



## Water Information Services

Output Group 1.5 – Water Information – comprises the single Major Output ‘Water Information Services’.

The Water Information Services output supports the national water reform process through development and management of Australia’s first integrated national system of high-quality water information, and through establishment of a single authority for such information. This initiative recognises the importance of good water information in the management of water scarcity, water quality and flood risk.

The Bureau’s water information role includes:

- building and maintaining a national database of water information and making it publicly accessible via the internet;
- facilitating improvements in Australia’s hydrometric networks via administration of the \$80 million Modernisation and Extension of Hydrologic Monitoring Systems Program;
- monitoring and interpreting trends in water availability and quality, compiling and maintaining water accounts for Australia, and publishing reports including Australian water resource assessments and an annual National Water Account; and
- providing effective flood warnings, and eventually short-term and extended (seasonal and multi-decadal) water availability forecasts, based on the best science and a sound understanding of user needs, and in close cooperation with State and Territory partners.

The Bureau’s national water information role is supported by the *Water Act 2007* and the *Water Regulations 2008*, which name more than 240 organisations across Australia which are custodians of water data and are required to provide water information to the Bureau. The water data cover all elements of surface and groundwater budgets and some aspects of water quality, along with information on water trades, entitlements, allocations and restrictions.

## Output Performance Information 2008-09

Output performance is measured against a number of performance targets. The results achieved for 2008-09 are provided below along with a commentary on significant variations.

Description of Output	Holding, managing, interpreting and disseminating Australia's water information. Providing regular reports on the status of Australia's water resources and providing forecasts on the future availability of water. Compiling, maintaining and annually publishing the National Water Account. Encompasses the provision of flood warning services and hydro-meteorological advice*.
Contribution to Outcome	Provision of water information and related services as part of the 'Water for the Future' program. Enhanced community safety and well-being through the effectiveness of flood warnings used by the general public and other major social, environmental and economic sectors.
Key result	Progressive implementation of new water information data and reporting systems, and the provision of effective warning services.

\* The Budget Statements 2008-09 for the Bureau of Meteorology erroneously included flood warning and hydrometeorological advice in the description of Output Group 1.3 – Meteorological and Related Services. These activities and related key performance indicators are reported on in this chapter against Output Group 1.5.

Key Performance Indicator	Target	Result
Water planners and managers have access to water information that is accurate, timely, reliable and fit-for-purpose (satisfaction of Australia's present and future needs for reliable, homogeneous water data).	The quality and timeliness of data from Australian water observation networks is maintained or improved relative to 2006 levels.	Achieved
	Investment programs for the modernisation and extension of water observation networks are agreed with all State and Territory governments to facilitate improvements in national hydrometric networks.	Achieved
	Successful harvesting of water data and information from Australian water data owners, at specified data quality and currency levels.	Largely achieved (see Note 1)
	Publish a National Water Account addressing National Water Initiative objectives.	In progress (see Note 2)
	Build a web-based and publicly-accessible national database of water information resulting in a 10% increase in access to water information from the Bureau's website.	In progress

	95% of regular data downloads to the national water data archive successfully completed within preset quality control standards.	In progress (see Note 3)
	90% of users surveyed are 'satisfied' or 'very satisfied' with water information products.	In progress (see Note 3)
Water information standards satisfy the requirements of water planners and managers.	Water information standards defined to the satisfaction of an appropriate expert group.	In progress (see Note 4)
Strategic investigations for an enhanced understanding of Australia's water resources.	100% of commissioned investigations completed in accordance with specified terms and conditions.	Achieved - all eight projects met progress targets for 2008-09
	Four new water information products are developed.	In progress (see Note 5)
Community safety and well-being are served through preparation of water data products and information and the effective use of hydrological and flood forecasting services by the general public, industry, and major social and economic sectors.	Provide and further develop an effective and reliable flood forecasting and warning services in close cooperation with State and Territory partners.	Achieved

## Notes:

- (1) Systems for receipt and cataloguing of water data and information were completed, and most of the data required under the Water Regulations 2008 were received by the Bureau. The Bureau continues to work with those organisations that have not supplied data to assist them in meeting their obligations under the Regulations.
- (2) The National Water Account (NWA) Roadmap and Implementation Plan was completed, and the preparation of a Methods Pilot for the NWA commenced. The Methods Pilot is an important step in the process of delivering the first NWA, involving the 'piloting' of sub-national accounts (sub-accounts). The Methods Pilot will be conducted from June to December 2009 and will produce sub-accounts for seven geographic areas. The Bureau, in cooperation with participating agencies, will prepare a Methods Pilot NWA by December 2009, and a comprehensive first NWA a year later, according to the timetable agreed by the COAG Water Sub-Group in October 2008.
- (3) The Australian Water Resources Information System production, development and test hardware was commissioned. Software development continues and the system will be accessible in early 2010.
- (4) The Water Accounting Standards Board was established and preliminary Water Accounting Standards released. Three expert panels were established in the areas of water information terminology, water data transfer standards and hydrological geospatial data.
- (5) The development of new water information products is expected to proceed during 2009-10, following re-formatting and quality control of water data delivered in a diversity of formats by more than 240 custodians around Australia.

## Comments on Output Performance

Several of the target areas above are listed as 'in progress', as they relate to systems that are still in development in this second year of the Bureau's new water information role. The notes below the table detail the progress made on these items.

A major recruitment campaign for hydrologists and other specialist staff was completed during the first half of the year to enable the Bureau's implementation of its new water information role.

## Achieving the Outcome

The Water Information Services Major Output was delivered through the Water Data Service, Water Monitoring Service and Water Prediction Services outputs. Developments related to each of these outputs, and their contribution to the overall outcome, are addressed below.

### Water Data Service

The Bureau's water information role contributes to enhanced water planning and supports the sustainable development and management of Australia's water resources, consistent with national water reform under the National Water Initiative and the 'Water for the Future' Program. The Bureau's Water Data Service contributes to these objectives through the identification, cataloguing and discovery of all the potential sources of information relevant to Australian water resources, the collation of this information in the Australian Water Resources Information System (AWRIS), and the provision of free public access to this information through AWRIS. This task also includes the setting of standards for and quality control of water data, the ongoing evolution of the water regulations, and management of the funds available under the Modernisation and Extension of Hydrologic Monitoring Systems Program for the upgrade of Australia's water monitoring networks.

#### Major Developments 2008-09

- The second round of funding under the Modernisation and Extension of Hydrologic Monitoring Systems Program was completed, with \$20 million in funds, for 132 projects, committed to organisations listed in the *Water Regulations 2008*. Funding under this program will result



The Canberra Data Centre, home for the Bureau's national database of water information.

in improved accuracy, currency and coverage of Australia’s water monitoring network and an increased capacity for organisations to provide quality water information to the Bureau.

- First drafts of Strategic Water Information Monitoring Plans (SWIMPs) for each State and Territory of Australia were completed, documenting existing water monitoring networks, and identifying gaps and priorities for future improvements. The SWIMPs, which are funded through the Modernisation and Extension of Hydrological Monitoring Systems Program, will be used to guide future rounds of funding under the Program, deepening the benefits derived from this funding program.
- Information technology tools were developed to allow acceptance of data from organisations listed in the *Water Regulations 2008*, and to track and catalogue data in the ten categories of data listed in the Regulations. Data collection and ingestion is a key process in populating the national database of quality water information that the Bureau is developing.
- A Water Data Transfer Format (v.3) was developed through the Water Information Research and Development Alliance (WIRADA), the Bureau’s five-year water research and development collaboration with the CSIRO, to provide a standard way for organisations to convey their data to the Bureau. Standardisation of data transfer formats reduces complexity and increases collaboration between the Bureau and the organisations providing data. This is an interim format which will be improved as refinements are implemented.
- Under a Heads of Agreement involving Geoscience Australia, the Bureau and the Australian National University, a major data input to the Australian Hydrological Geospatial Fabric was completed. Called the Geofabric (Figure 27) it will provide a consistent, national

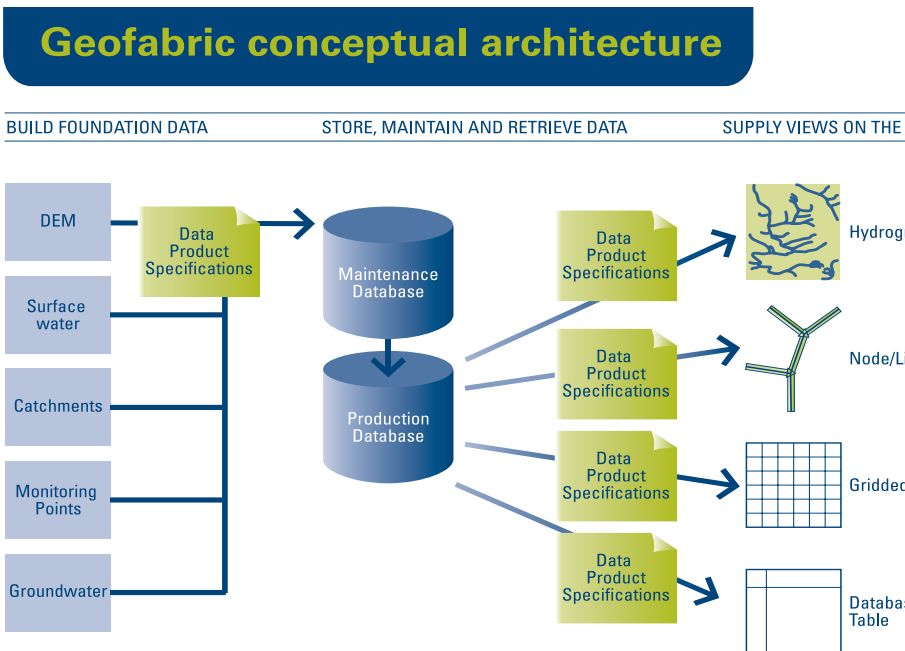


Figure 27. The chart illustrates the several major data inputs and other components of conceptual plans for the Australian Hydrological Geospatial Fabric including a national Digital Elevation Model and national surface hydrology data layer.

spatial context for the data obtained by the Bureau and will be an essential element of Australia's water information. In Phase 1, the Geofabric will link time-series data from AWRIS such as surface run-off, diversions, storages, entitlements, allocations and trades with hydrological features including catchment boundaries and streams. In later phases, the Geofabric will be updated to include groundwater information as well as improvements to the resolution of the underlying digital elevation model and surface hydrology.

- Expert panels were established for the Water Data Transfer Standards project and the Geofabric which will provide technical commentary and review of the activities undertaken by the Bureau. The use of expert panels assists in ensuring that outputs are of sufficiently high quality to achieve the intended purpose of these systems.

## Water Monitoring Service

The Bureau's Water Monitoring Service undertakes analysis and interpretation of water information and provides periodic situation reports, annual water resources assessments, and the National Water Account (NWA). These products will assist water managers and policy makers to manage water resources more sustainably.

The Water Monitoring Service also provides hydrometeorological advice to the water engineering community and is leading a major revision of the rainfall intensity-frequency-duration data in the Australian Rainfall and Runoff document (published by Engineers Australia).

Through this service, the Bureau provides a focus for Australian input to, and dissemination of, information from the international hydrology and water resource programs of the World Meteorological Organization (WMO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO).

### Major Developments 2008-09

- The National Water Accounts Committee was established to guide the implementation of the national water accounting process led by the Bureau. Expert panels and committees are a mechanism used by the Bureau for guidance in technical areas, each one composed of technical experts from industry and government in the relevant field, to provide commentary and review to ensure the quality of outputs.
- The Expert Panel on the Australian Water Information Dictionary was established to develop standards in water information terminology.
- A preliminary Australian Water Accounting Standard was developed by the Water Accounting Standards Board which was established by the Bureau during 2008-09. These are critical elements needed to underpin the first NWA due for production in 2010.
- Through WIRADA, a water balance framework was developed that identifies the elements of the water cycle to be reported under an Australian Water Resources Assessment scheduled for production in 2010.
- A major review of hydrological modelling and estimation techniques was completed to inform stakeholders of water balances required by the Australian Water Resources Assessment and the first NWA, both scheduled for 2010.
- The NWA Roadmap and Implementation Plan for the cooperative production, between State and Territory water agencies, of the NWA was completed, including a methods



Water information standards satisfy the requirements of water planners and managers (Googong Dam near Canberra). (Photo courtesy of Lynton Crabb)



## Water Information Research and Development Alliance Launched and on its Way

The Water Information Research and Development Alliance (WIRADA) brings together CSIRO expertise in water and information sciences and the Bureau's requirement for research in support of its new operational responsibilities in water information. Under an umbrella research collaboration agreement and through the CSIRO 'Water for a Healthy Country' Research Flagship, around 40 leading CSIRO researchers are focusing on topics including data interoperability, hydrologic modelling, water accounting, water resource assessment and water availability predictions.

WIRADA was formally launched by the Minister for Climate Change and Water, Senator the Hon Penny Wong, on 4 September. Key research outcomes for 2008-09 included:

- substantial progress in the development of the interim Water Data Transfer Format with uptake by a number of industry and agency data providers;



Dr Rob Vertessy, Deputy Director (Water), Bureau of Meteorology, and Senator the Hon Penny Wong, Minister for Climate Change and Water, at the WIRADA Launch, Parliament House, Canberra, in September. More than 80 senior managers, researchers and policy staff from Commonwealth agencies, research centres and representative industry attended the launch. WIRADA is a strategic investment of \$50 million over five years that will yield most of the innovation required by the Bureau to fulfil its national water information mandate.

- development of a digital surface model and digital elevation model for the continent with support from the Defence Imagery and Geospatial Organisation, Geoscience Australia and the Australian National University, and now available to all government agencies (Local, State or Federal);
- completion of a prototype water balance system of models now readied for testing by the Bureau; and
- improved prediction of seasonal streamflow volumes using statistical techniques based on a range of indices that describe climate patterns, including the El Niño-Southern Oscillation Index.

The Alliance is governed by a management committee which sets the strategic direction for the Alliance, approves the annual research program and budget, and oversees the effective delivery of the research program.

pilot to be completed in 2009. The Plan describes the milestones and process required to develop a first comprehensive water account by the end of 2010 and annual production of water accounts thereafter.

- The Bureau signed a contract with Engineers Australia for the Bureau to deliver Stage 1 of the Intensity-Frequency-Duration (IFD) Revision project. Deliverables include a quality controlled database of rainfall data collected from all relevant agencies, and a detailed methodology for data analysis to be agreed with Engineers Australia's Technical Committee. The uptake of improved IFD estimates will contribute to safer and more cost effective engineering designs.

## Water Prediction Services

The Bureau prepares and disseminates flood forecasts and warnings to the public through Flood Warning Centres in each of its Regional Offices, with overall coordination provided by the Head Office element of this output. Regional service delivery depends on close cooperation with State and Territory water and emergency service authorities, local government agencies and other stakeholders. More detailed local interpretation of Bureau flood warning information is provided directly to the public by flood response agencies. Bureau inputs include early alerts to the possibility of flooding through a web-based Flood Watch product, with site-specific forecasts of river height and the expected impact in terms of minor, moderate or major flooding in specific river basins.

The severe and protracted drought in Australia has created increasing demand for improved water availability prediction services and this is now possible under the Bureau's new responsibilities for water information services. Extended water availability predictions are valuable in developing water policy and making decisions on water allocations, assessing water demand, purchasing environmental water and water trading. A major task under this output in coming years is the development of systems and services for seasonal and longer-term predictions of streamflow and other hydrological variables in key catchments.



Lismore during the major flood event in New South Wales in early 2009.  
(Photo courtesy of Alexandra Reeson.)

## Flood Warning Services in 2008-09

During 2008-09 satisfactory flood warning services were provided for all significant flood events. Further development of flood forecasting and warning services was achieved through contributions to several natural disaster mitigation projects, including the Avon-Swan River in Western Australia, Huon River in Tasmania, Upper Parramatta River in New South Wales, Wimmera River in Victoria and the Nogoa River in Queensland.

January and February saw periods of particularly significant flooding in Queensland and New South Wales. The Queensland statewide rainfall average for January was 229.3 mm (the highest since 1991). A number of sites in large areas of the Gulf Country, Northwest, Northern Goldfields, Herbert and Lower Burdekin, Northern Tropical Coast and Tablelands and western Channel Country received their highest recorded January rainfall with quite a few others receiving their highest January rainfall for at least 20 years. In the Gulf country, flooding persisted for over two months.

Several deaths occurred in Queensland as a result of the flooding. Reported damage bills were well in excess of \$200 million with the extensive flooding leading to

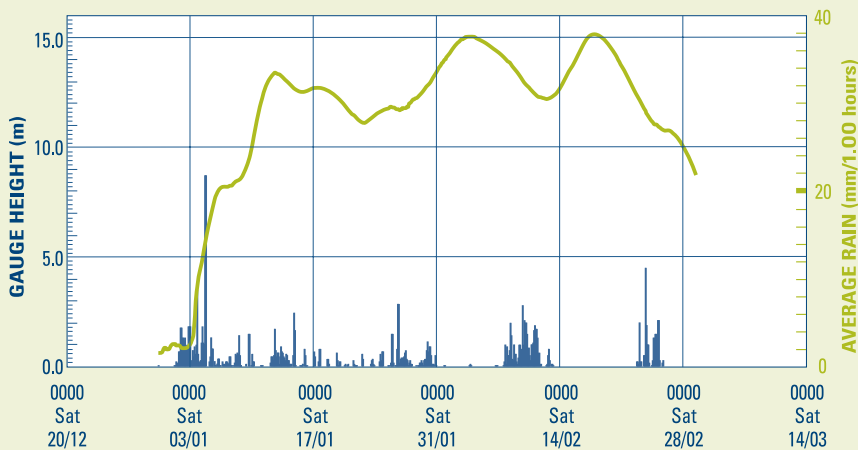
prolonged isolation of towns and properties with very high stock losses, interruption to transport routes and the inundation of urban areas, most notably Ingham.

In mid-February heavy rainfall over mid-north coastal areas of New South Wales led to significant flooding in many coastal rivers, most notably in the Orara, Bellinger, Nambucca, Macleay, Hastings, Manning and Hunter river valleys.

In May, Bureau warnings of major flooding in a number of northern New South Wales river valleys provided the State Emergency Service (SES) with sufficient early warning to undertake significant advance preparations, including the evacuation of around 20,000 people and the deployment of additional resources from outside the region. The Director General of the SES formally expressed his appreciation to the Bureau for the high quality of services during the event.

Bureau Flood Warning Centres in Brisbane and Sydney provided essential warnings and flood information (rainfall and river height bulletins) as well as extensive briefings to emergency management officials and media.

Post-event reviews confirmed that flood forecasting and warning services effectively met requirements and there was little criticism from external stakeholders. In the early stages of the flooding in NSW some warnings (based on forecast rather than observed rainfall in order to provide greater lead time) overestimated the degree of flooding but nevertheless provided valuable advanced notice of expected flooding. Other issues identified in post-flood reviews included some data collection system failures which interrupted the flow of flood information (mainly during the Queensland floods) and the expectations of some NSW communities which are not covered by the current flood warning system.



Flood hydrograph for Flinders River at Walkers Bend showing flood levels above the major flood threshold from January to early March.



## Major Developments 2008-09

- Through WIRADA, three key extended hydrological prediction projects were initiated, on: (i) statistical seasonal prediction; (ii) dynamical seasonal prediction; and (iii) statistical downscaling of global climate model outputs. These projects will enhance the Bureau's ability to provide extended water availability predictions in the future, which, in turn, will assist water planners and policy makers in making better-informed decisions.
- A user-needs analysis of water managers around Australia was undertaken to help the Bureau better match its planned seasonal water availability prediction capability with the requirements of key stakeholders.
- A scoping paper was drafted for the Australian Hydrological Modelling System (AHMS). To be developed over the next five years, the AHMS will provide the high-level modelling capability needed for the Bureau to provide improved and extended water availability predictions in the future.
- The first phase was completed of an investigation into the suitability of the Flood Early Warning System (FEWS) as the basis of the Bureau's future flood forecasting and warning operational system. Improvements are expected to increase the forecast lead time and to improve reliability of hydrologic forecasts by being able to match particular models to flood situations rather than relying on a single modelling approach.
- The first phase of a staff competency training program for flood forecasting and warning operations was completed.
- A WIRADA research project was initiated to develop a continuous hydrologic model aimed at producing more accurate and timely flood forecasts. The project aims to (i) extend the Bureau's current event-based flow modelling for flood prediction to provide continuous flow forecasting; (ii) improve the accuracy of flow and flood prediction at both catchment outlet and internal (ungauged) points through model updating, using spatially variable rainfall input, and using remotely sensed soil moisture data; (iii) improve forecast lead-time by using quantitative precipitation forecast products; (iv) determine further improvements that can be made by employing physically-based spatially distributed hydrological models; (v) develop a hydrological modelling system for providing flash flood guidance; (vi) develop a practical method for quantifying forecast uncertainty; (vii) evaluate a modelling framework for upgrading the Bureau's flood forecasting system.