Water Information and Environmental Intelligence

Warwick McDonald
Bureau of Meteorology, Australia
25 April 2012
DRIVE
IMPROVING WATER INFORMATION PROGRAM

ENABLEMENT
HYDROLOGICAL GEOSPATIAL FABRIC

FOUNDATION
DIGITAL ELEVATION MODEL

APPLICATION
AUSTRALIA WATER RESOURCES ASSESSMENT
DRIVE

IMPROVING WATER INFORMATION PROGRAM
Why invest in water information?

- Judicious infrastructure investments
- Accurate and timely flood warnings
- Properly functioning water markets
- Greater efficiency in water use
- Fair pricing and equitable sharing of a scarce resource
- Prudent environmental flow allocations

Good water information is the key
Four years into a ten year program

1. Sharing data
2. Setting standards
3. Building systems
4. Data warehousing
5. Improving observations
6. Publishing information
7. Assessing water resources
8. Accounting for water
9. Forecasting flows
10. Research & Development
ENABLEMENT

AUSTRALIAN HYDROLOGICAL GEOSPATIAL FABRIC (GEOFABRIC)
What is the Geofabric?

Evolving and consistent spatial data product that ...

- identifies important water features in the landscape
- describes connections between these features
- supports multiple representations of these features
- underpins Australia’s water information products
Identification of important water features
(standardised definitions)

River confluences

River outflow to sea

Inland sink

Monitored features

Image Source: Bing Maps
Connections between water features (topology)

Connected features with different representations

Supporting multiple representations (persistent identifiers)

Complex vs Simple Geography

Complex vs Simple Topology

The value of the Geofabric?

To underpin our water information activities

Visualisation and mapping

Hydrological modelling

Catchment contributing areas

Water reporting
In development: geospatial framework for groundwater
FOUNDATION

NATIONAL (30m) DIGITAL ELEVATION MODEL
Improved resolution
New knowledge
Reconciling topography and cartography
# Murray-Darling Basin

## Water Assets and Water Liabilities

### as at 30 June 2010

<table>
<thead>
<tr>
<th>Description</th>
<th>2010 ML</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WATER ASSETS</strong></td>
<td></td>
</tr>
<tr>
<td>Connected Surface Water Store</td>
<td>9,870,733</td>
</tr>
<tr>
<td>Groundwater Store Assets</td>
<td>1,019,004</td>
</tr>
<tr>
<td><strong>TOTAL WATER ASSETS</strong></td>
<td>10,889,737</td>
</tr>
<tr>
<td><strong>WATER LIABILITIES</strong></td>
<td></td>
</tr>
<tr>
<td>Surface Water Liability</td>
<td>2,371,865</td>
</tr>
<tr>
<td>Groundwater Liability</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL WATER LIABILITIES</strong></td>
<td>2,371,865</td>
</tr>
<tr>
<td><strong>NET WATER ASSETS</strong></td>
<td></td>
</tr>
<tr>
<td>Net Water Assets</td>
<td></td>
</tr>
<tr>
<td>Opening Net Water Assets</td>
<td>5,954,859</td>
</tr>
<tr>
<td>Change in Net Water Assets</td>
<td>2,563,013</td>
</tr>
<tr>
<td><strong>CLOSING NET WATER ASSETS</strong></td>
<td>8,517,872</td>
</tr>
</tbody>
</table>
2010 Assessment: Analysis by region

Landscape water balance in 2009–10

Australian average

- Rainfall: 536 mm
- Evapotranspiration: 415 mm
- Landscape water yield: 96 mm

Soil moisture in 2009–10

Regions that became drier:
- North Western Plateau, Pilbara–Gas
- South West Coast, South Western Plains
- South East Coast (NSW) and Tasmania

Surface water storage (comprising approximately 94% of Australia)

<table>
<thead>
<tr>
<th>Total accessible capacity (GL)</th>
<th>Accessible volume (GL)</th>
<th>% of average</th>
</tr>
</thead>
<tbody>
<tr>
<td>78,500 GL</td>
<td>36,000 GL</td>
<td></td>
</tr>
</tbody>
</table>

Comparison of water use between 2008–09 and 2009–10

Urban water use

- Volume:
  - 1,568 GL in 2008–09
  - 1,497 GL in 2009–10
- Change: -4.5%
AUSTRALIAN WATER RESOURCES ASSESSMENT MODELLING SYSTEM

• An integrated modular system,
• with continental coverage,
• a resolution appropriate for reporting,
• that produces the reported water balance framework terms,
• with quantified error bounds,
• maintains mass balance,
• uses the available observations,
• and the most suitable estimation methods.

Cartographic data (Geofabric)
Network data (Geofabric)
Land use data (ACLUM)
Runoff time series (AWRA-L)
ET time series (satellite)
Water Regulations data

- Historic flood marker from 1974 flood on the Murray River.
- Images of a dam and a person working on a flood control structure.
- Maps and data visualizations related to water regulations.

CSIRO
IN SUMMARY
Note to self

✔ Created an enduring national data service
✔ Galvanised national collaboration
✔ Getting Australian water data flowing freely
✔ Developed a national water data format
✔ Re-invigorate hydrologic monitoring
✔ Built a national geospatial framework for water
✔ Started annual, standardised water accounting
✔ Started operational water forecasting services
✔ Secured an innovation pipeline (WIRADA)
Thank you

Acknowledgements
Dr Rob Vertessy, a/Director of Meteorology, BOM
Dr Albert van Dyke (and team), Scientific lead AWRAMS, CSIRO
Dr John Gallant (and team), Scientific Lead DEM, CSIRO
Elizabeth McDonald (and teams), Manager AHGF, BoM

Warwick McDonald
+61 408 894 552
w.mcdonald@bom.gov.au