GREAT ARTESIAN BASIN COORDINATING COMMITTEE

A

RESEARCH PROSPECTUS

FOR THE

GREAT ARTESIAN BASIN

June 2009

Purpose

The Great Artesian Basin (GAB) is the world's largest fresh water artesian aquifer system and one of Australia's most important water resources. Landholders and governments have invested many millions of dollars in the GAB to rehabilitate bores, renew water delivery infrastructure and improve knowledge about the Basin and the benefits that it provides. With this investment comes the opportunity to improve GAB management and support the values attached to the GAB. However, our knowledge of the Basin is incomplete. Additional research is required on the structure, functions and values of the GAB, the infrastructure used to access GAB resources, higher value uses for GAB resources and GAB management and investment. The Great Artesian Basin Coordinating Committee, a national advisory group to government on management of the GAB, with representatives from all stakeholder groups, is well placed to work with research and funding organisations to encourage and facilitate priority research.

The aim of the *Research Prospectus* is to identify priority GAB research. It is hoped that this *Prospectus* will guide the preparation of new research proposals that provide an opportunity for researchers, industry and resource managers to collaborate in meeting the needs of the management of the Basin into the future.

In principle:

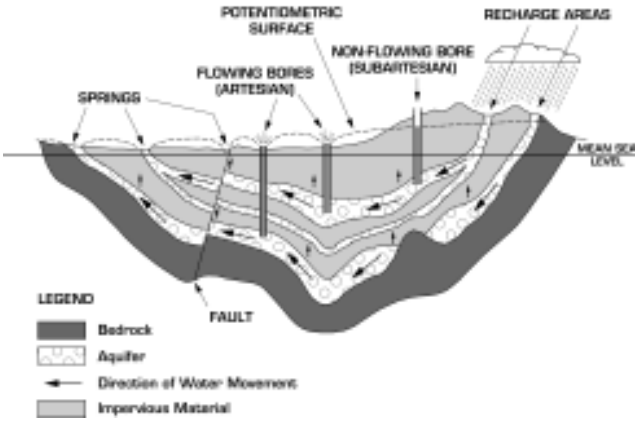
- research should focus on identified areas of strategic priority, and inform/influence practice and policy.
- research findings should be accessible to a wide audience, and
- cooperation should be maximised and duplication minimised.

In this context, research is defined as any form of inquiry seeking evidence to increase knowledge and includes activities that expand, clarify, reorganise and/or create knowledge. It includes not only traditional scientific research but also approaches like surveys, literature reviews, case studies, statistical analysis and focus groups.

What is the GAB?

The Great Artesian Basin (GAB) is one of the most important water resources in Australia covering over 1 711 000 square km. It underlies approximately one-fifth of Australia and extends beneath arid and semi-arid regions of Queensland, New South Wales, South Australia and the Northern Territory, stretching from the Great Dividing Range to the Lake Eyre depression. It is the only source of reliable water for human activity and water-dependent ecosystems over much of this area.

The GAB was formed between 100 and 250 million years ago and consists of alternating layers of waterbearing (permeable) sandstone aquifers and non-waterbearing (impermeable) siltstones and mudstones up to 3000 metres thick. The overlying



impermeable rocks confine the aquifers and the water becomes pressurised and can flow to the surface through bores or natural springs.

It is estimated that more than 65,000 million megalitres (ML) of water are stored in the GAB, at pressures of up to 1,300 kilopascals. The aquifers are recharged by infiltration of rainfall and leakage from streams into outcropping sandstone, mainly on the eastern margins of the Basin along the Great Dividing Range, and also along the western and south-western margins.

Groundwater flows under the influence of gravity and pressure from these recharge areas toward natural discharge springs in the west and southwest. This movement is slow, at about 0.1 to 5 metres per year, and in some parts the discharging water is up to 2 million years old.

Of the bores distributed across the Basin, approximately 5,000 are artesian in nature, with water rising naturally above ground under hydrostatic pressure. The discovery and exploitation of these water resources has been instrumental in development of the pastoral industry and in settlement of many areas overlying the Basin, as the only source of reliable water for stock, domestic, industrial and mining purposes. Individual bore depths vary up to 2,000 metres with the average being 500 metres.

Many bores initially flowed at rates of over 10 megalitres per day (ML/d), distributing water around the landscape to stock through bore drains. However, even in well-maintained drains, up to 95 per cent of this water can be wasted through evaporation and seepage. Since then, artesian pressure and water discharge rates have declined, while the number of bores has increased. The majority of flows are now between 0.01 and 6 ML/d. Springs have become extinct and ecosystems have been lost. In addition, it has become difficult for new water users in or near the Basin to obtain access to groundwater resources.

Management of the GAB

Following almost a century of efforts by landholders and governments to improve the management of GAB resources, a Basin-wide Strategic Management Plan (SMP) was completed in 2000. Since that time, governments and landholders have worked cooperatively to invest in the best science and technology available to understand the resource and its values, rehabilitate bores, improve water delivery infrastructure and change practices to ensure that water is used judiciously. Substantial gains are now being made in eliminating waste and restoring pressure. Commitments have been made to complete the task.

Substantial changes have occurred in water policy, water management technology and the management of other natural resources. Land use in the Basin is changing, new industries continue to develop, and the relative value of water, energy and other resources is rapidly shifting. The impacts of climate change are also yet to be understood.

A present challenge is to develop a clear vision of how the GAB can best be used into the future. It is safe to assume that demand for the GAB water saved will increase its value, and that the GAB will continue to be a vital resource for industries and other developments that are planned and yet to be conceived. There will be a continuing need to maintain the health of the GAB and the water dependent ecosystems that it supports. A policy framework to manage the GAB into the 21st century must be underpinned by a thorough understanding of the physical resource, and the economic, social and environmental values it supports.

Who are the GABCC?

The primary role of the Great Artesian Basin Coordinating Committee (GABCC) is to provide advice from community organisations and agencies to State, Territory and Australian Government Ministers on efficient, effective and sustainable whole-of-Basin resource management and to coordinate activity between stakeholders. While the groundwater resource is the central issue, the Committee is expected to consider the usage aspects by industries, communities and the environment.

Specific responsibilities of the Committee include:
- reviewing the progress of programs
- reporting on the implementation of the Strategic Management Plan
- promotion/publicity and communication about whole-of-Basin values
- objective analysis of policy issues and provision of advice to Ministers
- coordination of policy/management across sectors where appropriate
- coordination of technical activity (e.g. standards) and research
- examination and preparation of recommendations to Ministers on cross-border issues.

The GABCC has the following responsibilities in regard to obtaining, collating and brokering knowledge:
- to develop and maintain a strategic scientific contact network and knowledge base for GABCC to support improved management of the Basin, which is accessible by researchers, managers and other stakeholders
- to develop and maintain a register of past, current and proposed research, technical development and related outputs in the Basin as an integral component of the knowledge base
- to identify and prioritise strategic management information needs in relation to the economic, social and environmental implications of implementation of the GAB Strategic Management Plan
- to actively influence and encourage research and technical development to address strategic knowledge gaps
- to act as a key broker of knowledge on the GAB and ensure relevant research outputs and other information are appropriately incorporated into the Committee's communication strategy
- to coordinate technical activity (e.g. standards) and research; and
- to make recommendations on ways to showcase research on the GAB, e.g. workshops and seminars.

The GABCC is well placed to work cooperatively with research and funding groups to support the development of research initiatives that will serve the interests of the GAB and its users.

For more information on the Great Artesian Basin Coordinating Committee visit www.gabcc.org.au

Addressing the questions

The GABCC has identified important knowledge gaps in a range of research areas. The GABCC invites potential researchers/contractors to provide proposals to address the priority research questions outlined below. These questions have been grouped under five themes: 1. Understanding the resource; 2.GAB access infrastructure; 3.Monitoring and measurement; 4.Higher values uses; and 5.Valuing investment and allocation.

1. Understanding the resource

The structure and function of the GAB has been a topic of on-going research since its discovery more than a century ago. Natural discharge from the GAB, and the biological communities that depend on the springs and soaks, have also been investigated. Monitoring of bores in the Basin has contributed to knowledge about the GAB and its management. Much of the work on the GAB has been published and bibliographies are available for review. However, the GAB is a very extensive and complex aquifer system and significant knowledge gaps still limit the reliability of management and investment decisions. Additional research on understanding the Basin is required in the areas listed below.

1.1 Water balance

Many of the components of the water balance in the GAB have been estimated through very broad scale simplified modelling or extrapolated from point source or site measurements. An understanding of the characteristics of the principal aquifers - and the volumes, rates and processes of water movement into and through them - is necessary to predict the consequences of various management options.

Priority research questions

a. How can the assumptions and errors in the water balance be improved on?
b. What are the vital gaps in our knowledge of the water balance that restrict management?
c. What do we know about rates of up and down leakage between aquifers?
d. What are the volumes of recharge?
e. What are the aquifer recharge processes?

1.2 Surface/groundwater interaction

While much of the GAB is confined, in the intake areas rivers and streams run across the exposed sandstone aquifers. The National Water Initiative (NWI) and other initiatives demonstrate the increasing recognition of the connectivity between surface water and groundwater systems, and the need to plan and manage accordingly.

Priority research questions

a. How do we set priorities for investment for research into springs and surface water groundwater interaction?
b. How does management of GAB impact on surface water management?
c. How does management of surface water impact on GAB management?
d. How is this accounted for in plans?
e. What can we do to bring together a database/map of natural discharge/stream baseflow sections?
f. What is the importance of diffuse discharge?

1.3 Springs and other groundwater dependant ecosystems

The springs in the discharge areas of the GAB are listed as threatened ecological communities under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and many springs are also protected under state legislation, in conservation areas and through water management plans. There has been research into the ecology of the springs identifying many endemic species, and many of the threats to their continued existence and unique qualities have also been identified. However, more information is needed on their ecological significance, the processes that threaten them and how best to manage these processes.

Priority research questions

a. What is the local hydrology around springs?
b. How important are shallow aquifers?
c. What are the values associated with springs?
d. How will recovered flows affect springs and stream baseflow?
e. How does on-ground management affect springs?
f. What is the history of spring formation, discharge and extinction?
g. What factors influence spring geomorphology?
h. How does a changing flow regime affect spring biodiversity?
i. What are processes that threaten biodiversity?
j. What techniques can be used to restore springs?

1.4 Indigenous values

The GAB springs have great traditional and contemporary cultural significance, as they are often the only permanent water in arid areas. The springs have provided water, food and other material resources for many thousands of years. Springs have significant spiritual value as ceremonial sites and feature in many dreamtime stories. However, most GAB springs have not been systematically surveyed or assessed for indigenous heritage values and significance, and much remains to be documented.

Priority research questions

a. What needs to be done to better document and recognise the indigenous values associated with the GAB, particularly with springs?
b. What methods used by Aboriginal peoples is effective in managing springs?
c. What are the creation/dreamtime stories that are attached to particular springs, associated species or activities?

1.5 Modelling and assessment tools

Appropriate assessment tools are required to improve understanding of the hydrology of the Basin, assist in the development and implementation of plans and assess the impact of management decisions. The current Model has many limitations and is a tool only suitable for undertaking Basin-wide assessments.

Priority research questions

a. What are the current deficiencies in data and models that require investment?
b. Where and at what scale do we need models to address this issue?
c. How can modelling be improved?
d. What other assessment tools are appropriate?

1.6 Sustainability under climate change

Changes in climatic patterns have the potential to affect the water balance of the GAB e.g. changing recharge-discharge volumes and balance, and affecting springs through

evaporation. There is also the potential, if surface water and shallow groundwater systems become unreliable, for increasing pressure to be placed on access to the resource of the Basin. Investigation into the likely impacts of climate change on the GAB is required

Priority research questions

a. What is the potential for climate change to place more pressure on the GAB resources?
b. How will climate change affect baseflow to/from streams?
c. How with rainfall patterns affect recharge?
d. Are springs likely to be affected by increased evaporation?
e. What effects do management actions have on greenhouse gas emissions?

2. GAB access infrastructure

Governments and landholders have worked cooperatively to invest in the best science and technology available to rehabilitate bores, improve water delivery infrastructure and change practices to ensure that water is used judiciously. Substantial gains have and are being made in eliminating waste and restoring pressure. Over $350M will have been invested into the Great Artesian Basin Sustainability Initiative (GABSI) alone, by its completion at the end of 2014. These investments need to be protected.

2.1 Water bore failure

Water bores constructed both privately (non-GABSI), and as part of the GABSI program, have an anticipated lifetime largely determined by the method of construction, construction standards and landholder water bore maintenance.

The failure of older water bores, and more recently some water bores constructed under GABSI, is an emerging issue that jurisdictions and landholders will need to resolve. These failures are likely to continue to occur as infrastructure deteriorates over time. Any response requires an understanding of the likelihood of water bore failure (both GABSI and privately constructed works) and the risks to the groundwater resource associated with any failures. In planning and determining a response to this issue, a projection of the number of water bores that are anticipated to fail is needed to determine the extent of any future investment required.

Priority research questions

a. What methods and data do we need to assess the risk of bore failure?
b. Can we project the future failure of water bores in the GAB?
c. What are the current knowledge gaps in why water bores fail?
d. How does a risk profile shape projection of landholder and government costs for infrastructure?
e. What technical advances in construction and materials are required to prolong the life of water bore infrastructure?
f. What do we need to know about increased costs of construction and materials?
g. What data do we need to collect on construction materials?
h. What are implications for databases and storage of materials information?
i. What do we need to do about standards for construction and materials?
j. What methods can be used for down-hole assessment of bores?

2.2 Failure of distribution systems

Since the 1980s Australian and state governments have assisted landholders in undertaking rehabilitation of uncontrolled water bores and the replacement of open bore drains with closed distribution systems. In many cases, state governments have

established minimum construction guidelines for piping systems (e.g. tanks, troughs, cooling ponds, scour valves, air release valves) with the best available technical knowledge. In addition, state government engineers undertake the role of system design.

During the period of investment under GABSI and its predecessors, there have been failures in distribution systems including cooling pond design and polytank failures. While the best available knowledge and materials are used during the design and construction of these assets, it is anticipated that some failures will continue to occur. This has implications for the future maintenance of these distribution systems and associated costs, landholder confidence in the program and jurisdictional response to any failures into the future. Investigation into ways to predict, monitor and respond to distribution system failure is needed.

Priority research questions

a. What methods can be used to assess the risk of system failure?
b. Can we project the future failure of distribution systems?
c. What information would we collect to assess system condition?
d. What are the current knowledge gaps in why distribution systems fail?
e. What are the future management costs of piped systems?
f. How does a risk profile shape projection of landholder and government costs for infrastructure?
g. What data do we need to collect on construction materials?
h. What are implications for databases?
i. What do we need to know about increased costs of materials?
j. What are issues around distribution design?
k. Are standards in materials and design adequate?

2.3 Down-hole leakage

Jurisdictional investment in capping and piping has historically focused on the loss of water from artesian water bores at the surface; however, in some circumstances, water (and pressure) is also being lost below ground.

The current extent of 'down-hole' leakage in the GAB is unknown, but there is a growing perception within the community that it is a significant issue for pressure recovery in the GAB. This is an issue which may be occurring in both subartesian and artesian water bores. If down-hole leakage is confirmed as an issue, adequate technical information is needed to support any policy resolutions and any future decision making within the jurisdictions (e.g. regulatory compliance, potential future work under GABSI or similar subsidy program, water bore construction standards).

Priority research questions

a. What is an appropriate methodology to identify and characterise the extent and occurrence of this issue in the GAB?
b. Should partnerships be developed within the Petroleum and Gas industry and with academic researchers to develop methodologies to characterise this issue?
c. What effect will down-hole leakage have on pressure recovery and the maintenance of environmental flows?
d. What rehabilitation options are available for these water bores?
e. How can we assess the costs to rehabilitate down-hole leakage?

2.4 Sub-artesian water bores returning to artesian conditions

As result of investment in capping and piping, measurable pressure recovery is occurring in the GAB. In marginal areas this is resulting in some subartesian water bores returning to artesian conditions. Bores currently in this condition are unlikely to be operating open bore

drain distribution systems. This has implications for eligibility for inclusion in GABSI phase 3, and for the protection of pressure recovery that has resulted from GABSI and its predecessors. Investigation into the potential for a return to artesian conditions and ways to monitor pressure recovery is required.

Priority research questions

a. Where and how many water bores are likely to return to artesian conditions?
b. What tools do we need to better assess, manage and map recovery in these areas?

3. Monitoring and measurement

3.1 Pressure and spring monitoring

All jurisdictions have now completed a water plan for the GAB. All water plans have identified a requirement for monitoring pressure and environmental flows. Although monitoring is primarily the responsibility of the jurisdictions, information collected is required to support both Basin wide and local assessment needs under jurisdictional planning frameworks. Consistency in approach and data collected is pivotal to allow for any whole-of-resource assessment needs. Further investigation of monitoring approaches is needed to ensure future capacity to:

- integrate whole-of-resource and regional assessment needs;
- overcome cost prohibitive monitoring constraints (i.e. specific pressure monitoring bores); and
- accommodate the complexity of the GAB aquifer structure.

Priority research questions

a. What should the characteristics of the network be?
b. What are the deficiencies in the current data collected - where are the gaps?
c. What data should be collected in jurisdictional spring and pressure monitoring?
d. What data is needed to provide more accurate modelling, mapping and assessment capabilities within the jurisdictions?
e. How should measurements be carried out?
f. What is the most effective way of monitoring pressure as springs?
g. What is the most effective way to measure spring discharge?
h. What options/technology is available to remotely measure pressure recovery?
i. How do we engage landholders while maintaining the integrity of the data set?
j. How can data/reports from industry be used more effectively?
k. Who reports on what and to whom?
l. What is a reliable way to separate human induced change from natural changes in discharge from large spring complexes?
m. What are good biological indicators that indicate significant changes in natural diversity in and around springs?

3.2 Landscape change

Open drains have been removed from the landscape and replaced with closed piping systems through GABSI and private investment. The impacts of this change on the environment and the productivity of the land need to be measured or quantified.

Priority research questions

a. What effect does replacement with closed systems have on the environment and biodiversity?
b. What effect does replacement with closed systems have on productivity?
c. How do we measure these changes?

3.3 Accounting for stock and domestic use

Stock and domestic use accounts for the single largest use of water in the GAB. Even when all uncontrolled water bores are capped, stock and domestic use will still represent the largest use. There is now agreement between the Commonwealth and states that there will not be a requirement for stock and domestic use to be metered or to hold a volumetric entitlement. As a consequence, there is a need to identify and implement a robust methodology for measuring and accounting for stock and domestic use across the GAB. This is pivotal to providing accurate data to support and inform future planning and management decisions.

Priority research questions

a. What are the jurisdictions' current approaches to estimation of stock and domestic use in the GAB?
b. What data is required to ensure accurate accounting of stock and domestic use?
c. What is an optimal method which can be standardised?
d. What can be done using remote technology?
e. Can landholders be involved in accounting for stock and domestic use?
f. What costs are associated with ongoing measurement of this use?

4. Higher value uses

Investment to introduce best practice water use into the pastoral industry has been considerable as this industry uses the most GAB water. New water distribution technologies have opened up new opportunities for pastoralists and land managers. Importantly, this has lead to benefits to all users across the Basin. Similar investment in initiation of best practice water use for other industries within the Basin would yield further benefits to the resource and requires investigation.

4.1 Pastoral industry

The development and installation of new materials and technologies to access, control and distribute water have made major changes in the pastoral industry and the way landholders manage their country. Appropriate uses of new technologies can have important environmental benefits and improve values supported by the GAB. Additional research is required to continue the development of new technologies and find more effective applications for existing ones that improve production, reduce costs and improve management practices in the pastoral industry.

Priority research questions

a. How can productivity be improved through watering point management and distribution?
    i. How can watering points be managed to reduce total grazing pressure and improve the condition of country?
    ii. How can watering point design and distribution be used to manage stock and control feral animals?
b. How can technologies, such as telemetry, photo-imaging and electronic tagging, be used at watering points to improve stock management and control feral animals?
    i. How can water distribution systems be used to improve animal health and nutrition?
    ii. What are the costs/benefits of these new technologies?
c. Are there other opportunities to use artesian pressure and water temperature to increase efficiencies, diversify production or improve operations?

4.2 Petroleum industry

The extraction of petroleum from aquifers normally results in formation water coming to the surface along with targeted petroleum products. Additional research is required to identify cost-effective ways to separate the petroleum from water, either in the aquifer or at the surface without having to dispose of the water. Research into cost effective treatment and productive use of formation water is also needed.

Priority research questions

a. Can down-hole separation of petroleum products be undertaken while maintaining potentiometric head?
b. What opportunities are there for closed loop separation of petroleum products and reinjection of formation water?
c. How can formation water be treated following separation of petroleum products for productive use or reinjection?
d. What aquifers are affected by extraction of co-produced water?
e. How can we better measure, monitor and determine the effects of extraction of co-produced water?

4.3 Mining industry

The mining industry is a significant user of GAB water. Open cut mining can cut through GAB aquifers and result in dewatering from GAB aquifers. Mineral exploration often requires drilling into GAB aquifers. These exploration wells need to be abandoned properly and can, under proper procedures, be converted into useful water wells. Additional research is required into cost effective use of GAB water by the mining industry and the impacts of mining on the integrity of the GAB.

Priority research questions

a. How can we better measure, monitor and determine the effects of dewatering of GAB aquifers around mining developments?
b. What options are there for treatment and reinjection of GAB water from mining developments?
c. Can water saving practices in mining and processing be improved?
d. What is the state of rehabilitation and abandonment of mining exploration wells that drill into GAB aquifers?
e. Can mining exploration bores that drill into the GAB be converted to use as water bores while protecting the resource?
f. What are the affects of final voids in open cut and underground mines?

4.4 Tourism industry

The GAB is important to regional tourism across the Basin. The natural discharge of water from GAB springs supports natural and cultural values that are important attractions for people visiting the GAB. The water from the GAB supports tourist developments and regional communities that are essential to the tourist industry. Special attractions such as the mineral baths around Moree are of regional importance. Additional research is required into various aspects of the tourism industry in the GAB, to support encouragement and management of tourism.

Priority research questions

a. How should tourism be managed around springs and other natural discharge sites?
b. How can information be best provided to tourists on the GAB and values it supports?
c. How can tourists be best informed about the cultural history of the GAB and the management of cultural sites?

d. How can the involvement of indigenous interests in the development and operation of GAB tourism be facilitated?
e. How can returns on water allocated for tourist enterprises be maximised?
f. How can the judicious use of GAB water for special tourist industries supported be encouraged?
g. What is the significance of the GAB in regional tourism?
h. How can a national and international tourism profile for the GAB be created?

4.5 Community and industrial water supplies

The GAB is the only reliable water supply for many communities and industries across the Basin. Businesses, residents, town amenities and future developments depend on continued access to GAB water. Research is required into the role and significance of GAB water to communities and industries. Ways in which communities and businesses use GAB water, how it is treated and water saving strategies need to be investigated. In addition to the water, temperature and pressure are valuable commodities in their own right and some communities have taken advantage of this. The current use and potential benefit of these resources needs to be investigated. Likely development scenarios and the capacity of the GAB to meet projected demands also need to be considered.

Priority research questions

a. What are the characteristics of water use pattern in GAB towns including quantity, quality, treatment, types of use and relative consumption?
b. What are the likely developments involving expanded water use for domestic and industry purposes?
c. What is the capacity of the GAB to meet future demands?
d. What are the water saving and efficiency strategies for households, businesses and amenities, and what more could be done?
e. What are the potentially productive uses of head pressure and temperature?
f. What use could be made of new water infrastructure and treatment technologies by community and industrial water users?

4.6 Emerging industries

The reduction of waste and the recovery of groundwater pressures as a result of infrastructure renewal mean that there will be additional water available for allocation from the GAB. The pressure and temperature of the GAB has never been adequately utilised. A number of industries are currently developing across the GAB including irrigation of high value crops, coal gasification, geothermal power generation, coal seam gas development and carbon geosequestration. Additional research is required into new industries or practices that can be supported by GAB resources to improve and diversify current businesses and to develop new industries to contribute to regional development.

Priority research questions

a. Where are the emerging industries in the GAB?
b. What are the risks to the resource, environmental assets and existing users from further development of these industries?
c. What technical aspects require further investigation?
d. What are the opportunities for new industries?
e. Are existing policy frameworks sufficiently mature / robust to effectively regulate emerging and developing industries?

5. Valuing investment and allocation

5.1 Cost/benefit - return on investment

Water from the GAB supports a variety of natural and cultural values and a wide range of human activities across the GAB. Environmental, social and economic costs and benefits accrue as an outcome of these values and activities. A substantial investment has been and will continue to be required to cover costs associated with rehabilitation and ongoing maintenance of infrastructure and the management of activities that affect the GAB. A clear understanding of the value of GAB resources, and the costs and benefits of various uses, is fundamental to making appropriate investment and management decisions. Additional research is required into valuing GAB resources and developing comparative models for various industries and activities supported by GAB resources (in terms of their environmental, social and economic significance), and to assess the returns on investment in water infrastructure.

Priority research questions

a. What is the total value of GAB water?
b. What is the comparative value of the major uses of GAB water?
c. What is the cost benefit analysis for activities supported by GAB resources?
d. What is the value of water allocation for various industries?
e. What are the rights and responsibilities for costs, benefits and risk management?
f. Whare are the likely impacts of climate change on the values of GAB resources?

5.2 Water pricing and trading

Increased demand for GAB water is anticipated in key areas beyond the volume of water currently available under jurisdictional water planning frameworks. Planning and management approaches will need to be more flexible to accommodate this demand and include mechanisms that allow trading, relocation, water sharing rules, emergency supplies and other special circumstances. Additional research is required to investigate the best way to design and use market mechanisms, including water trading that meet the needs of water users and the requirements of the National Water Initiative.

Priority research questions

a. What pricing principles are appropriate for GAB water?
b. How could inter-jurisdictional trading occur?
c. What tools or measures do we need to assess and respond to these issues?

Partnerships

In the past the GABCC has commissioned and supported research that addressed what was seen as an urgent knowledge gap or was proposed by external researchers and seen as relevant. No strategy to prioritise knowledge gaps and actively encourage relevant research existed prior to this *Prospectus*.

The Committee is not well placed to directly undertake research. However, the Committee is well placed to

- provide leadership and focus strategic research
- broker relationships within the research community and between industry, policy and research groups
- build a knowledge base, and
- communicate research to a wide audience

In undertaking research in the Basin, coordination across jurisdictions and disciplines is necessary to minimise duplication and maximise effectiveness. A range of organisations will be approached and encouraged to prepare proposals and participate in projects to answer the critical questions facing the management of the Basin and fill the gaps in our knowledge. These organisations will include:

- state agencies with responsibilities for water management in NSW, SA, Qld and NT
- Australian Government Department of the Environment, Water, Heritage and the Arts
- regional NRM bodies with responsibilities within the GAB
- universities
- CRCs including CRC for Landscape Environment and Mineral Exploration, CRC Mining, Invasive Animals CRC, CRC for Sustainable Tourism, Desert Knowledge CRC, Future Farm Industries CRC, CRC for Australian Weed Management, eWater CRC, CRC for Water Quality and Treatment
- industry – mining and petroleum, tourism and pastoralists.

Scholarships

The GABCC has established two PhD top-up scholarships, each valued at $5,000 per annum over three years. These top-up scholarships are intended to supplement the funding of primary scholarship holders who intend to conduct innovative research that will address priority research questions and themes identified in the *Research Prospectus*.

How to get involved

For further information on this *Research Prospectus* or to indicate your interest, please contact us or complete the attached registration of interest and forward to:

GABCC Secretariat
PO Box 3318
MANUKA ACT 2603
AUSTRALIA

Phone: +61-(0)2-6295-7573
Fax: +61-(0)2-6295-9277
Email: gabcc@secretariat.com.au

GABCC *Research Prospectus* - registration of interest

Name
Organisation/Affiliation
Theme of Interest
Your approach in answering the problem
Previous research, papers, experience
Contact details