowledge about ecological responses to surface and ground water regimes and water quality. The interaction between these policies and their knowledge needs is complex and requires a well structured science program to align policy needs with research output.

Solution

To address the knowledge needs for the SE, a broad program of research activities has been scoped, which includes ecological and hydrological investigations, development of models to integrate ecological and hydrological data and the subsequent incorporation of these models into a decision support system. This project aims to (i) develop and apply a decision support framework that will draw on new decision science techniques that are not currently incorporated into any decision support frameworks used for water management in South Australia, and (ii) research the connectivity of surface and groundwater along drains of the SE, using a recently cut drain as a study site, by undertaking field work at two sites and conducting a reconnaissance assessment of the surface water-groundwater connection across the SE region.

Achievements

Field surveys have been planned and the infrastructure installations required to conduct the field surveys have been completed.

Next Steps/Future Work

The DSS framework scoping report is one of the foci of quarter 2 of 2011-12. A final phase of regional sampling of drains will take place in early October 2011, which will include some further flow gauging, and chemical sampling of drains for electrical conductivity and radon activity. Following analysis of data from this sampling trip, the final report will be prepared.

Additional tasks will be submitted for consideration of the Goyder Institute Research Advisory Committee and Board in 2011 as part of the broader research plan for the South East (South East Phase 2), which will build upon the reconnaissance study and the two site specific studies conducted in the South East Phase 1 project, with the aim to provide a detailed assessment of surface water-groundwater interaction across the entire South East.

Development of an agreed set of climate change projections for South Australia

GOYDER PROJECT NUMBER:	C.1.1
GOYDER PARTICIPANTS:	University of South Australia, The University of Adelaide, CSIRO, Flinders University
GOYDER ASSOCIATES:	SARDI, SA Department for Water
GOYDER AFFILIATE:	SA Water
PROJECT LEADER:	Prof Simon Beecham (University of South Australia)
GOYDER ROADMAP:	C.1 Regional Downscaling
PROJECT DURATION:	1 October 2010 to 30 June 2014
BUDGET AND EXPENDITURE:	Total Project Budget: $6,697,054 / Expenditure to 30 June 2011: $515,442

Challenge

Climate change will bring about significant changes to the capacity of, and the demand on, South Australia's water resources. As the future changes to these water resources cannot be measured in the present, hydrological models are critical in the planning required to adapt the State's water resource management strategies to future climate conditions. Climate projections derived from global climate models are typically on the spatial scale of a state or a region and on temporal scales that are typically monthly at best. There is a missing link between the outputs of regionally-downscaled global climate model projections for time horizons of 2030, 2050 and beyond, and the climate data requirements of hydrological models. Past and ongoing hydrological modelling efforts within South Australian State Government departments, universities and research organisations have been carried out individually rather than being coordinated across organisations, resulting in a lack of an agreed set of downscaled time series.

Solution

This project, in close consultation with end users, will develop an agreed set of downscaled climate projections for South Australia to support proactive responses to climate change in water resource planning and management. Distributions of environmental time series, including rainfall, temperature and potential evapotranspiration will be developed from a suite of agreed Global Climate Model (GCM) downscaled projections for the Onkaparinga catchment, which will also account for current climate variability (including trend and seasonality) and the influence of known climate drivers. Once the methodology on the Onkaparinga case study catchment has been validated, the work will be expanded to provide downscaled climate projections for all eight South Australian NRM Board areas, using the most up-to-date climate information coming from the Intergovernmental Panel on Climate Change (IPCC) and Australian climate initiatives. The project's integration component ensures that the required interconnections between each task are realised and that there is an integration of this work into the other three Goyder Institute Themes.

Achievements

The Bureau of Meteorology is using the new understanding of El Nino-Southern Oscillation (ENSO) impact on Australian climate coming through the Indian Ocean to improve their seasonal prediction**.** The project team has purchased daily rainfall gridded data, daily evaporation, hourly temp, humidity, pressure, and daily wind data from the Australian Bureau of Meteorology. Four project workshops have been held throughout 2010-11.

Next Steps/Future Work

The climate driver work will be used to determine how much of the observed climate change over SA is attributable to climate and climate variability, and evaluate how the impacts of climate drivers are manifested in terms of changes in extreme events. The system for benchmarking climate models will be applied to AR5 simulations as they become available. The Generalised Linear Modelling of Daily Climate Sequences (GLIMCLIM) precipitation simulations for historical climate will be assessed and GLIMCLIM and Nonhomogeneous Hidden Markov Models (NHMM) predictions will be compared for the Onkaparinga catchment. The project will conduct initial hydrological model calibration and evaluation using Bayesian Total Error Analysis (BATEA) and commence the development of runoff error models for inclusion into BATEA calibrations.

Performance Report

Budget to 30 June 2011

In the first year of the agreement, nine research projects have been approved, which has committed $15,052,793 to research funding that comprises $7,359,399 in cash from the SA Government and $7,693,394 in in-kind contributions from Goyder Institute partners. This excludes any contributions to the program from non-Goyder participants. The total planned expenditure of research budget in FY2010/11 was $3,222,871.

$2,210,000 was comitted to non-research activities in FY2010/11, which includes PhD support and support to an ANZSOG chair in water policy. The non-research budget comprises $1,000,000 in cash from the SA Government and $1,210,000 in in-kind contributions from Goyder Institute partners. The total planned expenditure of non-research budget in FY2010/11 was $608,680.

The administration budget for the lifetime of the Institute (2010-2015) is budgetted as $4,792,565. The planned expenditure of administration budget in FY2010/11 was $360,000.

The total planned expenditure in FY2010/11 was therefore $4,191,551, comprising $1,554,940 in cash from the SA Government and $2,616,494 in in-kind contributions from Goyder Institute partners.

Financial Position at 30 June 2011

The actual expenditure of research, non-research and administration budgets in FY2010/11 was $3,081,049.

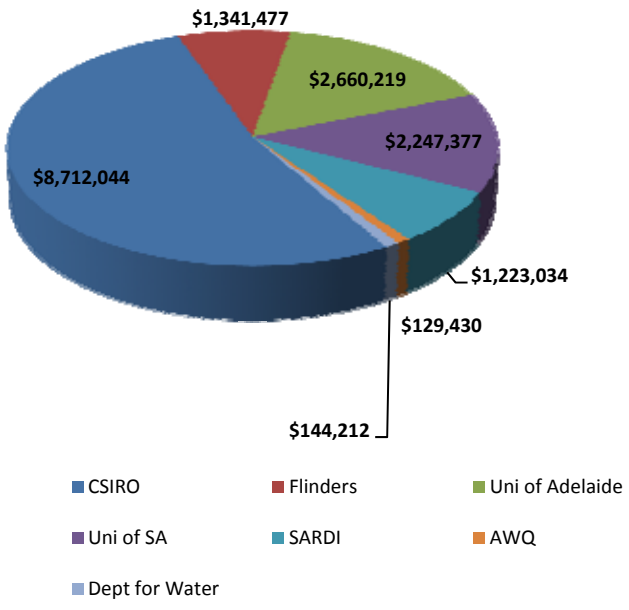
The gap between budget and actual expenditure was $1,110,502. For the research budget, this reflects the delay in project agreements being signed and therefore a delay in work being started. For the non-research budget, the underspend was caused by the fact that the ANZSOG chair was not appointed in this financial year. There was an overspend in the administration budget of $84,268 that was approved by the Management Board.

Due to the delay in project agreements being signed no cash payments were made in FY2010/2011. All outstanding cash payments ($1.1m) to projects will be paid once the project agreements are signed.

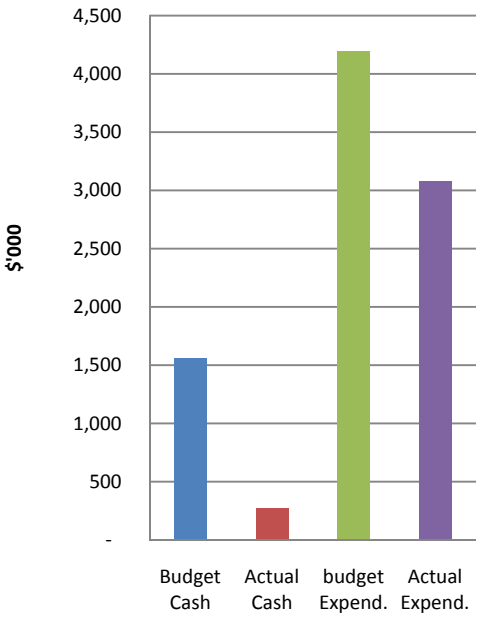
Goyder Institute Trust Account

The closing balance of the trust account was $4,819,729. During the year the trust received $5,000,000 in cash from the State and $84,968 in interest. The trust made one payment of $265,239 to reimburse CSIRO for the administration expenses, excluding the Director's salary expense incurred through the year.

Research Allocation for all Participants



Overall Budget FY 2010/11



Publications

Project E.1.1 - MDB Review

CSIRO (2011). A science review of the implications for South Australia of the Guide to the proposed Basin Plan: synthesis. Goyder Institute for Water Research Technical Report Series No. 11/1, Adelaide. ISSN: 1839-2725.

Connor J (ed.) (2011) A compilation of reports informing a socioeconomic assessment of the Guide to the proposed Basin Plan. Goyder Institute for Water Research Technical Report Series No. 11/4, ISSN: 1839-2725.

Connor JD, Banerjee O, Kandulu J, Bark RH and King D (2011) Socioeconomic implications of the Guide to the proposed Basin Plan – methods and results overview. Goyder Institute for Water Research Technical Report Series No. 11/3, Adelaide. ISSN: 1839-2725.

Maltby E and Black D (2011). Synthesis review of the science underpinning the environmental water requirements of the Coorong, Lower Lakes, and Murray Mouth. Goyder Institute for Water Research Technical Report Series No. 11/5, Adelaide. ISSN: 1839-2725.

Pollino CA, Lester RE, Podger GM, Black D and Overton IC (2011). Analysis of South Australia's environmental water and water quality requirements and their delivery under the Guide to the proposed Basin . Goyder Institute for Water Research Technical Report Series No. 11/2, Adelaide. ISSN: 1839-2725.

Project E.2.1 – South East Urgent

Aldridge K, Goodman A, Nicol J, Gehrig S and Ganf G. (2011). Using recent wetting events to detect salinity thresholds for aquatic plants in the South-East of South Australia. Goyder Institute for Water Research Technical Report Series No. 11/6, Adelaide. ISSN: 1839-2725.

Project E.1.2 – Murray Flood Ecology Urgent

Cheshire K.J.M, Ye Q, Wilson P, Bucater L. (2011). From drought to flood: annual variation in larval fish assemblages in a heavily regulated lowland river (in review).

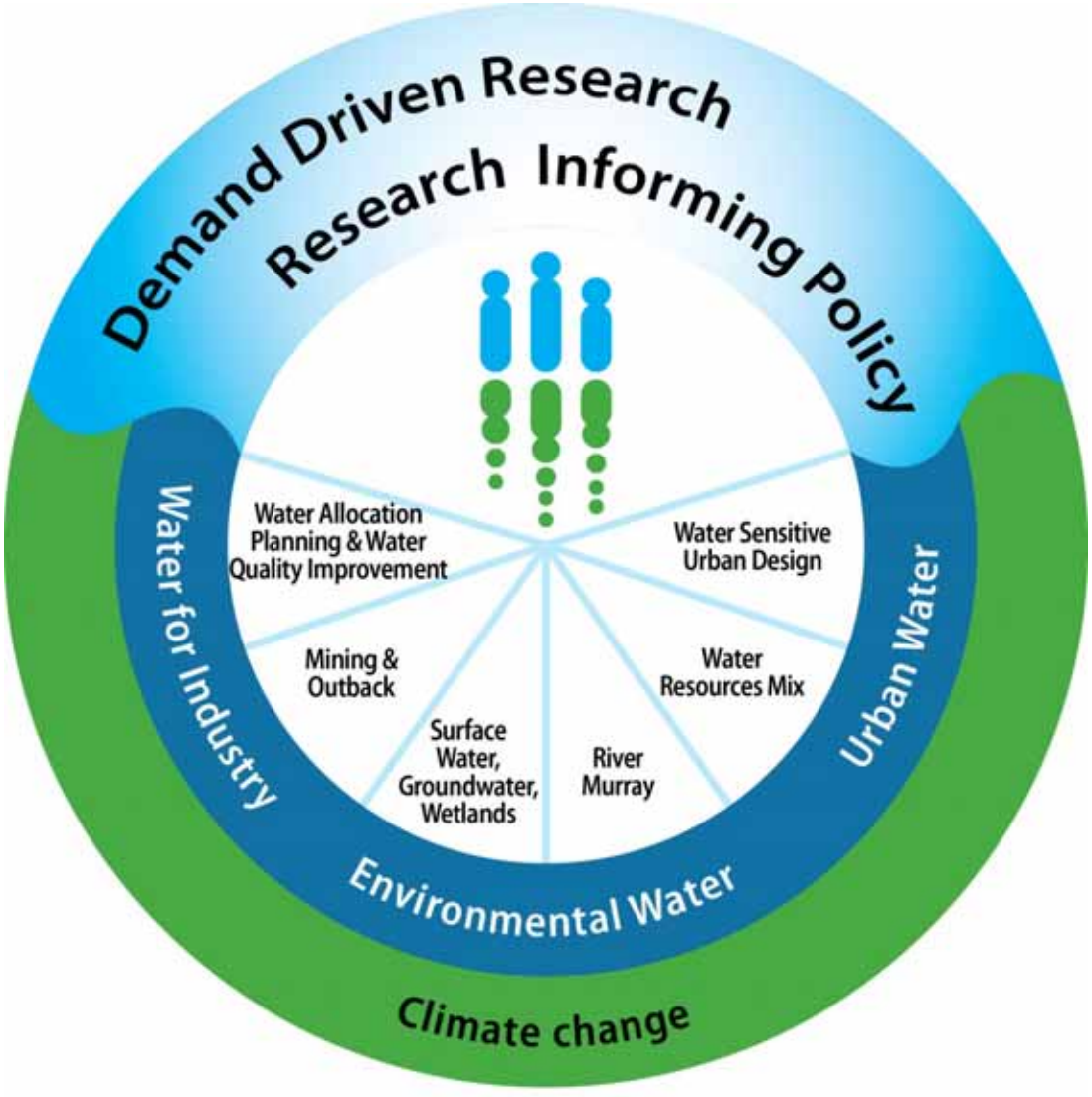
Photo: www.sxc.hu (Timo Balk – Australian Farm)

Roadmaps

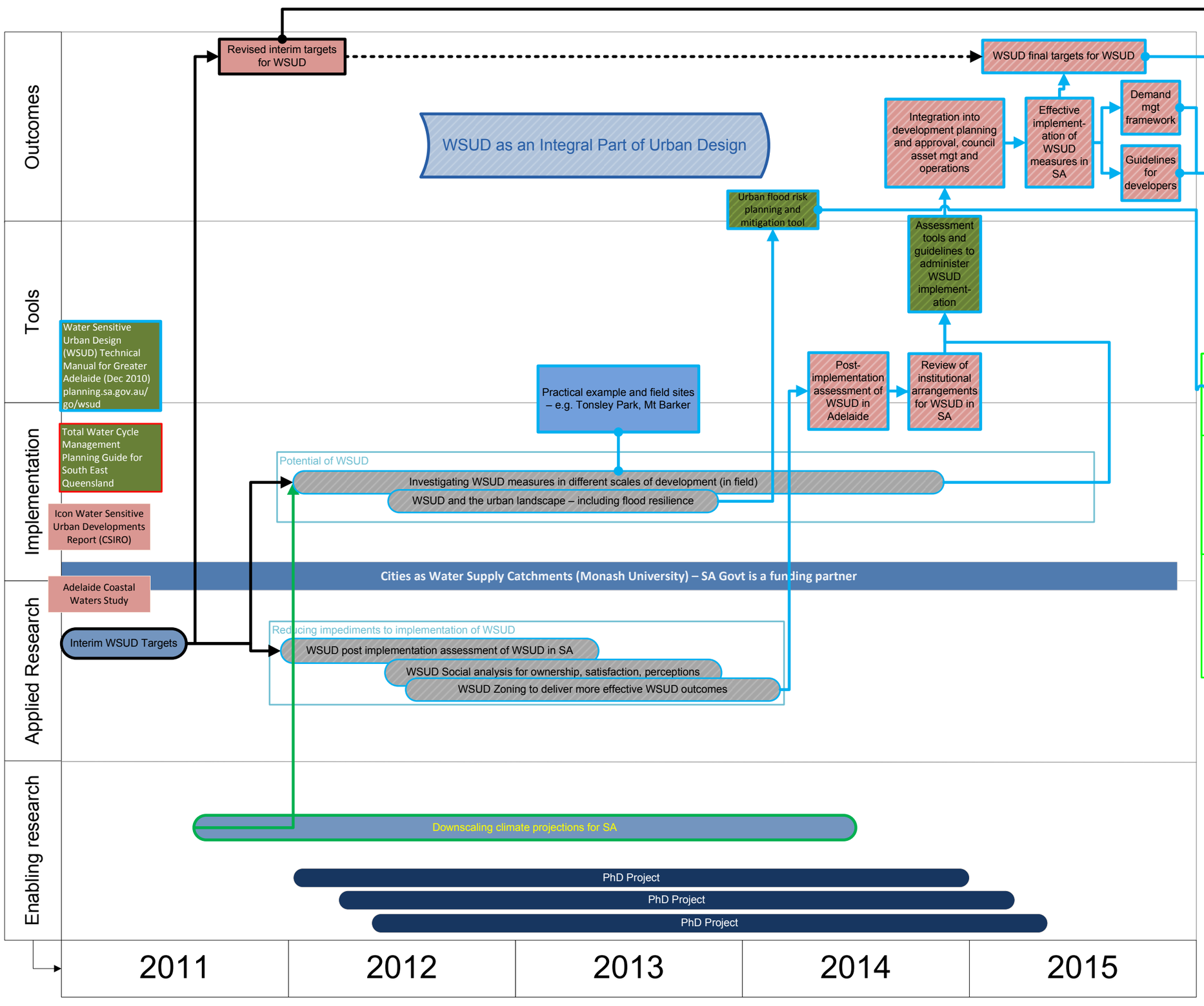
The following section provides a detailed overview of the roadmaps that have been developed for the respective Goyder Institute Research Themes. As already outlined above, the roadmaps detail the science and research requirements for desired outcomes and policy objectives that have been identified by both Government Agencies and other water industry partners as all Goyder Institute research projects are expected to demonstrate how they contribute to a specific roadmap, and hence how they contribute to a specific policy outcome or identified knowledge gaps.

The roadmaps show where research efforts are being concentrated on enabling research; fundamental research; applied research; implementation; and tool development. This enables the Goyder Institute to arrive at a balanced R&D profile in all research programs.

In addition, the contributions of other external research activities by associates or other partners can be visualised in the roadmap, thus demonstrating where there is synergy with others and where the Goyder Institute is able to leverage additional financial support for the research program.



Urban Water Theme: Programme U.1 WSUD (v 1.3)



Urban Water Theme: Programme U.2 Water Resources Mix (v 1.5)

Outcomes

Tools

Implementation

Applied Research

Enabling research

An Integrated Water Plan for Greater Adelaide

Informed public and stake-holders

Stormwater Infrastructure Plan for Adelaide

30-50 year water resources plan

Stormwater public health risk assessment

IUWM Decision Making Framework

National MAR/ stormwater guidelines (2009)

Revised National MAR/ stormwater guidelines to incorporate pathogen transport/ inactivation

Revised national MAR/ stormwater guidelines

Integrated Systems Analysis Toolkit

Methodology for implementing MAR projects and selecting options

Icon Water Sensitive Urban Developments Report (CSIRO)

Cities as Water Supply Catchments (Monash University) – SA Government is a funding partner

Adelaide Coastal Waters Study

IUWM Defining objectives and stakeholder engagement, education and awareness

IUWM Water quality, quantity and carbon footprint

Interim WSUD Targets

IUWM Multi-objective decision analysis

IUWM Economic analysis, value of water resources & externalities

Estimates of Household water use (SAW)

IUWM Social analysis/choices

Reducing impediments to implementation of WSUD

Potential of WSUD

MAR & Stormwater – public engagement and social research

Review of impediments to implementation

Aquifers as reservoirs: research to overcome remaining impediments to implementation for storage of stormwater, recycled water, reservoir transfers (including opportunity mapping)

MAR & Stormwater – infrastructure and water aesthetics

MAR & Stormwater – net benefits

Stormwater reuse options briefing

Infrastructure & water aesthetics report

Benefits report

Risk management report

Methodology transfer & satellite sites report

MAR & Stormwater – risk management

MAR & Stormwater – public health risk assessment

MAR & Stormwater – options risk management

Downscaling climate projections for SA

PhD Project(s)

2011 | 2012 | 2013 | 2014 | 2015

Ownership & pricing: tariffs, pricing, valuation, security/cost trade-offs, ownership (e.g. stormwater and injected water), entitlements transfer

Impediments to implementation:
- Risk allocation,
- Risk management,
- Approvals
- Mitigation
- Location/distance,
- Sunk investment,
- Source availability,
- Existing urban landscapes - infill options, redevelopment/retrofit

Water resources/sources optimisation (desalination, groundwater, stormwater, River Murray, MLR catchments, wastewater recycling, demand mgt): Ecology, fit-for-purpose, mixed sources, Life Cycle Assessment, water/energy nexus, carbon, benefits and costs, WAPs, when to switch on desal

Economics: Cost, price, reliability, growth, future shocks, sustainability, risk, security

Potential of WSUD: Volumes, optimise as water source

Flood Mitigation: Planning for urban flooding, risk mgt, investment

Coastal Water Quality: Suspended solids (SS), N, contaminants, sources of sediments, nature of sediments/ organic matter

Stormwater recycling and MAR: Economic & public health issues/ opportunities, at source & fit for purpose treatment, greening city, recycling into potable supply

Reduce demand on mains & on R. Murray

WfG 15. Identify & develop new stormwater harvesting projects

WfG 16. Stormwater master plan

WfG 19. Wastewater master plan

WfG 20. Decentralised water recycling

WfG 44. Two staged approach to water allocation planning

WfG 64. Regional water supply and Demand Plans

WfG 67. Best regulatory approach for WSUD

WfG 68. Introducing targets for WSUD

WfG 94. Stormwater treatment research

Multiple outcomes for stormwater management

ACWS 1. Reduce volumes of wastewater and stormwater into coastal environment

ACWS 2. N reduced to 600 t/yr (75% reduction from 2003)

ACWS 3. Reduce particulate matter (50% reduction from 2003)

ACWS 4. Reduced coloured organic matter (CDOM)

ACWS 5. Reduce toxicants loads from point sources (Port River, drains and WWTPs)

Water A: Reduce demand on mains supply in new developments through WSUD

Water B: All new dwellings to be connected to alternative sources to supply >15% of needs

Water C: Independence from mains water supply for new public open spaces

Water D: Alternatives to mains water use for all greenfield developments that are subject to Structure Plans and Precinct Requirements

Water E,F&G: Protect and maintain MLR catchment, reservoirs and proscribed water resources

Urban stormwater policy for South Australia

50GL Less Water use than base case by 2050

GL/y urban wastewater recycling by 2025

5 GL/y urban stormwater recycling by 2025

Water ensitive state

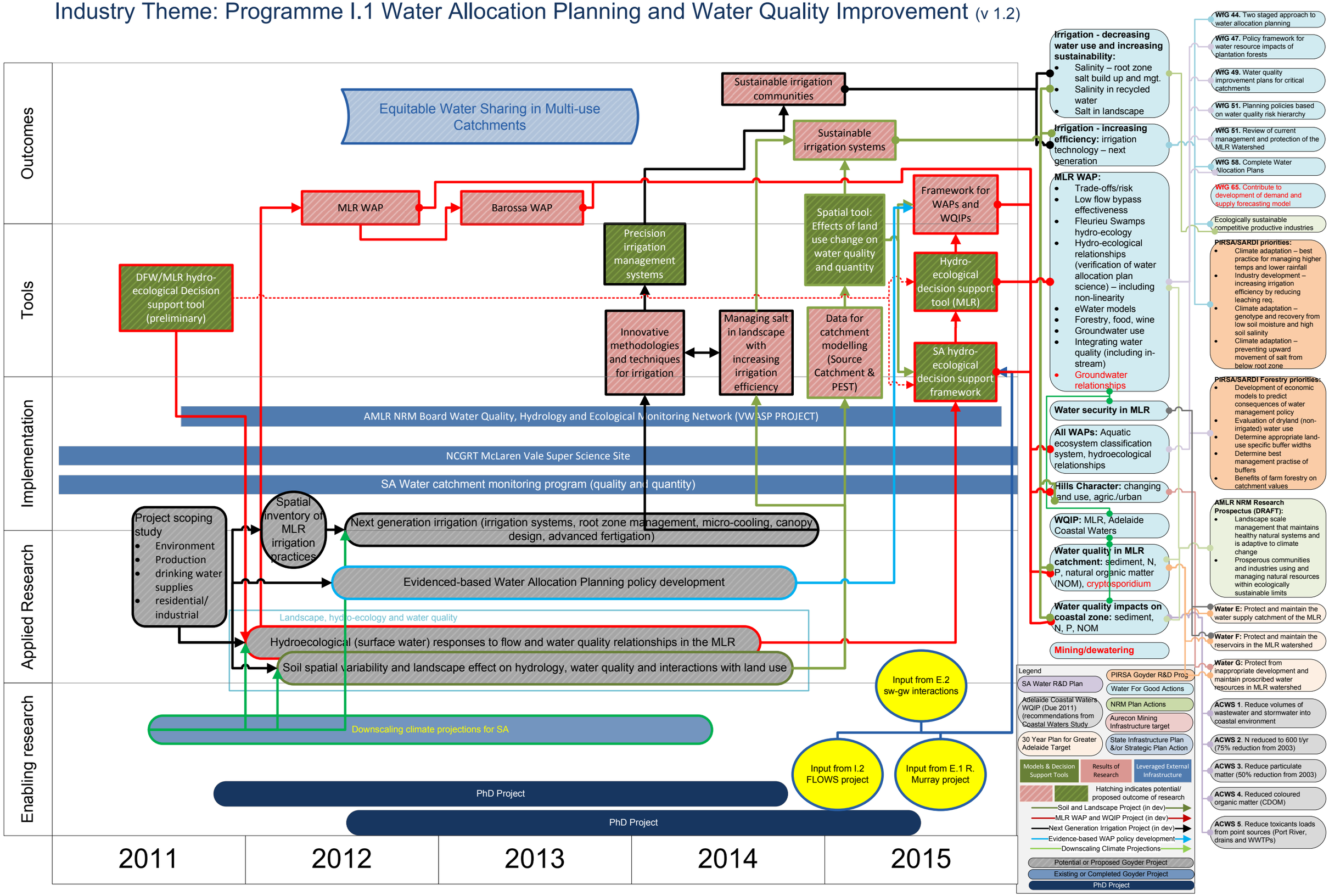
Alternative Water Sources 25%

Adelaide Coastal Waters WQIP (Due 2011)

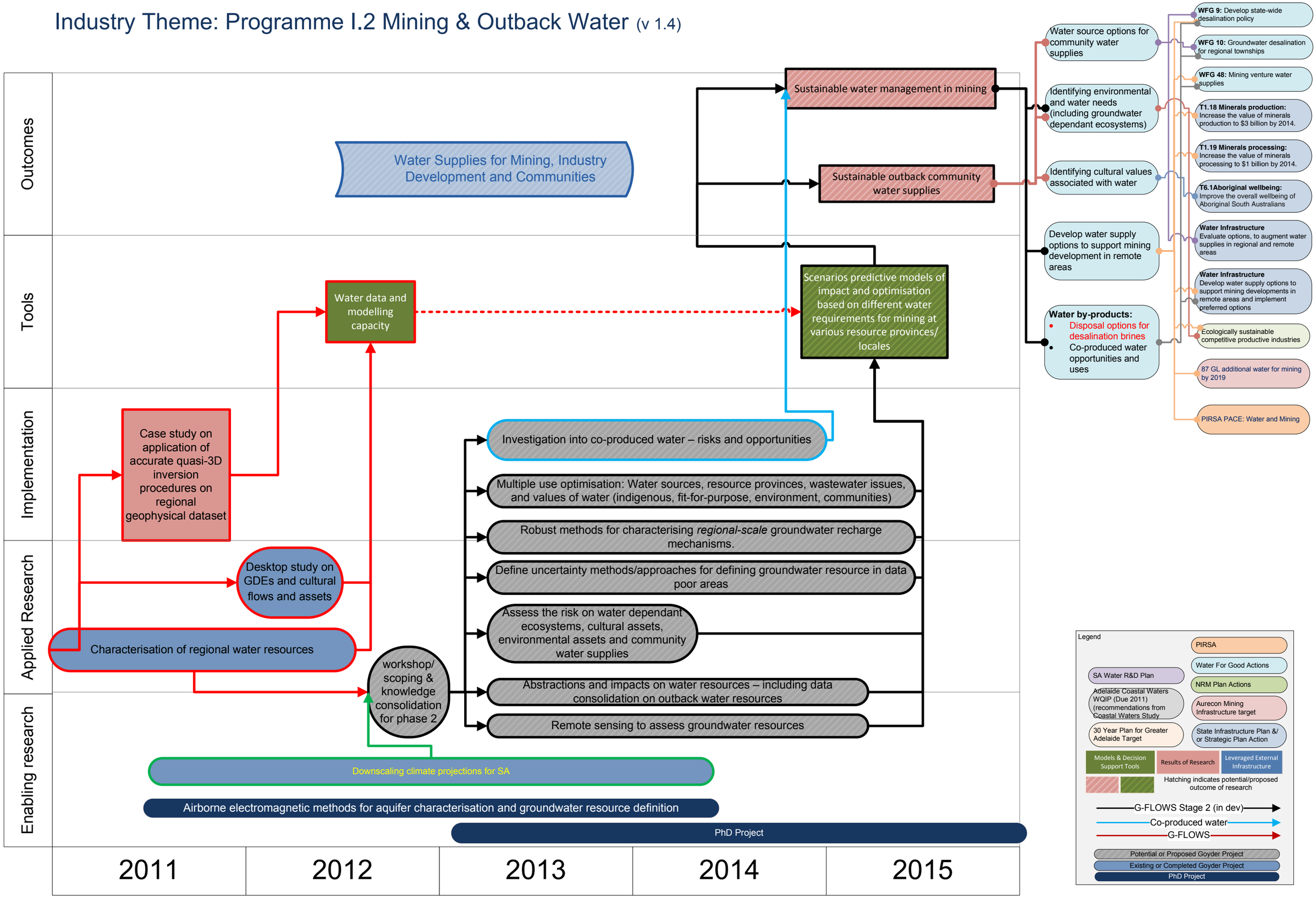
Legend

- SA Water R&D Plan
- Water For Good Actions
- NRM Plan Actions
- Adelaide Coastal Waters WQIP (Due 2011) (recommendations from Coastal Waters Study
- Aurecon Mining Infrastructure target
- 30 Year Plan for Greater Adelaide Target
- State Infrastructure Plan &/ or Strategic Plan Action
- Models & Decision Support Tools
- Results of Research
- Leveraged External Infrastructure
- Hatching indicates potential/proposed outcome of research
- Interim WSUD targets
- MAR & Stormwater
- WSUD (in dev)
- Downscaling Climate Projections
- Integrated Urban Water Mgt (in dev)
- Aquifers as reservoirs (future)
- Potential or Proposed Goyder Project
- Existing or Completed Goyder Project
- PhD Project

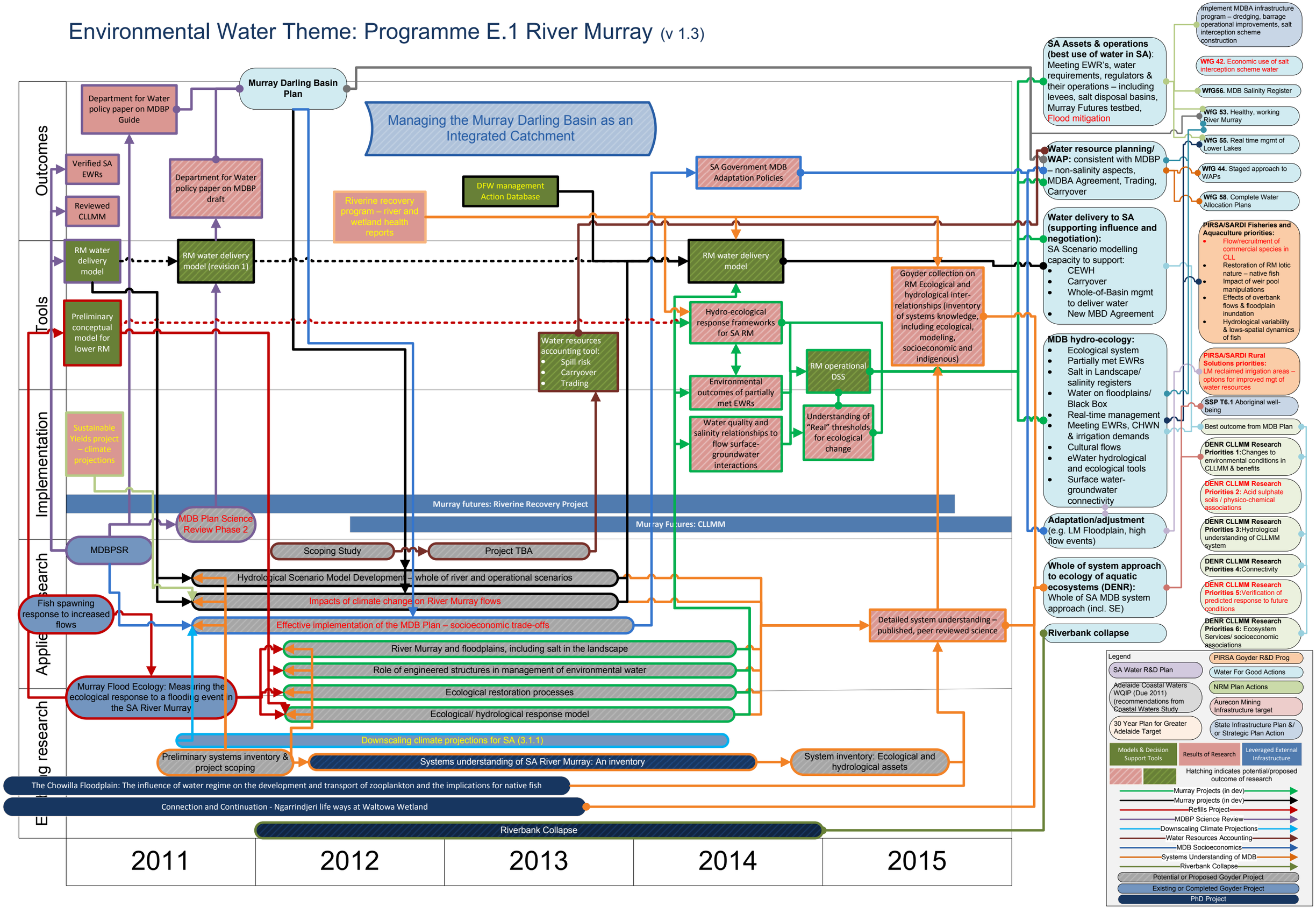
Industry Theme: Programme I.1 Water Allocation Planning and Water Quality Improvement (v 1.2)



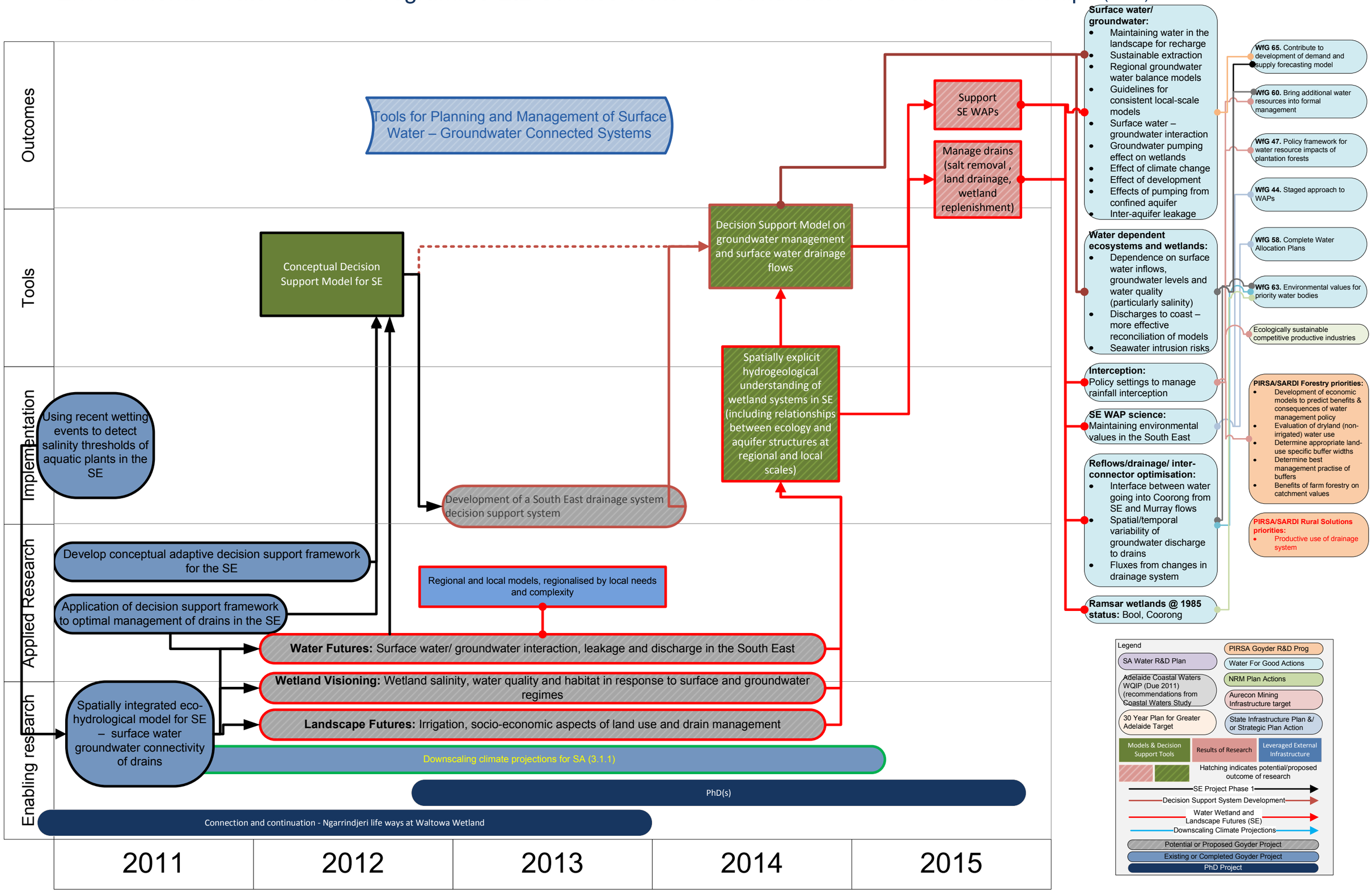
Industry Theme: Programme I.2 Mining & Outback Water (v 1.4)



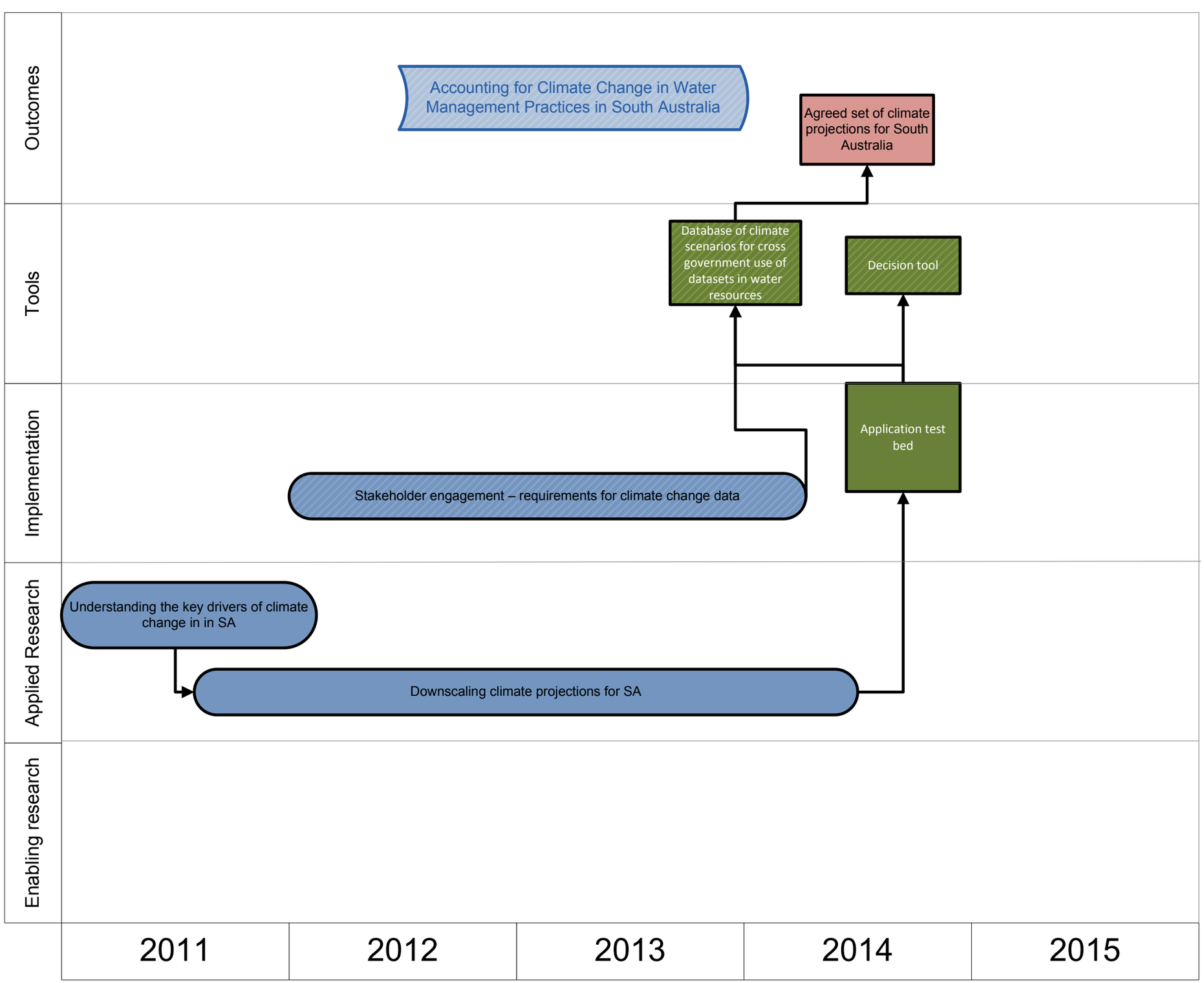
Environmental Water Theme: Programme E.1 River Murray (v 1.3)

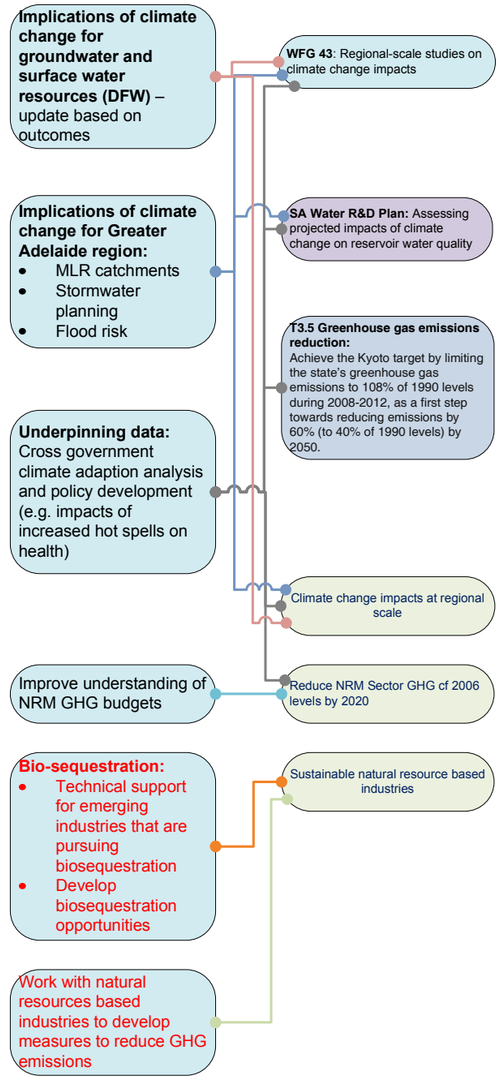


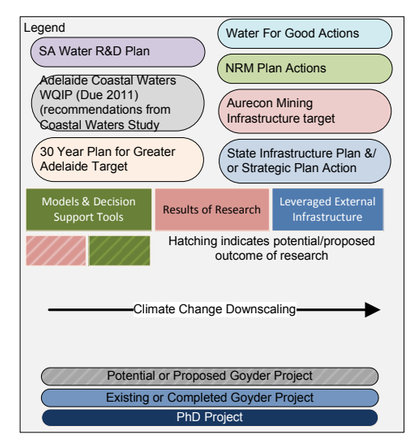
Environmental Water Theme: Programme E.2 Surface Water / Groundwater / Wetland Relationships (v 1.1)



Climate Change Theme: Programme C.1 Regional Climate Change Downscaling (v 1.1)







Murray Mouth, Aerial Flight 27 September 2010. Department for Water.