

## Current groundwater science and modelling work

*This document lists current and recent work by the department to improve our understanding and management of groundwater.*

Our groundwater team has five key roles: providing technical advice, acquiring groundwater knowledge, managing groundwater resources, completing modelling, and helping with the development of regulations, plans and policies.

Our technical work includes completing hydrogeological assessments and providing advice across agencies managing groundwater resources. We provide knowledge to help manage the resources and to prepare, develop and implement policies, water sharing plans and regulations.

Our modelling work focusses on developing regional groundwater models. Finally, planners and policy makers who specialise in groundwater amend and/or develop regulations, plans and policies.

In the last year, we have completed a range of projects to learn more about groundwater and communicate our findings. These are sorted below by key topics.

### Topic - Groundwater monitoring (groundwater level monitoring, groundwater quality monitoring)

Projects	Description
Statewide groundwater quality baseline	<p>There is limited data on groundwater quality across NSW. To address this, we completed the largest ever project to acquire state-wide data on groundwater quality, at a cost of \$3.4 million. The data is being uploaded directly into the WaterNSW water quality database.</p> <p>The analytical data include major ions, metals and a range of isotopes. This will be a significant dataset to support project and future research, including enhancing our understanding of groundwater recharge and flow processes. The data is available for any stakeholder through WaterNSW.</p>
Hydrography review	<p>A review of the state-wide groundwater monitoring network was completed in June 2021 to inform the WaterNSW IPART funding submission and an audit of groundwater monitoring required by the MDBA. The review identifies WaterNSW current obligations for groundwater monitoring and makes recommendations for further analysis and network refinement.</p>
Water monitoring framework and coal basin monitoring strategy	<p>This was a \$22 million project to install groundwater monitoring bores in coal and coal seam gas basin in NSW, completed in June 2021. 70 bores are now drilled and constructed and are equipped with dedicated sampling equipment and telemetry. The data is available through WaterNSW.</p>

Projects	Description
Ongoing groundwater monitoring	The NSW Government monitors groundwater resource levels at 4,300 sites across NSW, with about 400 sites monitored in real time. The data is available on the WaterNSW website.

## Topic - Groundwater resource assessment and groundwater management

Projects	Description
Water level reviews in NSW major inland systems	Water levels and long-term trends were reviewed for all major inland aquifers. The reviews aimed to identify areas of long-term stress on the aquifer, where water level management actions are required. The water level reviews also fed into the 2020 annual groundwater summary reports for 31 groundwater sources. Works are continuing to manage areas where water levels are declining.
Land subsidence (compaction) studies	The department worked with the CSIRO to analyse groundwater level and satellite data (InSAR) for any observed land subsidence associated with groundwater extraction. Where there was significant subsidence found, the project will consider managing the extraction of groundwater to protect the aquifer.  Works in the Lower Namoi are completed. Works in the Lower Murrumbidgee, Lower Murray, and Lower Lachlan are close to complete.
Statistical and machine learning to reproduce and predict groundwater level behaviour	The University of Technology Sydney (UTS) completed work to explore the relationship of time series data in the Alstonville Plateau area. UTS used classical statistical approaches as well as methods recently proposed in the machine learning literature.  Both approaches were able to reproduce water level time series. Currently the project is seeking to expand to more complex hydrogeological systems and is working with data from the Namoi area. The aim is to determine if we can use the new technologies to support groundwater management.
Groundwater trades and approvals – end to end process	WaterNSW and the department have worked together to document the process of groundwater trades and approvals. We have reviewed our internal processes and WaterNSW is updating their website to reflect this. Several supporting short videos have been completed to inform customers.
Groundwater quality changes review in area of high use	This work looks at water quality data acquired over a number of years in high groundwater extraction areas, and the geochemical processes affecting the water of the productive aquifer. The work will be published in 2021.

## Topic - Groundwater usage

Projects	Description
Groundwater usage dashboard	The department has published a dashboard to allow users to monitor usage in their water source, and how close the water source is to its compliance limit. Available at: <a href="https://www.industry.nsw.gov.au/water/allocations-availability/tracking-groundwater">https://www.industry.nsw.gov.au/water/allocations-availability/tracking-groundwater</a>
Annual groundwater summary reports for 31 groundwater sources	In 2020, annual status summary reports on groundwater resumed being published. <a href="https://www.industry.nsw.gov.au/water/science/reporting">https://www.industry.nsw.gov.au/water/science/reporting</a> . For 2021, status summary reports are planned on a subset of those sources, to be published in November / December 2021.

## Topic – Groundwater communications products

Projects	Description
Explaining how we manage groundwater. Those products can be videos or animations or technical guidance material.	<p>Released via websites/ social media. We have recently released:</p> <ul style="list-style-type: none"><li>• Groundwater 101, an animation on key groundwater concepts</li><li>• A video on the Water Monitoring Strategy program</li><li>• Technical guidelines on how to complete a pumping test “<i>Minimum requirements for pumping tests on water bores in New South Wales</i>”</li><li>• Technical guidelines on construction dewatering “<i>Minimum requirements for building site groundwater investigations and reporting</i>”</li><li>• Information on methods available to manage groundwater extraction to limits - <a href="https://www.industry.nsw.gov.au/water/allocations-availability/managing-access-to-groundwater">https://www.industry.nsw.gov.au/water/allocations-availability/managing-access-to-groundwater</a></li></ul> <p>We are close to releasing:</p> <ul style="list-style-type: none"><li>• An animation exploring the difference between groundwater recovery and groundwater recharge</li><li>• An animation on the importance of bores being properly constructed</li><li>• Two animations around “the journey of an application”. This relates to the work with WaterNSW to provide customers more information on groundwater trades and approvals.</li></ul> <p>We have also released Technical Guidelines for the documentation of SSDs/ SSI groundwater submissions</p>

## Topic – Impact management

Projects	Description
Groundwater pump test guidelines	Technical guidelines on requirements when submitting a pumping test to support an application with the department. This is published on our website.

Projects	Description
Technical Groundwater guidelines for State Significant Development (SSD) (including on groundwater models)	<p>These will be guidelines to help individuals complete their groundwater assessments for SSD. They aim to be clearer about the requirements for the groundwater models and submissions developed for SSD and reduce time lost due to incomplete documentation.</p> <p>The documents will include a discussion on best practice to model and represent groundwater cumulative impacts. The guidelines are expected to be released in early 2022.</p>
Technical guidelines on construction dewatering “Minimum requirements for building site groundwater investigations and reporting”	<p>We have worked with WaterNSW to publish better guidance for people applying for licences with a dewatering component, as part of updating the process to assess Integrated Development Assessment System (IDAS) applications for dewatering impacts.</p> <p>The department, which completes the technical assessments, has published a guideline on the departmental website.</p>

## Topic – Knowledge acquisition

Projects	Description
Great Artesian Basin (GAB) springs conceptualisation	The work looks at geological, geochemical and hydrogeological data for the GAB springs and aims to understand the aquifer source for each GAB spring complex in NSW. This report will be published in 2021. Some of the data was gathered during spring surveys run by the department.
Great Artesian Basin (GAB) springs survey factual report	The department has published the report of the combined three spring surveys undertaken between 2018 and 2019.
Macleay Sands hydrogeological characterisation	Water source hydrogeological description report of the Macleay Sands groundwater source.
Botany Sands Groundwater Study	Hydrogeological study towards the update of the Greater Metropolitan Region Groundwater Water Sharing Plan. The report will be release as part of the Greater Metropolitan Region Groundwater Sources Water Sharing Plan public exhibition.
Hawkesbury River Alluvium Groundwater Study	Hydrogeological study towards the update of the Greater Metropolitan Region Groundwater Water Sharing Plan. The report will be release as part of the Greater Metropolitan Region Groundwater Sources Water Sharing Plan public exhibition.

Projects	Description
Alstonville Plateau hydrogeological characterisation	Water source hydrogeological description report of the Alstonville Plateau groundwater source.
Cockburn Connectivity Study	Study of the relationship between the connectivity of groundwater and surface water and potential impact of groundwater use on river ecosystems.
Hunter WSP Area, Cease to Pump Triggers	Hydrogeological review of water levels against riverbed elevations for several tributaries of the Hunter River. The work is to inform the update of the Hunter Water Sharing Plan and is to be release during its public exhibition.

## Topic - State Groundwater Strategy and Regional Water Strategies

Projects	Description
State and Regional Water Strategies. State Groundwater Strategy.	Our department is developing a State Groundwater Strategy to capture the requirements for the planning and management of a sustainable access to groundwater over the next 20-40 years.

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