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Questions and Answers on the Great Artesian Basin Water Resource Assessment

Water for a Healthy Country Flagship

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CSIRO

Australian Government
Department of Sustainability, Environment, Water, Population and Communities
National Water Commission

1. What is the GAB Water Resource Assessment (the Assessment)?

The Australian Government, through the Department of Sustainability, Environment, Water, Population and Communities and the National Water Commission, engaged CSIRO to work with Geoscience Australia to provide an assessment of the 1.7 million square kilometre Great Artesian Basin (GAB) water resource. The GAB underlies parts of Queensland, New South Wales, South Australia and the Northern Territory.

The Assessment, which commenced in July 2010, involved a basin-scale investigation of water resources and the potential impacts of climate change and groundwater development to 2070. It built on the approach taken by the CSIRO in its Murray-Darling Basin, South-West Western Australia, Northern Australia, and Tasmania Sustainable Yields studies.

2. What was the objective of the Assessment?

The primary objective of the Assessment was to update our knowledge and understanding of the hydrological status and condition of the GAB at a regional scale, so as to assist water managers in the GAB better meet National Water Initiative commitments. To achieve this objective the Assessment synthesised available information about the GAB's water resources and modeled future water availability, particularly in light of increased industry demand and the potential impact of climate change on recharge.

3. What was the scope of the Assessment?

The Assessment focused on the aquifers of the Jurassic and Cretaceous period, which comprise the major part of the GAB and are present across the entire basin. Other geological formations within the GAB, such as certain Triassic sediments may represent significant groundwater resources but are not included in the Assessment – although recognising the Triassic sediments are part of the GAB and are managed under the Queensland GAB Water Resource Plan. The Assessment considers other adjacent groundwater systems to the extent that they have a material hydraulic connection with the GAB's Jurassic/ Cretaceous aquifers. However, additional detailed study would be needed to assess the water resources of any groundwater systems adjacent to those aquifers.

4. What were the key findings of the Assessment?

The GAB Water Resource Assessment is the first comprehensive study of the Great Artesian Basin since 1980. The Assessment builds on the previous understanding of the geology and hydrology of the GAB in a consistent way for the whole of the GAB. Key findings of the GAB WRA include:

- An enhanced understanding of the potential for groundwater extraction from the GAB to affect the overlying shallow groundwater system or deeper underlying groundwater basins due to:
  - an improved understanding of locations where underlying geological basins and overlying shallow groundwater are potentially connected with aquifers of the GAB; and
  - a demonstration that groundwater has a greater potential to move vertically across GAB formations due to areas of tectonic and in some areas polygonal faulting.
- Revision of the hydrological boundary of the GAB in the Coonamble Embayment (New South Wales) and the western margin near the Gulf of Carpentaria (Queensland)
- Reclassification of the layers that form aquifers and aquitards to provide a better representation in the variability of characteristics associated with geological formations in the GAB. This reclassification provides a consistent reference framework across the whole of the GAB.
- Computer model predictions of the possible risks of future groundwater development* and climate change scenarios on the GAB that:
  - groundwater levels in the central part of the Surat Basin and the northern half of the Central Eromanga Basin are expected to increase as a result of bore rehabilitation under the Great Artesian Basin Sustainability Initiative (GABSI).
  - groundwater levels in many parts of the western Great Artesian Basin are expected to decrease because much of the inflows along the western margin occurred in a previous geological period under a very different climate than today. However, the western Great Artesian Basin will continue to receive inflows from groundwater flowing from the east.

The Assessment's updated understanding of the GAB is being made available to the public via an interactive 3D model (see answer 21 below) that can be

*Note: Groundwater development comprises a reduction in groundwater extraction due to bore rehabilitation and increase in groundwater extraction due to extractive industries.

viewed over the internet. This enables the vast three dimensional structure of the GAB, which is often presented as a single, large, contiguous groundwater flow system, to be displayed, illustrating the hydrogeological complexity that governs groundwater movement in the GAB.

5. What does the Assessment say about GAB Springs?

GAB water is vital to natural springs, which in turn support unique ecological communities and native species. Some GAB springs are threatened and protected under state and national environment laws including the *Environmental Protection and Biodiversity Act 1999*. The Assessment identifies areas where likely future groundwater levels are expected to increase, and where springs might benefit from recovery of flow. It also, identifies areas, where groundwater levels are predicted to decrease and where spring complexes are at risk from a reduction of flows.

6. Who will use the results of the Assessment?

Through the provision of high quality, reliable and fit-for-purpose data. the Assessment provides an analytical framework that may be used by governments, industry and communities to inform planning and management and investment decisions.

7. What are the key products of the Assessment?

The Assessment has delivered the following key products:

- a Great Artesian Basin summary report, providing a synthesis and overview of the assessment findings;
- a 3D visualisation model of the Great Artesian Basin at whole-of-basin scale;
- four reports for regions within the GAB, including the Surat, Central Eromanga, Western Eromanga, and Carpentaria regions;
- a report reviewing and updating the conceptualisation of the hydrogeology of the GAB;
- a report presenting the results of modelling the current and future scenarios of groundwater pressure in the GAB; and
- a report presenting an assessment of the current and future predicted water resource development on key environmental assets, especially springs hydrology.

8. How will the Assessment complement other projects?

The Assessment has incorporated the findings of several recently completed projects that were funded by the National Water Commission, namely:

- Allocating Water and Maintaining Springs in the GAB;
- Strategic Assessment and Management of Priority/Stressed Groundwater Catchments;
- Queensland Identification of Source Aquifers to Significant Springs Dependent on Groundwater from the GAB;
- Investigating the Impact of Climate Change on Groundwater Resources; and
- Potential Local and Cumulative Effects of Mining on Groundwater Resources.

9. How does the Assessment relate to the Allocating Water and Maintaining Springs in the Great Artesian Basin (GAB Springs) project?

The Assessment covered the whole of the GAB from a broad perspective, whereas the GAB Springs project was a focused assessment of the Western GAB and related Springs.

The Assessment and GAB Springs project are generally consistent in their findings for the Western GAB. Both projects conclude that the Western GAB is in a state of long term pressure decline, primarily driven by current development and natural groundwater processes that may create a risk to the GAB Springs in that area.

The GAB Springs project describes an ongoing trend of very slow water level decline in the Western GAB due to climate variations over a very long timescale. The Assessment provides results of modelling that predicts a greater rate of decline than the GAB Springs project under current and future climate and groundwater development conditions.

The GAB Springs project also describes a new understanding of the hydrogeology in the Western GAB. The modelling results of the Assessment do not incorporate new information discovered by the GAB Springs project such as a new understanding of the hydrology of the area, and recent groundwater observations. Consequently the changes in groundwater levels shown by the large-scale model in the Assessment are likely to be an overestimate of actual declines of water levels for the Western GAB.

Due to these limitations the Assessment model's results should only be used for a comparison in groundwater level declines between different modelled scenarios – rather than the specific change – and for an estimation of potential future risks to western GAB Springs.

10. Why were regions chosen for the Assessment?

The study area is divided into four regions (see map in Terms of Reference), which are based approximately on the underlying geological structures and groundwater flow characteristics.

There is a substantial whole of basin report which provides an up-to-date synthesis of information about the aquifer structure, groundwater flow systems and response to climate change and groundwater development of the basin as a whole, as well as interconnections between the four regions.

11. Why was the date for the climate change scenario different from the previous Sustainable Yield projects?

Climate change may alter the recharge and surface water characteristics at the margins of the Basin, which could eventually impact on GAB water resources. However, as the GAB is such a large groundwater resource, potential changes are likely to take decades, not years, to have an impact. This meant that the Assessment needed to look further into the future than the previous Sustainable Yield projects.

12. What data sources were used in the Assessment?

The Assessment has obtained 'fit-for-purpose' data from government agencies and, where possible, the private sector, including mining and exploration companies. The purpose of the Assessment was to build upon our shared knowledge of the GAB to

the benefit of all stakeholders. All data has been used in accordance with the conditions upon which it was supplied.

13. Now that the Assessment has concluded does this prohibit extraction or further allocation of water under new development proposals?

No, the Assessment has improved our knowledge and understanding of how the GAB operates. This will allow for more informed assessments of development proposals by state and Australian government regulators. The Assessment products will also help better inform government policy, community and industry decision making.

14. What are the implications of the Assessment for mining and petroleum developments including Coal Seam Gas?

The Assessment did not examine the implications of individual developments. Rather, it modeled the impact of current and potential future development scenarios on GAB water and environment assets. The outcomes of the Assessment are likely to result in consideration of a new range of information (reflecting an updated knowledge of how the GAB operates) by State and Commonwealth government regulators before approval to proceed, if any, is provided.

15. What does the Assessment say about the impacts of CSG development?

The Assessment did not examine the implications of individual development. Rather, it modelled the impact of general development scenarios on GAB water and environmental assets. The Assessment used output from the model developed by the Office of Groundwater Impact Assessment in conjunction with CSIRO modeling to find that in the main aquifer of the GAB the future pressure gains due to completion of the GABSI program would be significantly greater than any pressure loss due to currently planned coal seam gas developments.

16. How does the Assessment relate to the Murray-Darling Basin Plan?

Under the Commonwealth Water Act 2007, the GAB is not a Murray-Darling Basin (MBD) resource; as such the outcomes of the Assessment will not have a directly impact the Plan. The Assessment provides data that may assist in quantifying previous findings that "GAB discharge occurs via springs and possibly via upward leakage to streams in the lower reaches of the Macquarie and Barwon rivers" (Evans et al., 1995; Radke et al., 2000). Such information could be used to inform future planning in both the MDB and GAB.

(See also a technical background report on interaction between GAB and MDB published by CSIRO at http://www.csiro.au/resources/BackgroundGreatArtesianBasinMDBSY.html)

17. What are the implications for the respective jurisdictions' water plans?

The Assessment will provide a new range of data and understandings to help better inform the development of future GAB water management plans. More detailed site-specific investigations would be needed to apply the broad scale Assessment results to the local scale useful for management.

18. How will the Assessment influence water management in the GAB?

The Assessment does not provide recommendations for water management in the GAB, rather it re-conceptualises our understanding of the Basin's water resource and provides new knowledge to be used by Basin decision makers.

19. How will the Assessment influence bore monitoring in the GAB?

The Assessment may assist future targeted bore monitoring by better identifying where potential stresses in the GAB might occur.

20. Will the Assessment support consideration of new development proposals requiring approval under the Environment Protection and Biodiversity Conservation 1999 (EPBC) Act?

The Assessment will provide new data and understandings to help inform whether development proposals may impact on matters protected under national environmental law, including threatened species or threatened ecological communities dependent on GAB water. The Assessment, and other new information that becomes available, could inform future reviews of GAB water management plans and consideration of protected matters under the EPBC Act.

21. How can the public access the products from the Assessment?

The Assessment reports and a link to the three dimensional model are available from the project website <http://www.csiro.au/science/Great-Artesian-Basin-Assessment.html>

For more information contact:

Brian Smerdon
Phone: 08 8303 8720
Email: Brian.Smerdon@csiro.au
Web: <http://www.csiro.au/science/Great-Artesian-Basin-Assessment.html>

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