

What the Bureau can offer you?

Climate and water products for groundwater specialists

Eloise Nation

Bureau of Meteorology

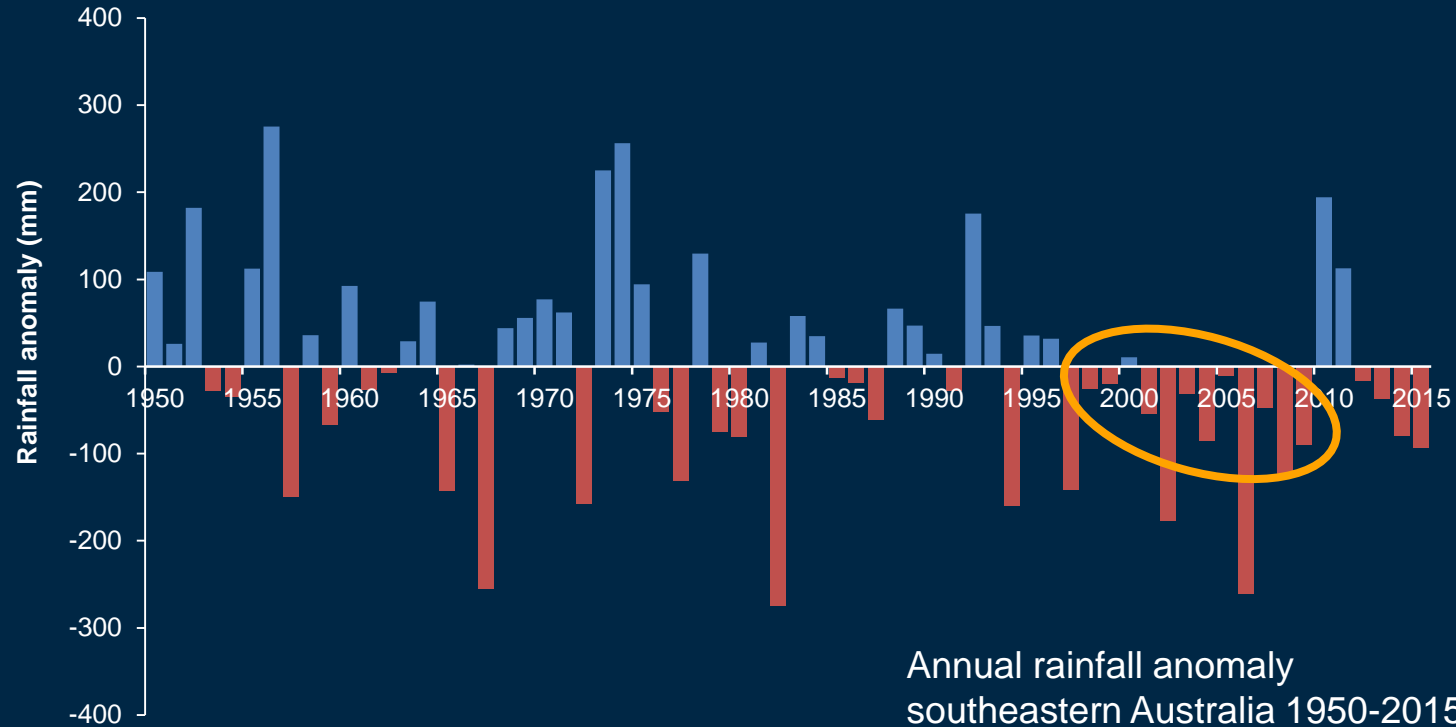


Overview

- Bureau's journey in groundwater
- Groundwater Information Suite overview
- Demo on how to access and download data



The Millennium Drought



Annual rainfall anomaly
southeastern Australia 1950-2015
www.bom.gov.au/climate/change

The Millennium Drought

THE BIG DRY

PUBLISHED IN MELBOURNE SINCE 1854

DROUGHT

Farms to lose vital irrigation supplies unless rain falls within weeks

FRIDAY, APRIL 20, 2007

PM's dire warning on water

By JEWEL TOPSFIELD,
JOHN GORDON
and ORIETTA GUERRIERA

LARGE sections of rural Australia are facing economic ruin and consumers have been warned of soaring prices for basic food items unless drought-relieving rain arrives within weeks.

In the most chilling assessment yet of the water crisis, Prime Minister John Howard yesterday said he had received a report warning of an "unprecedentedly dangerous" situation in the Murray-Darling Basin — the national agricultural "food bowl" that spans four states.

Mr Howard said that unless there was "heavy rain" in the next six to eight weeks, there would be no water allocations for irrigation in the basin, which accounts for 71 per cent of Australia's irrigated crops and 41 per cent of the nation's agricultural produce overall.

And economists have warned that continued drought could have much the same effect as cyclone Larry did on the



FARMING HEARTLAND

The Murray-Darling Basin:

- Contains more than 40 per cent of all Australian farms.
- Value of agricultural production in 2000-01 \$13.6 billion, 40 per cent of the national total.
- Has 75 per cent of nation's irrigated crops and pastures.
- Infuses at least 115 years.
- Population almost 2 million.
- 1.06 million square kilometres: 14 per cent of the continent.
- Uses around 70 per cent of all agricultural water in Australia.

imports made up the shortfall, it could have much the same effect as cyclone Larry did on the

have been doing already, they may have to truck in water," he said. "It is a grim situation and there is no point in pretending to the Australian public otherwise."

Victorian Farmers Federation president Simon Ramsay said Victoria's irrigated agriculture, which was worth \$2.67 billion in 2004-05, would be devastated if there were no water allocations. "Thousands of producers and their families would be suffering and struggling for income. Huge investments in irrigation industry would be ruined and thousands of jobs would be lost," he said.

But he urged farmers not to make hurried decisions based on Mr Howard's announcement, saying the federation had known from February that zero allocations were likely at the beginning of the next season.

The Prime Minister is talking about the



GROWERS IN DISTRESS

Dan Silkstone talks to drought-stricken farmers in Northern Victoria. NEWS 8

The Murray-Darling basin



DANNY LEE GRAPE AND CITRUS GROWER
"People in the city don't realise how totally we rely on water. Without water, this is a desert."



DAVID BEARD GRAPE GROWER
"I didn't think morale could go lower than this."

5
Water

level

water
farmers

Murray-Darling
basin

Water capacity 1.7 million megalitres.
Water lost through evaporation and seepage: 30 per cent.
With 12 billion spent on infrastructure, that could drop to 10 per cent.
This would save at least 100,000 megalitres of water a year.
Melbourne uses about 400,000 megalitres a year.

formal position on the plan but their customers had expressed concerns.

"Our customers are very concerned this takes away the incentive for Melbourne (water authorities) to clean up their own act," Mr Commins said.

"And, once you start water flowing in that manner, jobs and factories go with it — it is impossible to move water vast distances. And, it's never going to come back."

"Politicians are considering this now because Melbourne is running out of water, and Melbourne takes what Melbourne wants," he said.

Victorian National Party water spokesman, Peter Walsh, also spoke out against the plan, describing it as "disturbing."

But in other quarters, support continues to grow. National Water Commission member Professor

Groundwater worry

Anger at Koroit forum

The Standard THURSDAY, December 28, 2006 - 5

Free water for farms

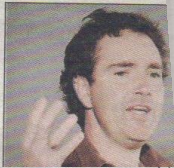
'ridiculous'

TERRY SIM

HEAP irrigation water in south-east Victoria would promote its overuse in the region, Environment Victoria director Dr Paul Sinclair has warned.

South-west irrigators pay just 65 a megalitre for groundwater while northern Victorian irrigators now pay \$2000 a megalitre, he said.

Mr Selway said that on calculations by his committee, "it already appears that about 30,000 megalitres are coming out of that



reassurances appeared to

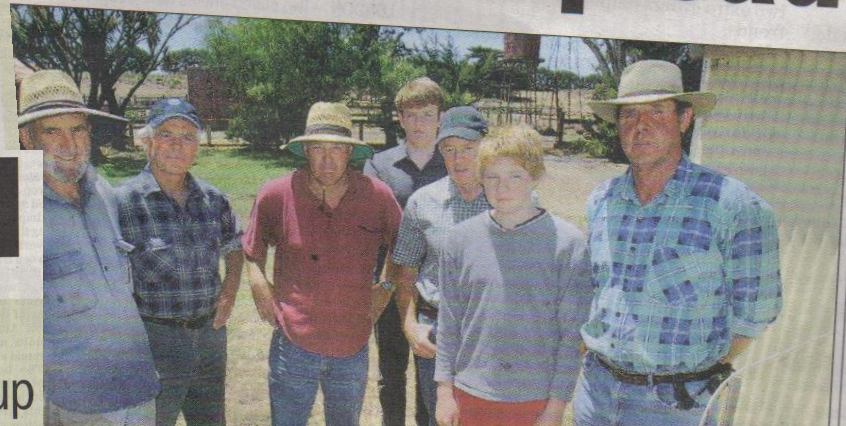
be accepted by many at the meeting. Greens parliamentary candidate Gillian Blair told the meeting her party was the only one



standard.net.au

Water wars at Tarrone

No more licences — farmers plead



GMA plea heeded

By RAELENE HESTON

SOUTHERN Rural Water will formally apply to the Department of Sustainability and Environment to declare a groundwater management area (GMA) north and west of Warragul, the body's deputy chief

"Our belief is that we need to declare a GMA and assess sustainable yields — what the government now calls permissible consumptive volumes — so we have a formal management regime," he said. SRW can refuse applications for new irrigation licences.

mental agreement (for a GMA) in November 2004," Mr Hawke said. Since then SRW had been talking with DSE officers.

"We will now make a formal application for a GMA, setting out the proposed boundary and proposed intention. Then they (DSE) have to formally consider it."

bore were built 30 to 60 years ago of mild steel, which rusts and they are now on the point of collapse. "In one case, we know of a bore which collapsed just a neighbouring dairy was being developed. The bore needs to be reconstructed."

And SRW may not know of all

Call for a users group

The Water Act

- Created new water roles for the commonwealth
- The Bureau is required to *"collect, hold, manage, interpret and disseminate Australia's water information"*
 - including groundwater data
- The *Water Regulations (2008)* require organisations to send their data to the Bureau



Water Act 2007

Act No. 137 of 2007 as amended

This compilation was prepared on 9 July 2008
taking into account amendments up to Act No. 73 of 2008

The Water Regulations

- Data in Regulations
 - Bore and borehole data
 - Levels and pressure
 - Salinity and pH
 - Licenced entitlements
 - Groundwater use
- Data outside of Regulations
 - Management areas
 - Aquifer boundaries
 - 3D aquifer models



Water Act 2007

Act No. 137 of 2007 as amended

This compilation was prepared on 9 July 2008
taking into account amendments up to Act No. 73 of 2008

Collaboration

- Agencies provided:
 - Water Regulations data
 - Groundwater datasets
 - Expertise, knowledge...goodwill
- Groundwater Product Reference Group:
 - States and Territories
 - Geoscience Australia
 - Murray–Darling Basin Authority
 - Department of the Environment and Energy



Groundwater Information Suite

Australian Groundwater Insight

Interpreted national and
regional groundwater
information ... [Insight](#)



Australian Groundwater Explorer

Bore data visualisation,
selection and download ...
[Explorer](#)



National Groundwater Information System

Spatial groundwater database
for GIS specialists ...
[Information System](#)



Groundwater Dependent Ecosystems Atlas

National inventory of
groundwater dependent
ecosystems ... [Atlas](#)



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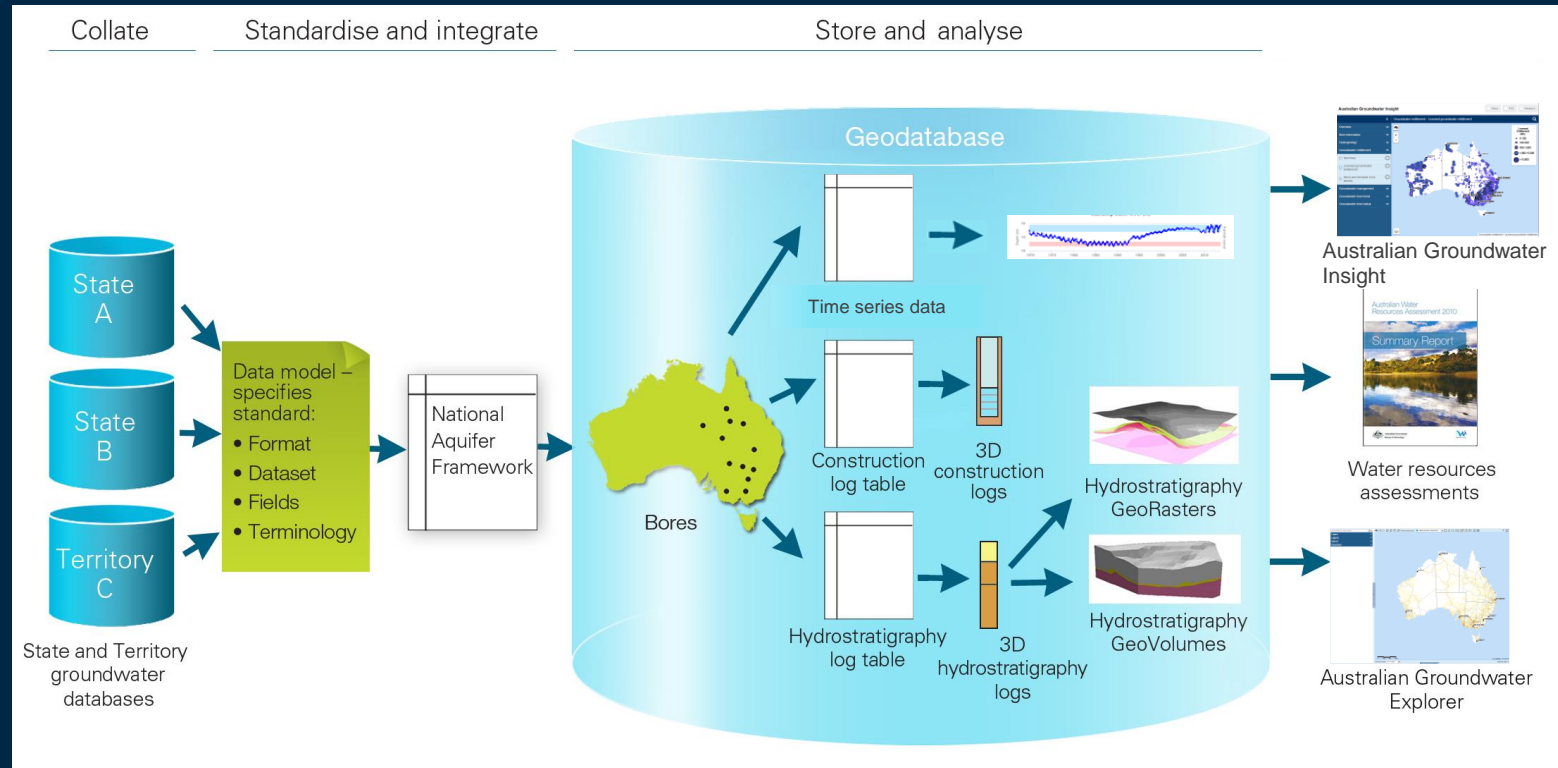


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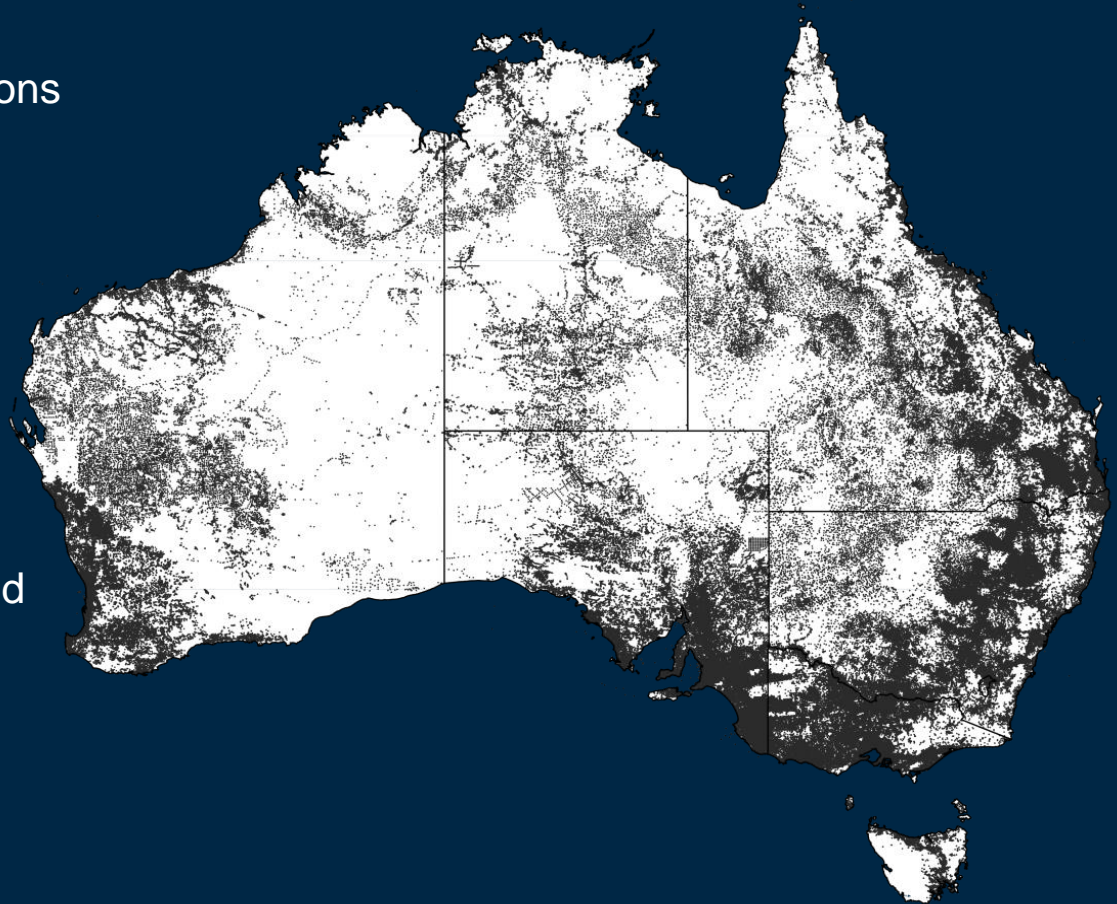


National Groundwater Information System (NGIS)

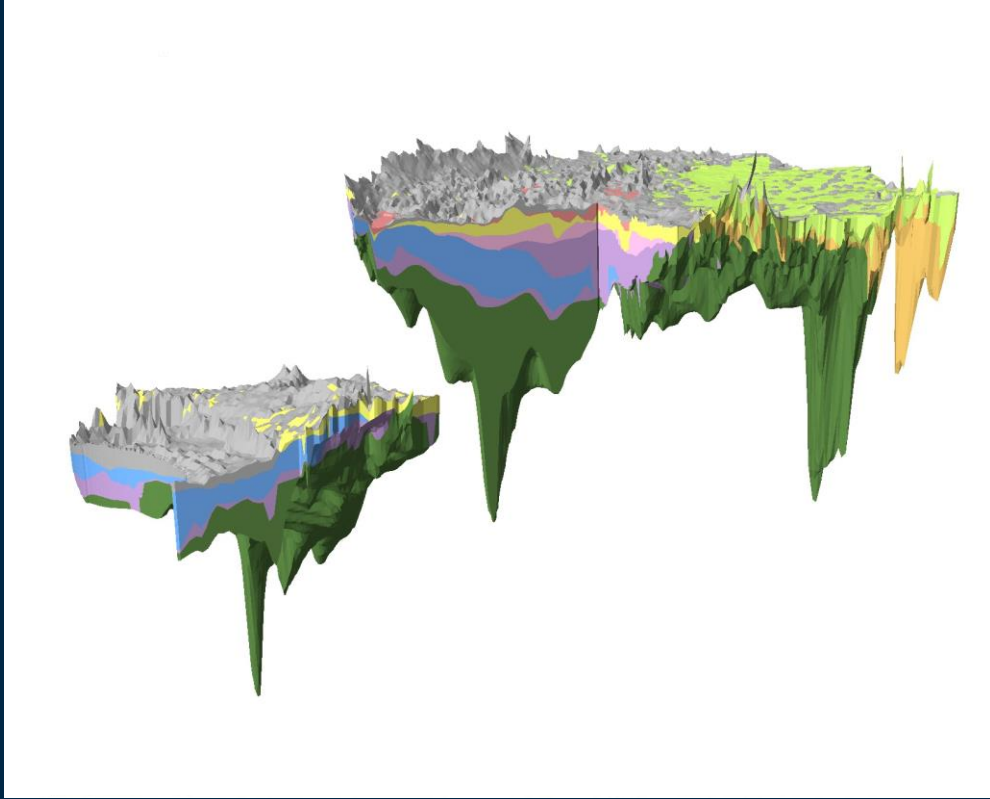


Nationally-consistent bore data

- More than 850 000 bore locations across Australia
- Bore and borehole information
- Construction, lithology and hydrostratigraphy logs
- Multiple interpretations included where available



3D aquifer models



Murray Basin

- **1991**
Murray Basin hydrogeological map series
- **2002**
Basin in a box
(digitisation of contours)
- **2012**
Victorian 3D aquifer surfaces
- **2014**
3D hydrogeological modelling

Australian Groundwater Insight

Interpreted national and
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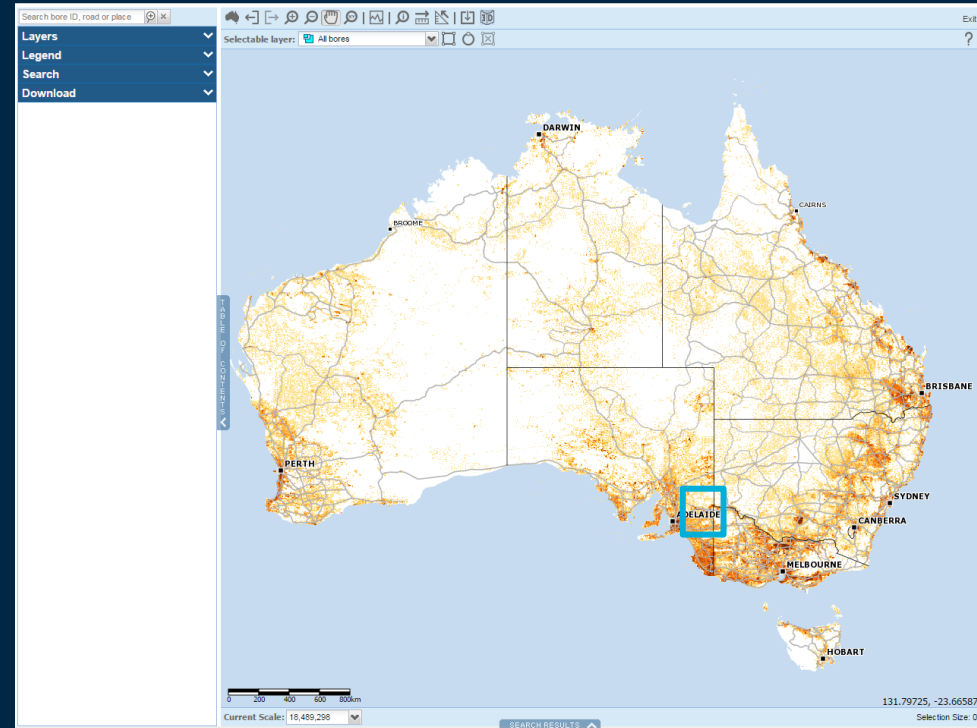
Groundwater Dependent Ecosystems Atlas

National inventory of
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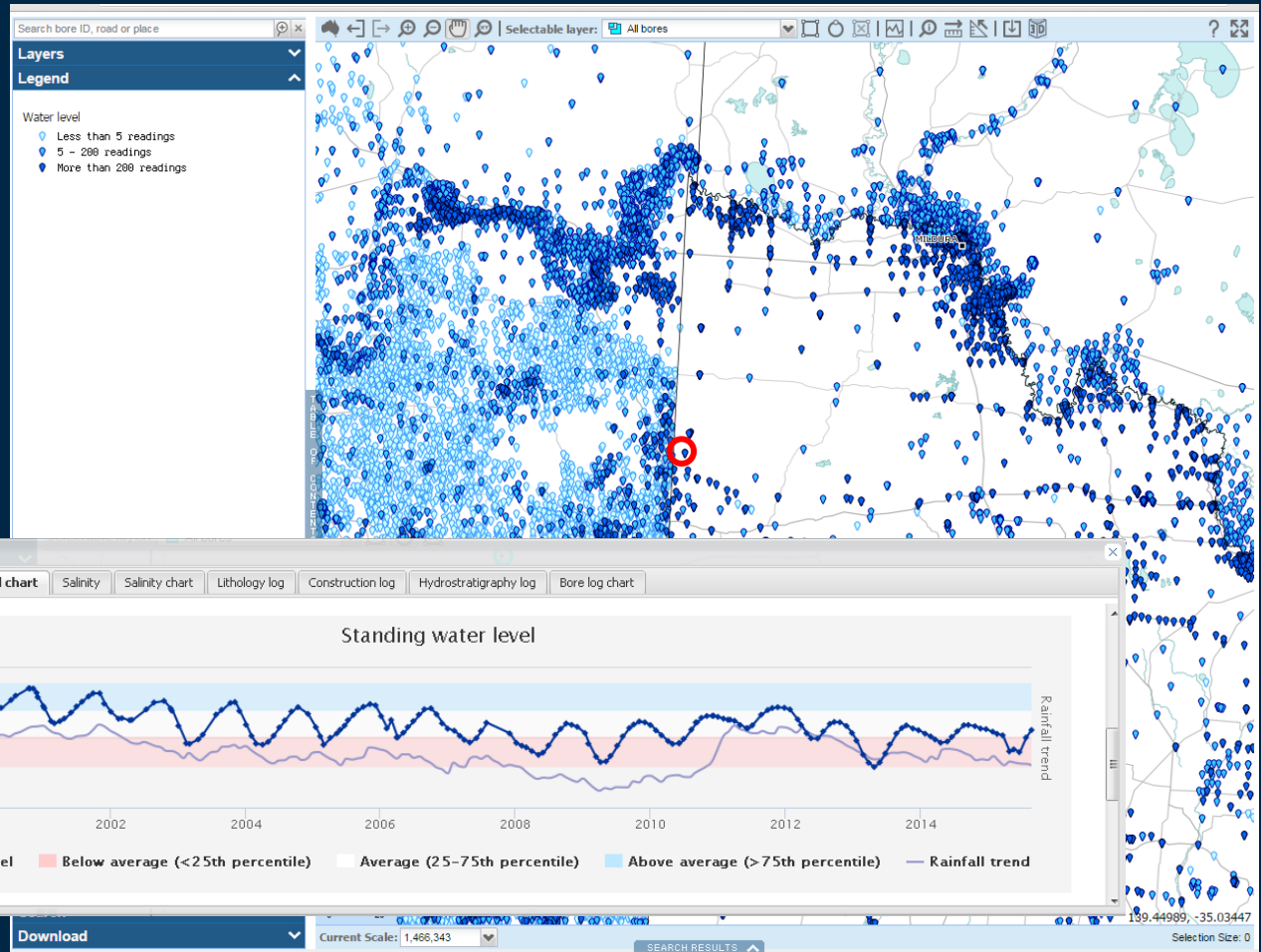


Australian Groundwater Explorer

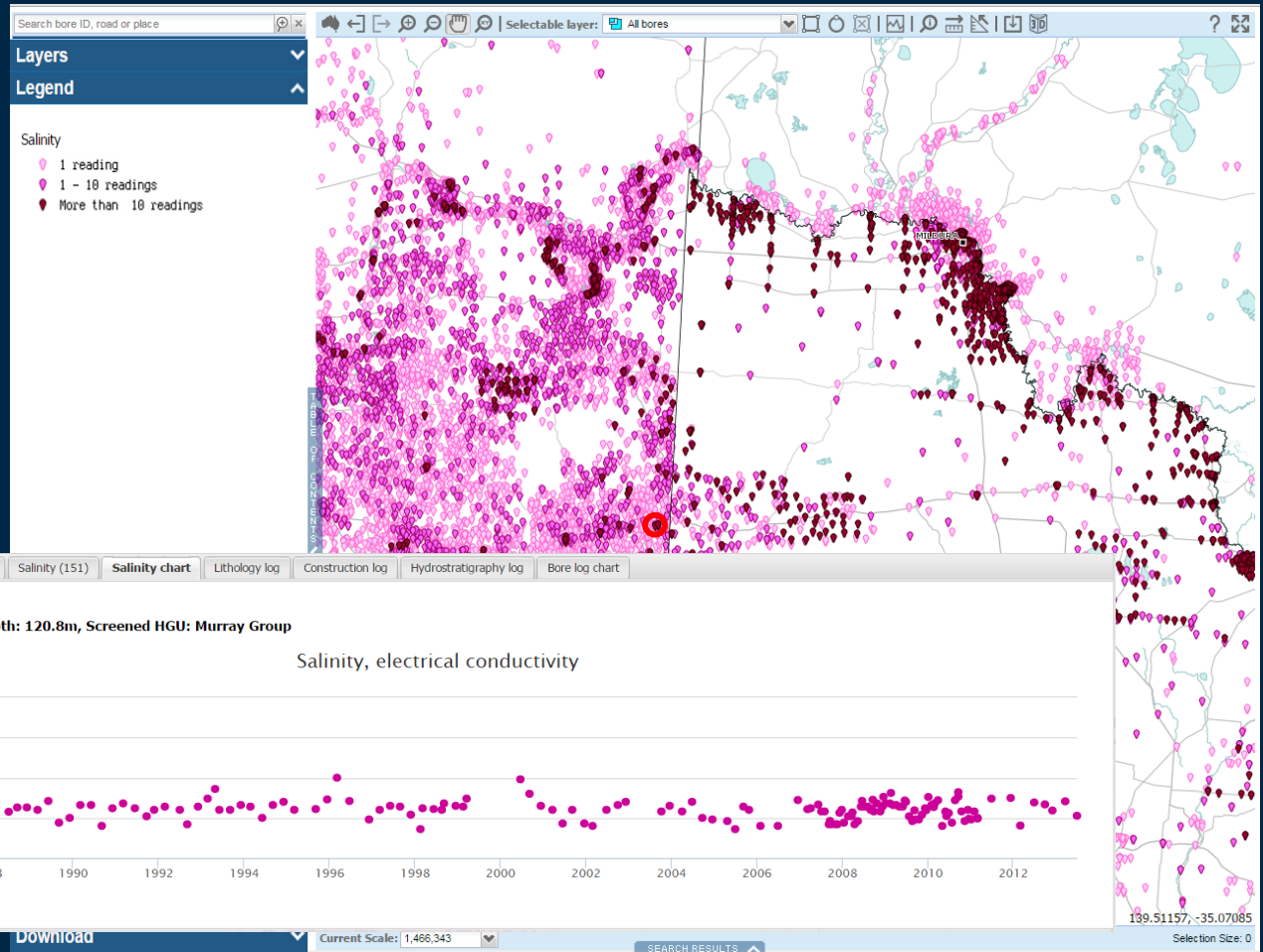
- Online access to groundwater data for technical specialists:
 - Bore data from NGIS
 - Water levels
 - Salinity
 - Rainfall trends
 - Contextual datasets
- View and search data online or download for further analysis



Water level



Salinity



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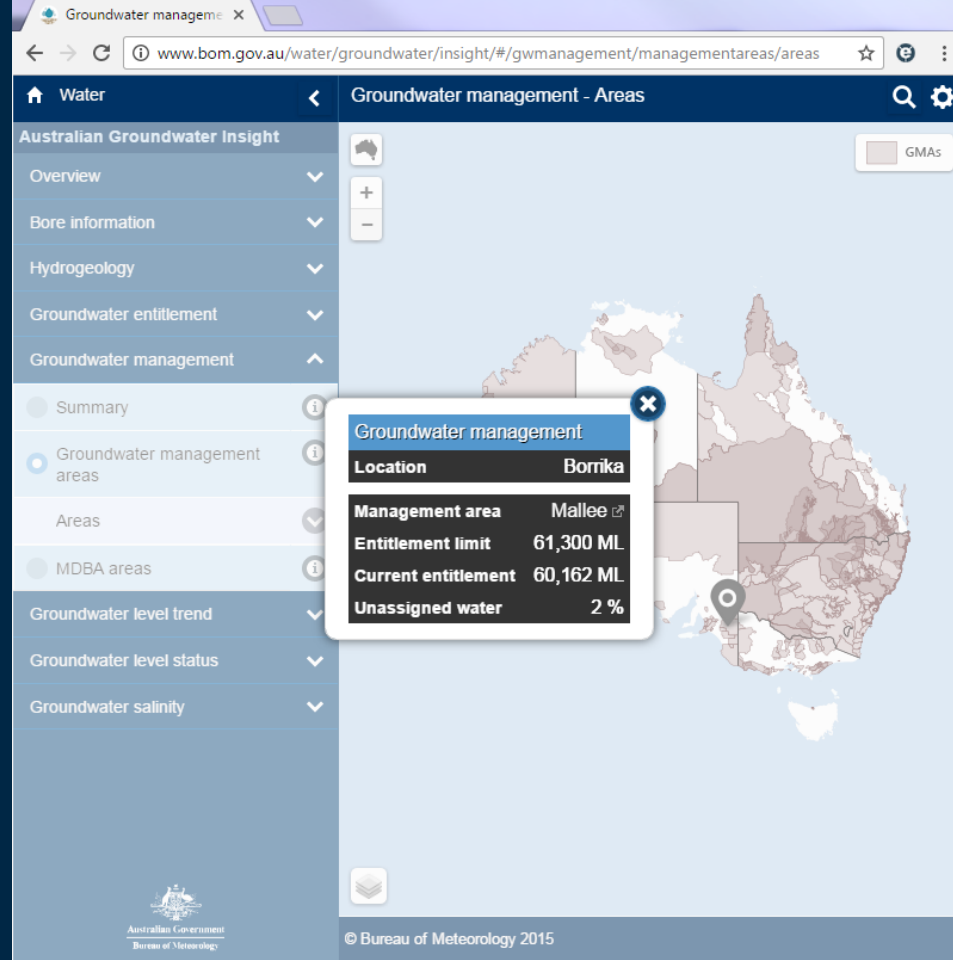
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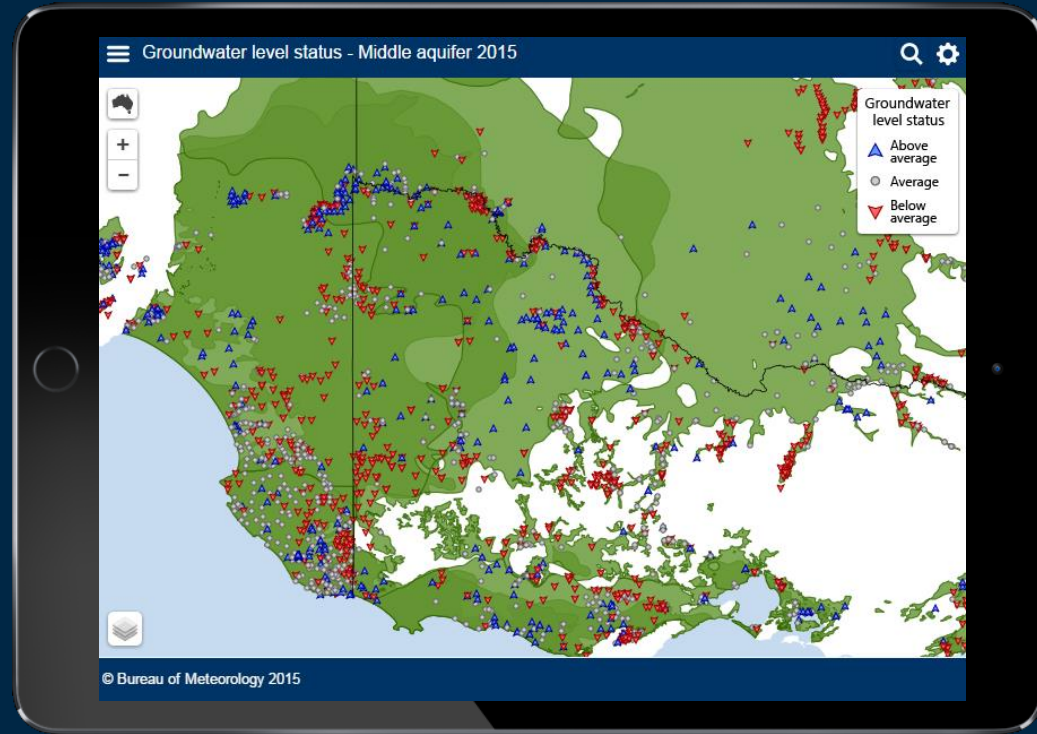
Australian Groundwater Insight

- Interpreted groundwater information, particularly for non-groundwater specialists
- Answers range of user questions:
 - What aquifers are in my area?
 - Where is groundwater used in Australia?
 - What management areas cover my property?



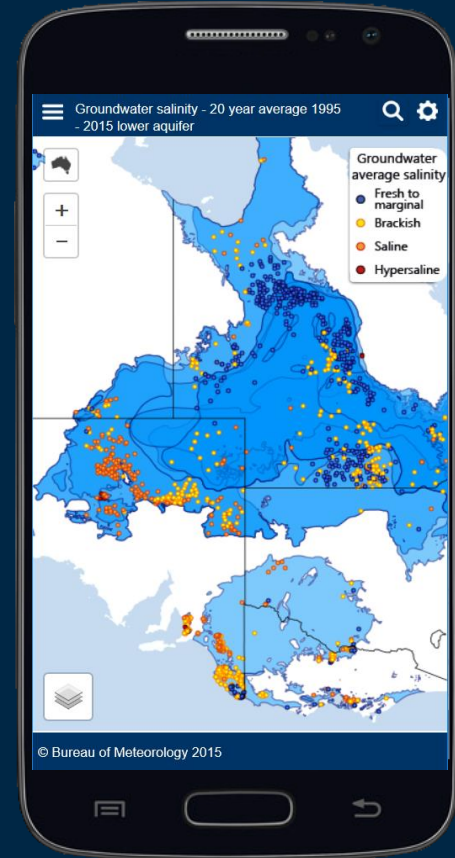
Australian Groundwater Insight

- Answers range of user questions:
 - How are groundwater levels changing?
 - How saline is groundwater?



Australian Groundwater Insight

- Answers range of user questions:
 - How are groundwater levels changing?
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Australian Groundwater Insight

Interpreted national and
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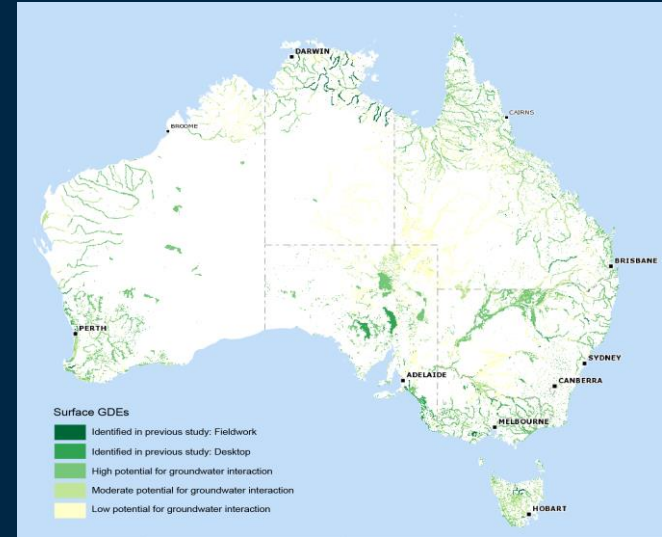


Groundwater Dependent Ecosystems (GDE) Atlas

1. Surface expression of groundwater
- *springs, wetlands, rivers*

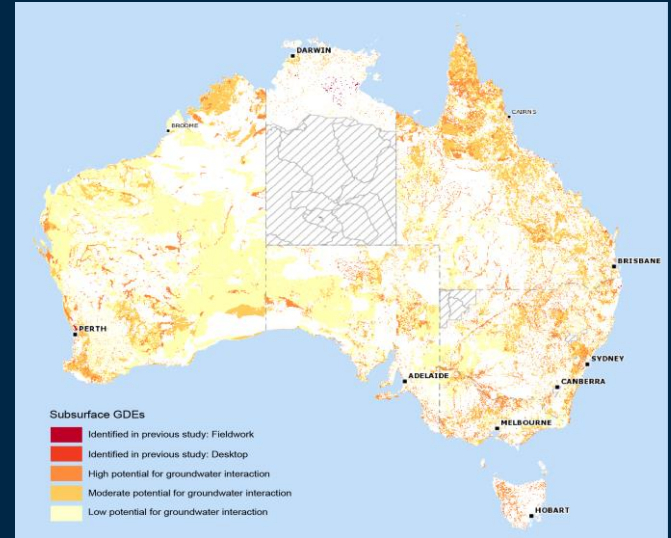


*Great Artesian Basin Mound Spring, South Australia. Picture:
Luke Doherty*



Groundwater Dependent Ecosystems (GDE) Atlas

2. Terrestrial - *vegetation*



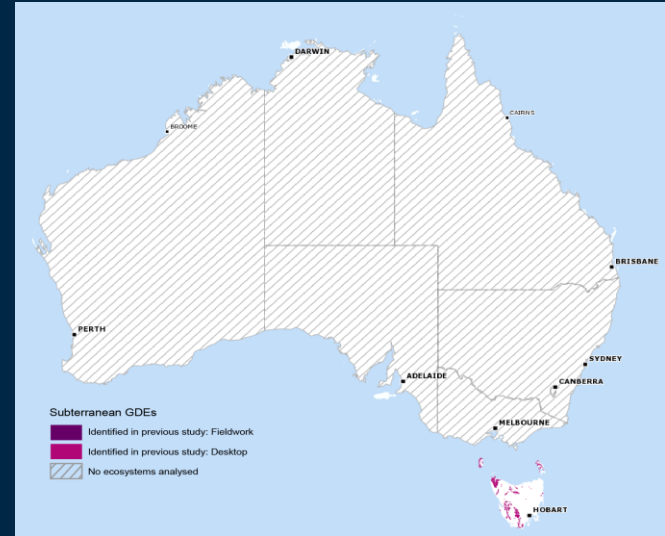
Yael Nature Reserve, Western Australia. Picture: Patrick Duane

Groundwater Dependent Ecosystems (GDE) Atlas

3. Subterranean - caves, aquifers

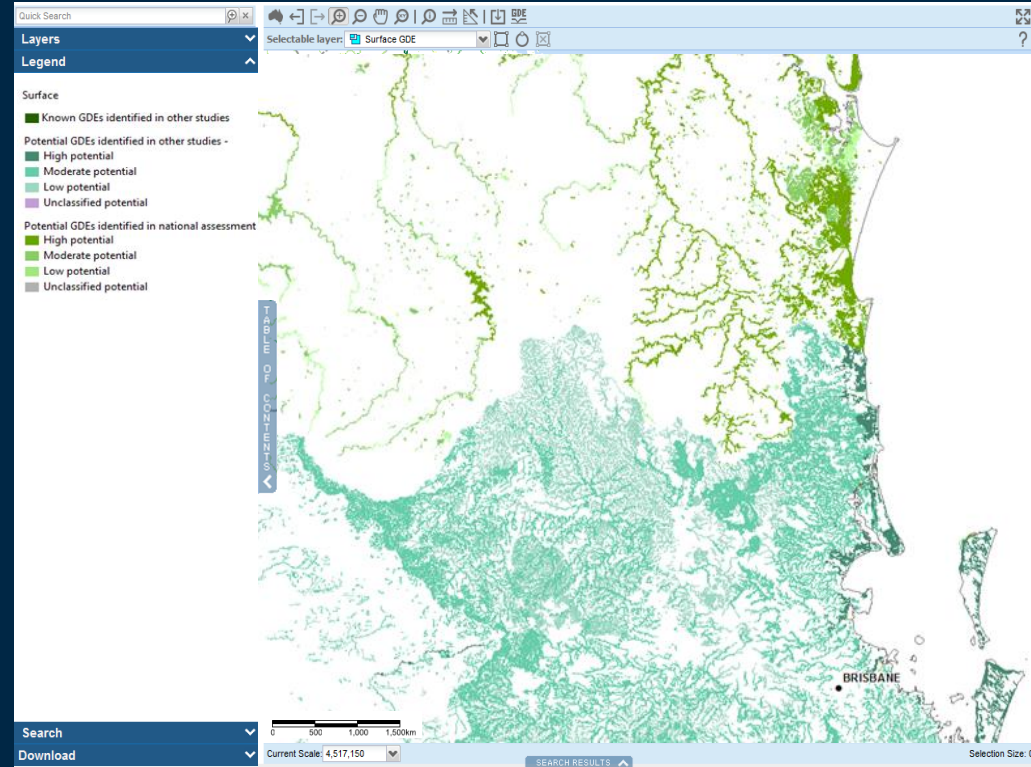


Mole Creek cave system, Tasmania. Picture: Ian Houshold

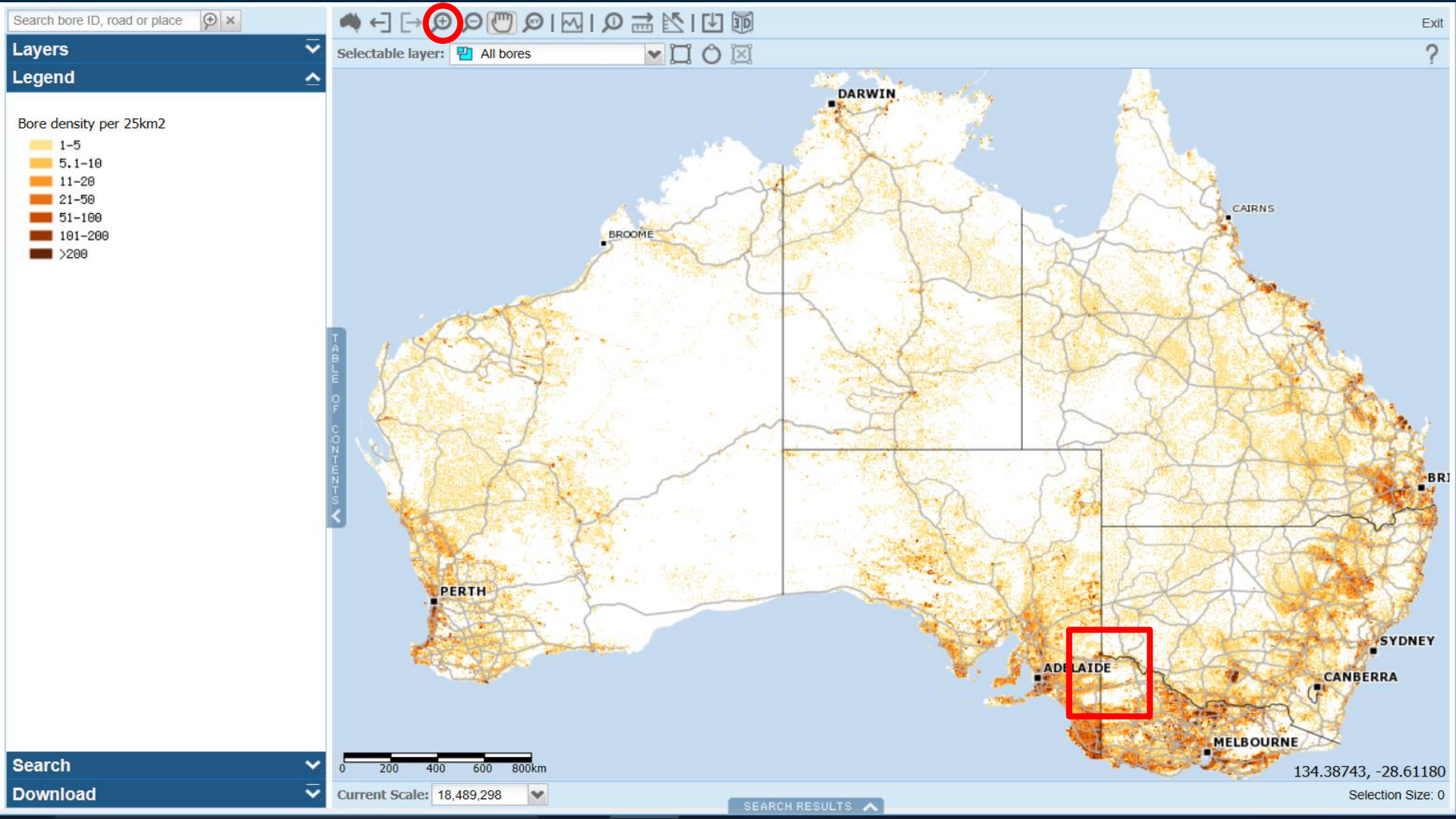


Updating the GDE Atlas

- First national inventory of GDEs:
 - Released in Sept 2012
 - Data from 2009-10
- Developed by NWC, SKM & CSIRO
- Bureau updating with recent state and regional scale GDE datasets



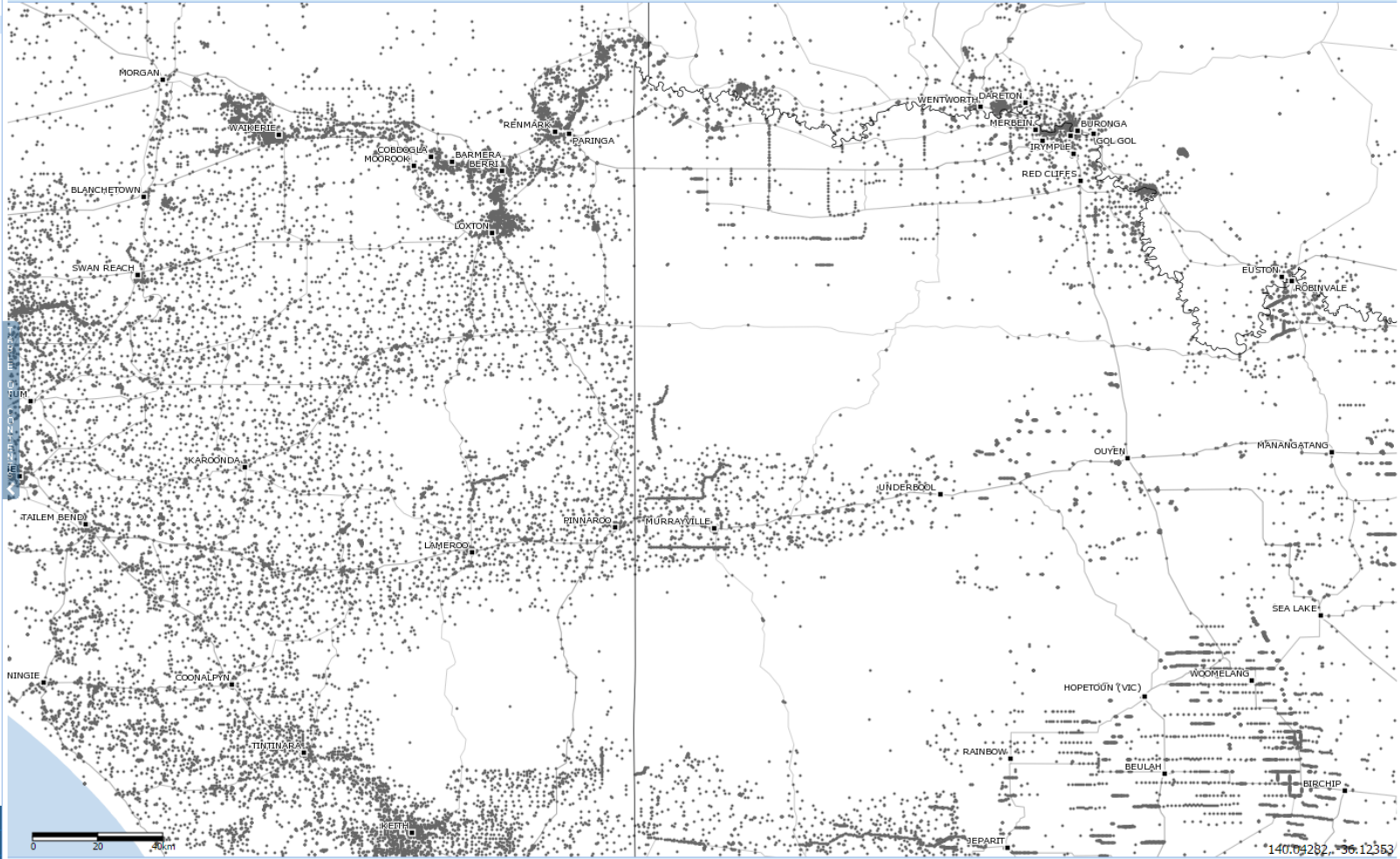
Demo: Australian Groundwater Explorer



Layers






- ☒ Bores
 - ☒ All bores
 - ☐ Groundwater measurements
 - ☒ Water level measurements
 - ☐ Salinity measurements
 - ☒ Bores by purpose
 - ☐ Bore logs
- ☐ 3D aquifer models
- ☐ Water management
- ☐ Hydrology
 - ☒ Rivers
 - ☒ Lakes
 - ☐ River region
- ☐ Geology
- ☒ Background
 - ☒ Places
 - ☒ State and Territory borders
 - ☒ Roads
 - ☒ Landuse
 - ☐ Elevation

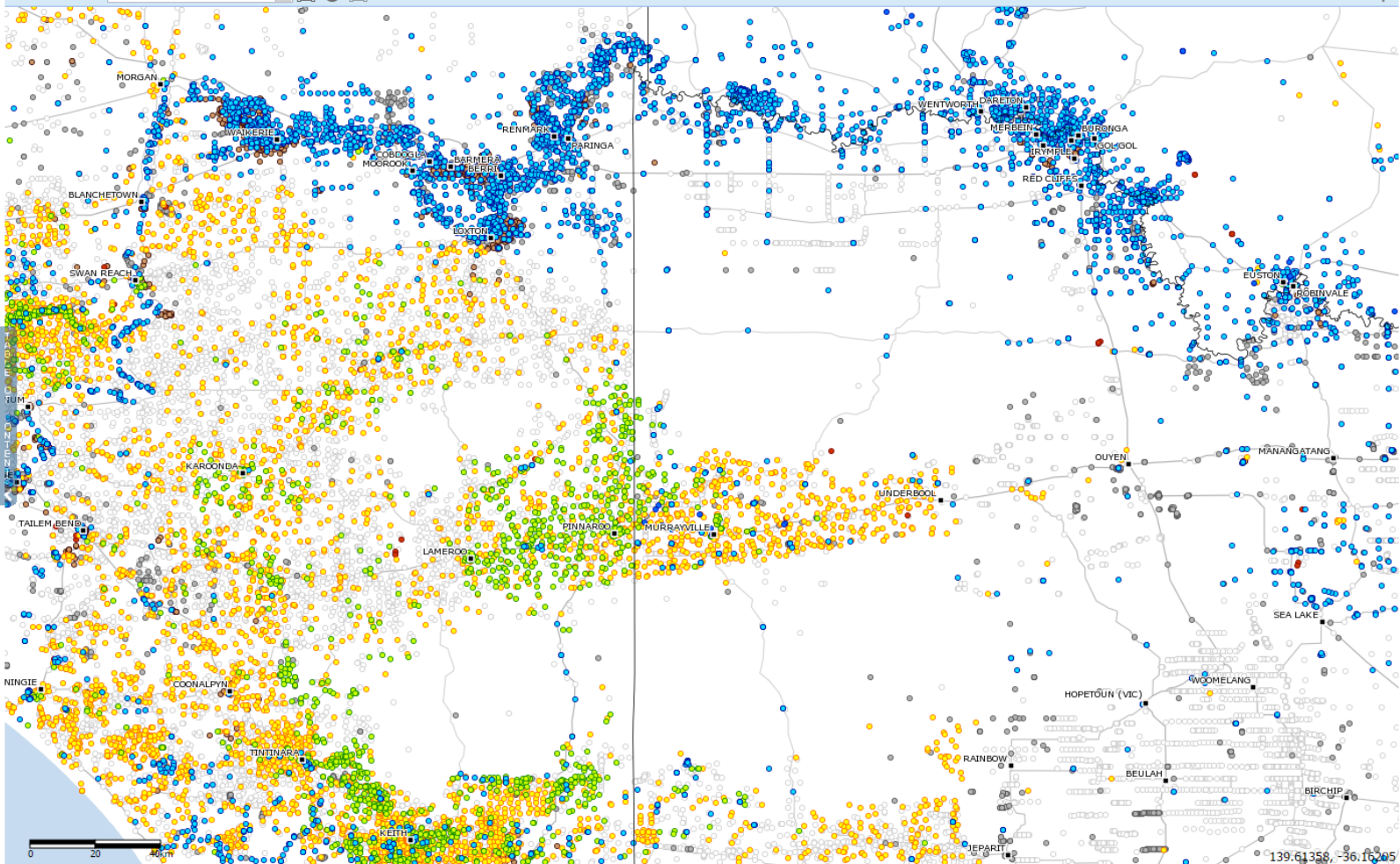
Selectable layer: All bores



Legend

- Unknown

Selectable layer:  All bores    



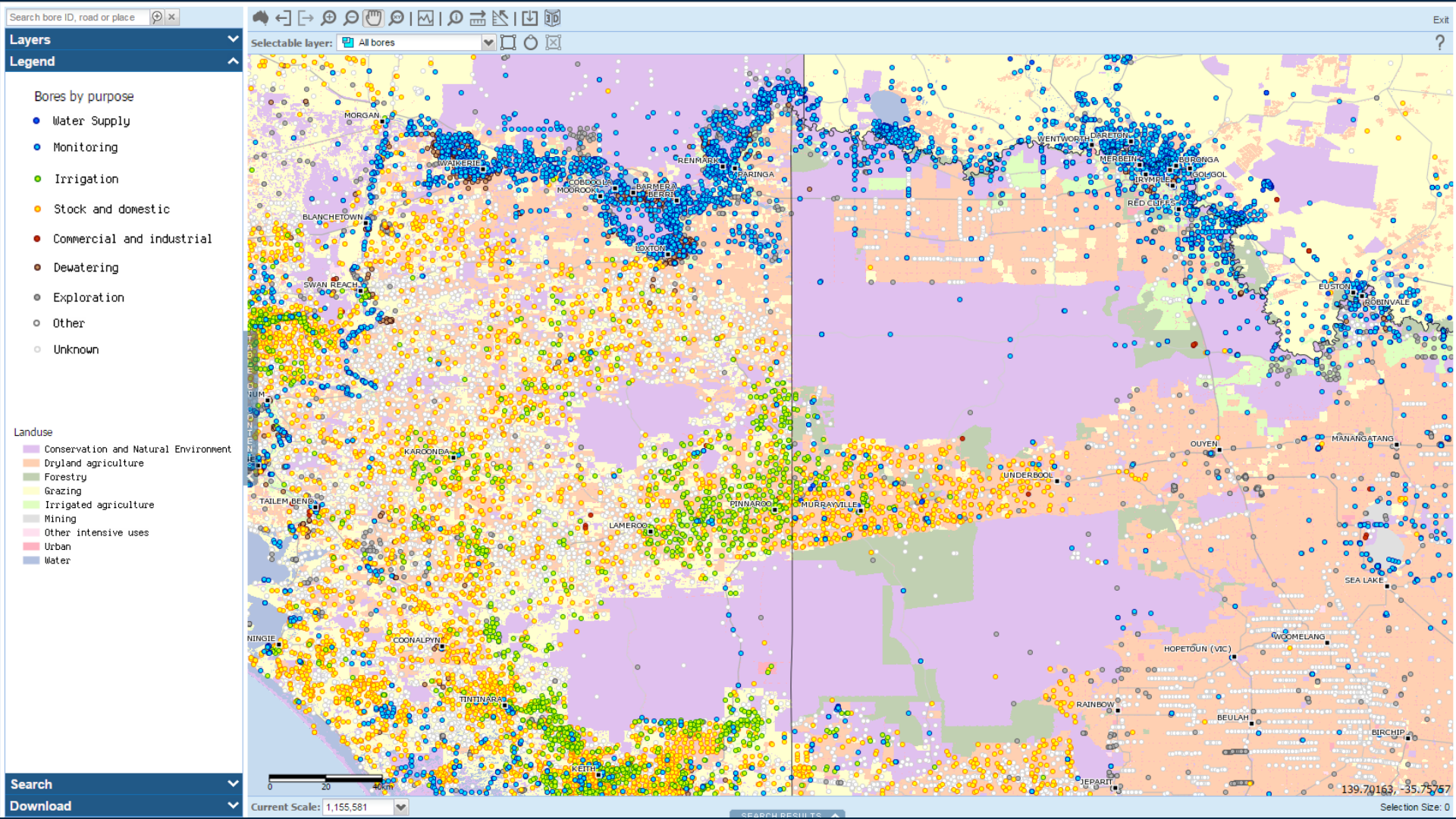
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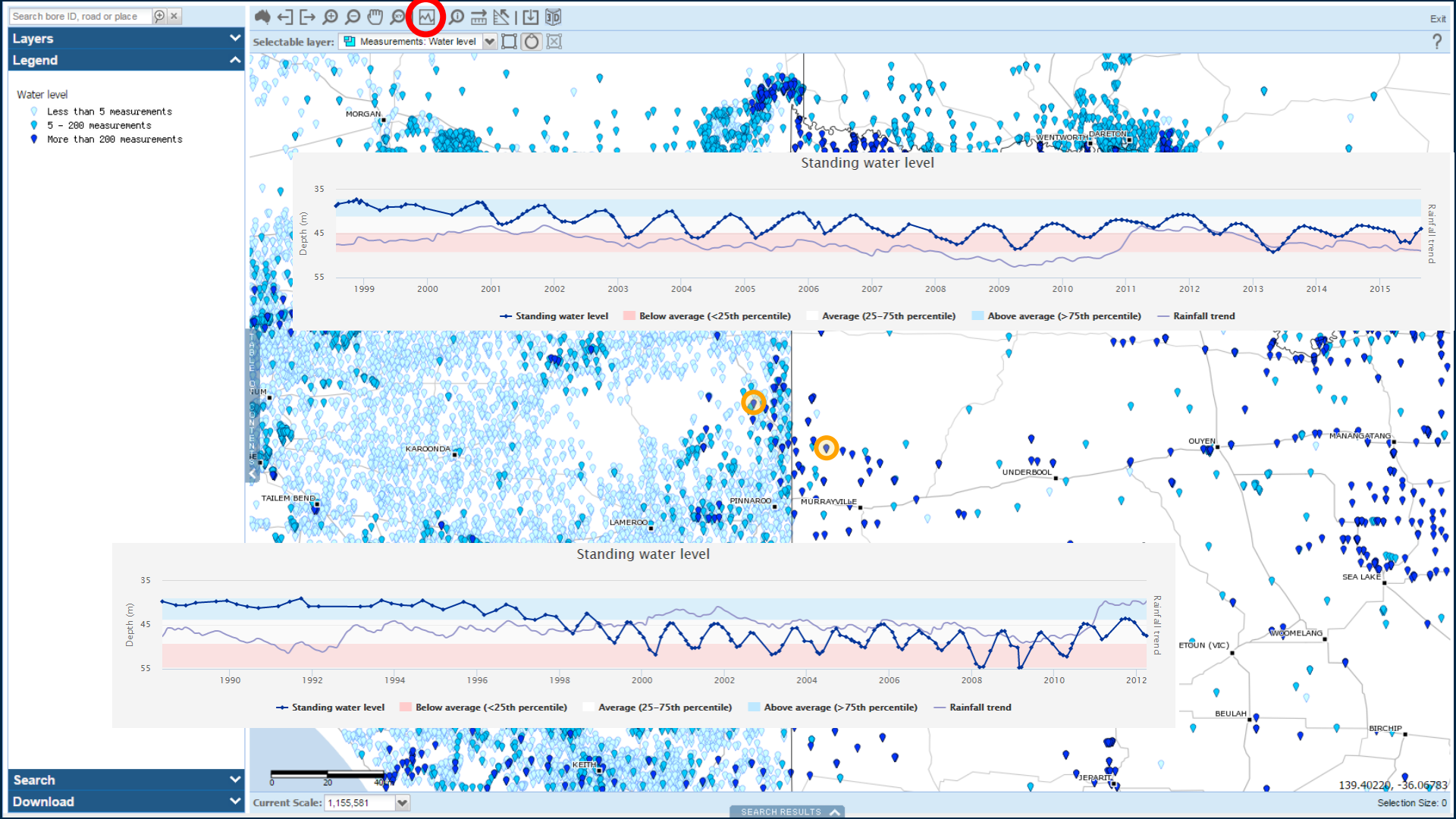
Download

Current Scale: 1,155,581

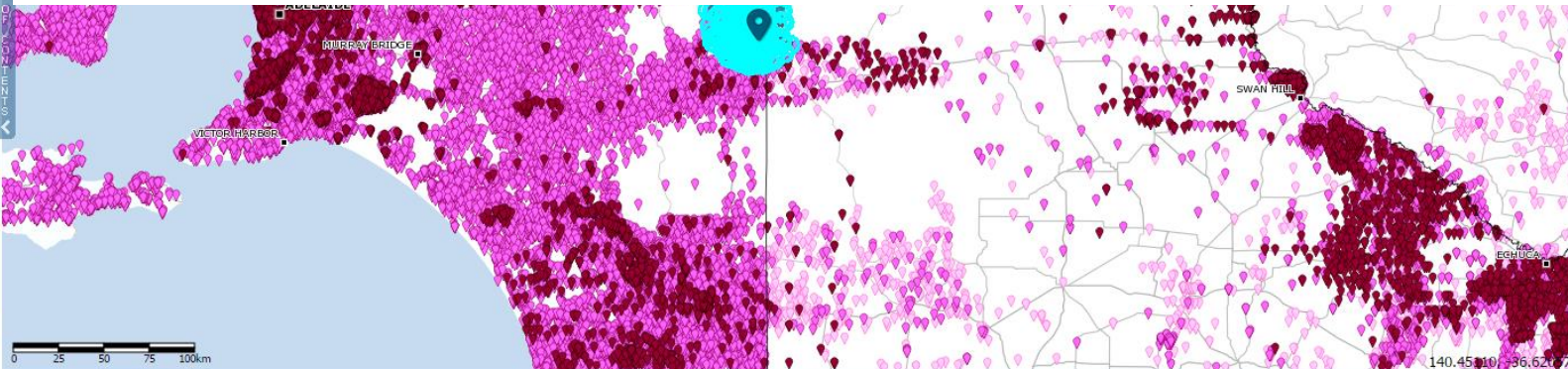
SEARCH RESULTS

Selection Size: 0





Salinity (psu) vs Year (1984-2008). The y-axis ranges from 2k to 5k. The x-axis ranges from 1984 to 2008. Data points are purple dots. The plot shows a general upward trend in salinity over the period, with a notable peak around 1997.



Selection Size: 238

SEARCH RESULTS ▾

 View Data

Pan Zoom Remove Refine

Bore ID	State	Bore Depth (m)	Drilled Date	Purpose	Status	Geology	Water level: No. measurements	Water level: First measurement	Water level: Latest measurement	Salinity: No. measurements	Salinity: First measurement	Salinity: Latest measurement	Water Level	Salinity
702700100	SA			Stock and Domestic	Functioning	Unknown	50	02/10/1951	06/03/1989	313	02/10/1951	30/06/2015	true	true
702800437	SA	98.8	31/01/1981	Stock and Domestic	Functioning	Unknown	6	31/01/1981	13/09/1984	248	31/01/1981	30/06/2015	true	true
702700578	SA			Stock and Domestic	Functioning	Unknown	60	28/07/1982	05/10/2001	218	01/12/1983	16/12/2008	true	true
702800568	SA	102.6	16/08/1990	Stock and Domestic	Functioning	Unknown	234	16/08/1990	22/08/2013	199	16/08/1990	29/06/2015	true	true
702700657	SA	121	11/02/1993	Stock and Domestic	Unknown	Unknown	258	11/02/1993	22/06/2013	152	11/02/1993	27/06/2014	true	true

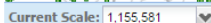
- ☐ All bores
- ☐ Groundwater measurements
- ☐ Bores purpose
- ☒ Bore logs
 - ☐ Construction log
 - ☒ Hydrostratigraphy log
 - ☐ Lithology log
- 3D aquifer models
- Water management
- Hydrology
- Geology
- Background
 - ☒ Places
 - ☒ State and Territory borders
 - ☒ Roads
 - ☐ Landuse
 - ☐ Elevation

Download

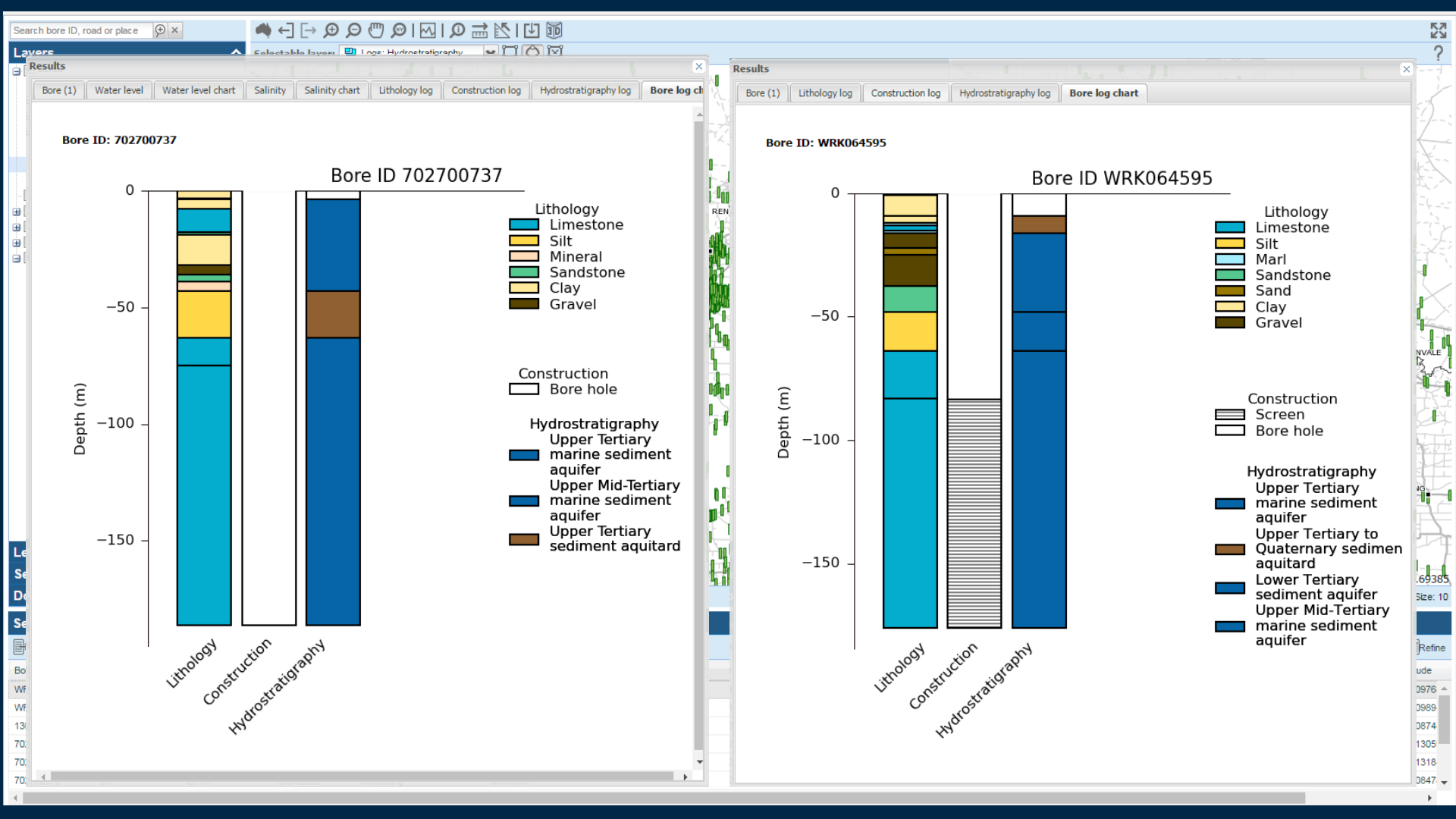
Export View Data

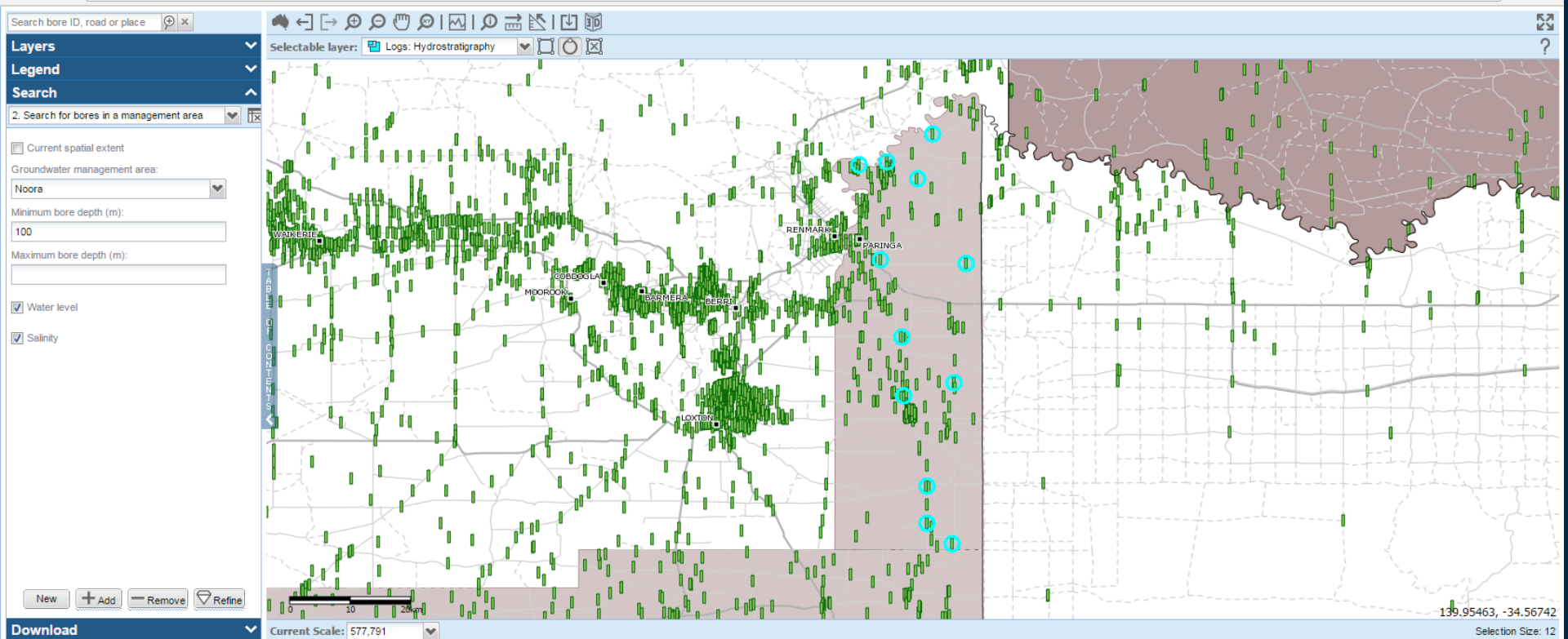
State

 Pan Zoom Remove Refine



Selection Size: 10

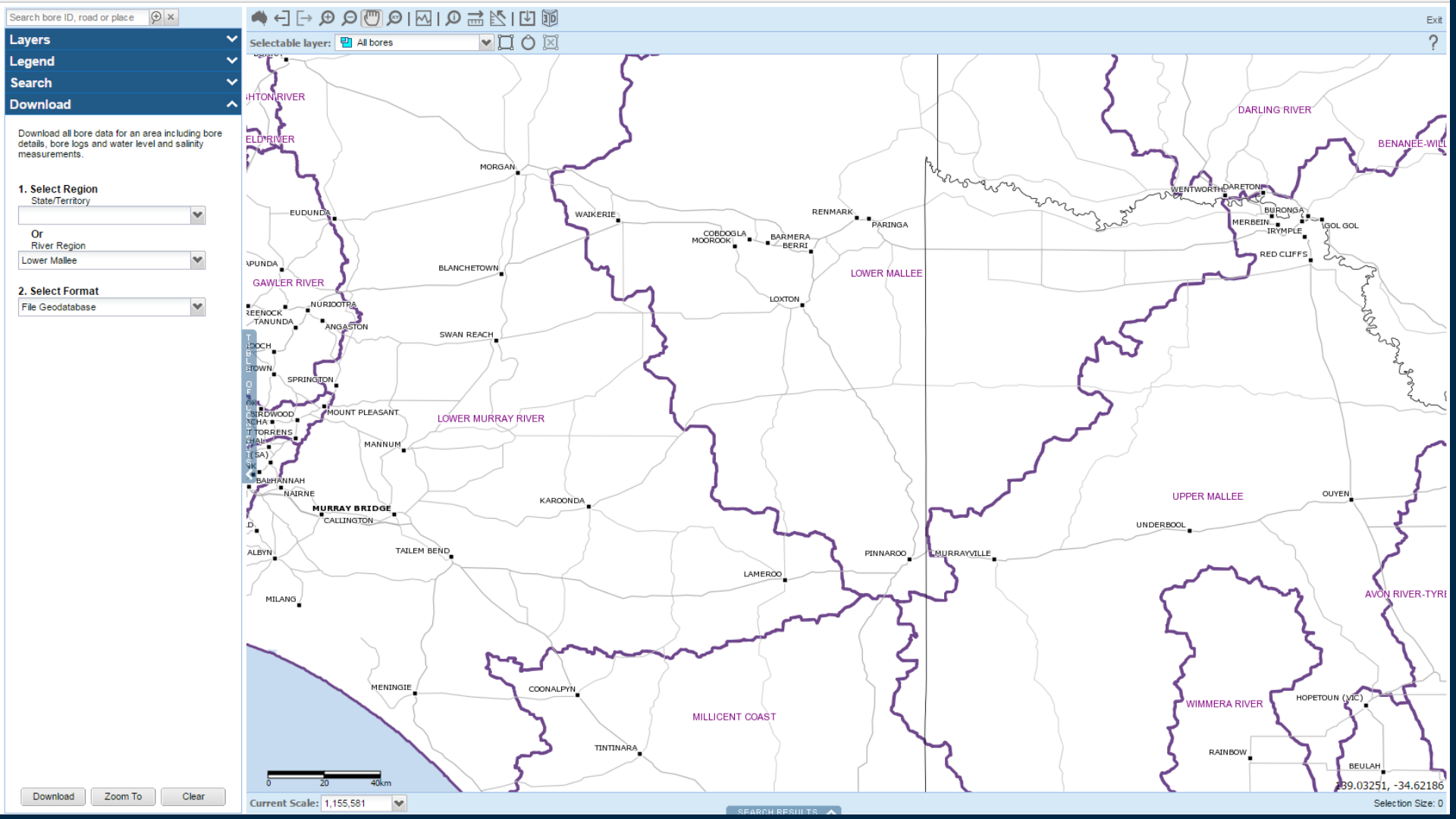


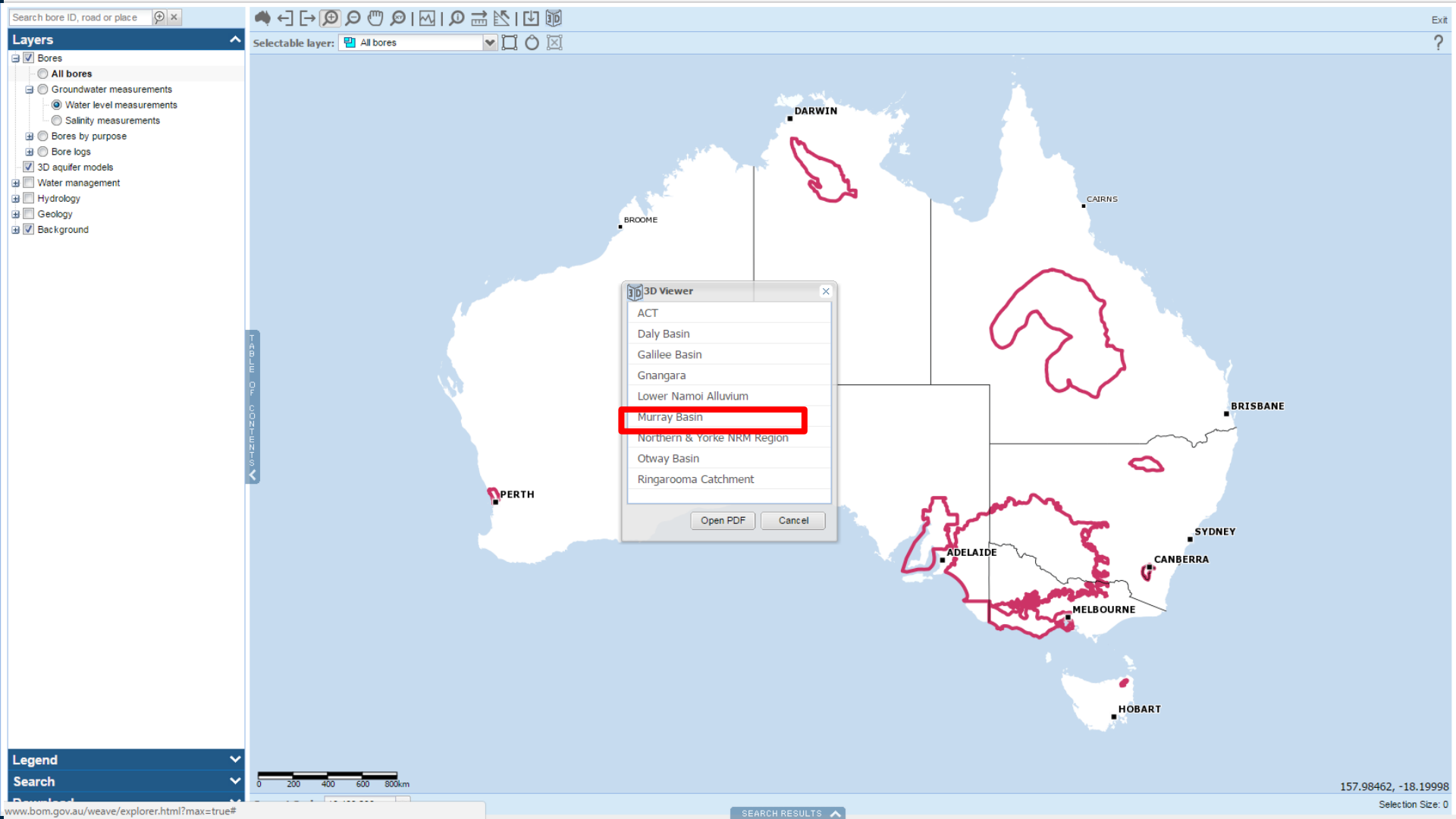


Search Results (12)

Export New Data

Bore ID	State	Bore Depth (m)	Drilled Date	Purpose	Status	Geology	Water Level	Salinity	Construction Log	Lithology Log	Hydrostratigraphy Log	Latitude
702901151	SA	100	30/04/1991	Monitoring	Functioning	Unknown	true	true	true	false	true	-34.4089
702900624	SA	102	08/07/1980	Monitoring	Unknown	Unknown	true	true	true	false	true	-34.3903
702902406	SA	108	28/07/2008	Monitoring	Unknown	Unknown	true	true	true	true	true	-34.0687
702800443	SA	120		Unknown	Unknown	Unknown	true	true	true	false	true	-34.6290
702902419	SA	138	09/08/2008	Monitoring	Unknown	Unknown	true	true	true	true	true	-34.0638
702902466	SA	144	15/08/2008	Monitoring	Unknown	Unknown	true	true	true	false	true	-34.0895







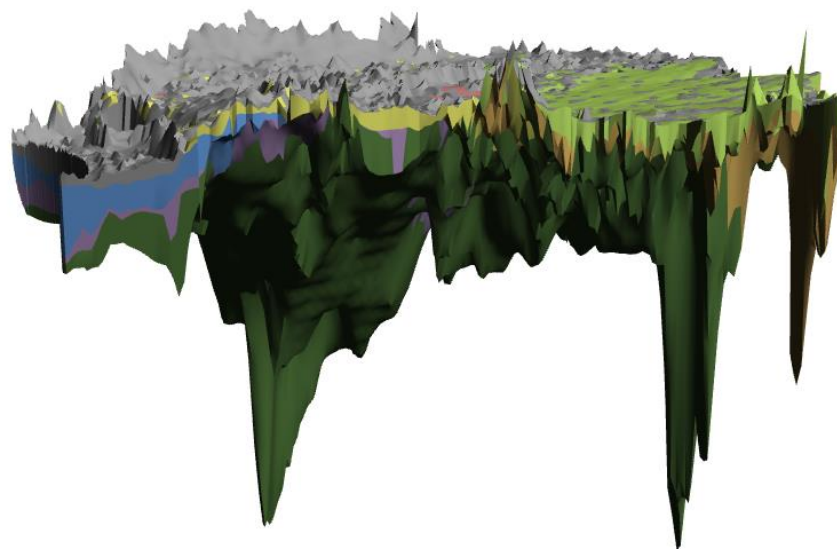
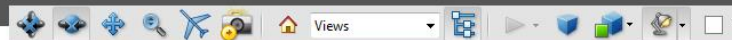
Model Tree

- model
 - Murray Basin - Hydrogeological Complexes
 - node
 - QA - Quaternary sediments
 - UTQA - Upper Tertiary to Quaternary aquifer
 - UTQD - Upper Tertiary to Quaternary aquitard
 - UTAM - Upper Tertiary marine aquifer
 - UTAF - Upper Tertiary fluvial aquifer
 - UTD - Upper Tertiary aquitard
 - UMTD - Upper Mid-Tertiary aquitard
 - UMTA - Upper Mid-Tertiary marine aquifer
 - LTA - Lower Tertiary aquifer
 - Product Views

Options

- Left
- Top
- Front
- Right
- Bottom
- Back
- default
- NewView8

<No available information>



Murray Basin

Legend

Hydrogeological Complexes

- Quaternary sediments
- Upper Tertiary to Quaternary aquifer
- Upper Tertiary to Quaternary aquitard
- Upper Tertiary marine aquifer
- Upper Tertiary fluvial aquifer
- Upper Tertiary aquitard
- Upper Mid-Tertiary marine aquifer
- Upper Mid-Tertiary aquitard
- Lower Tertiary aquifer



Australian Government
Bureau of Meteorology

All data is assumed to be correct as supplied from the Commonwealth, State and Territory data supplies or referenced projects.

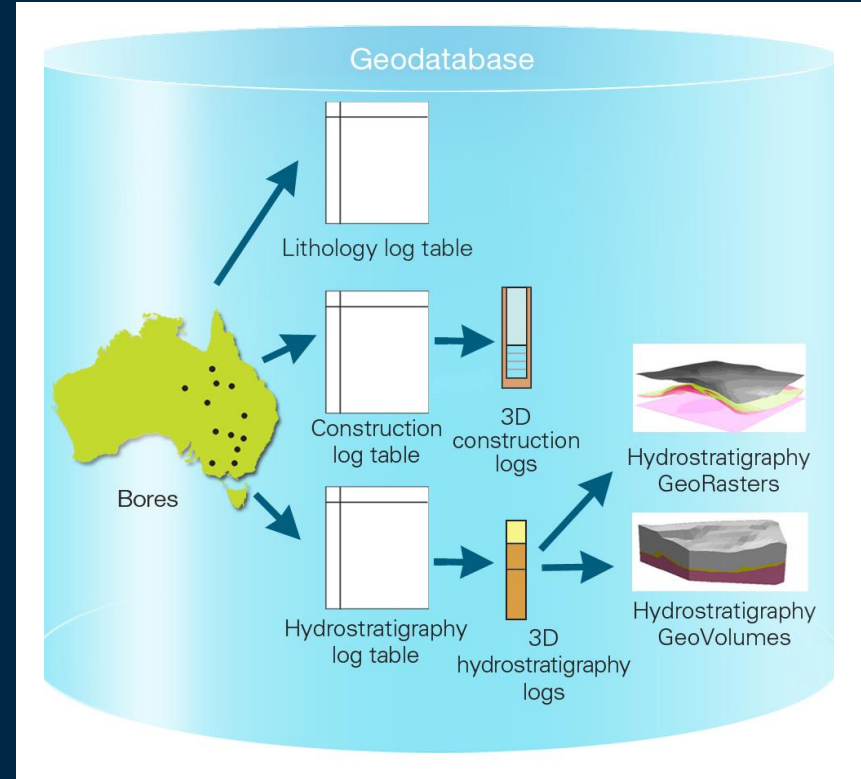
Australian Groundwater Explorer
Bureau of Meteorology



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NGIS Bulk Download

- Full national product is publically available as a ArcGIS geodatabase
- To make a request please email: groundwater@bom.gov.au
- A link will be provided to download the data



Future work

- Link to GA geochemistry
- GDE Atlas update
- Better QC on all data
- Monthly Explorer updates
- Licensed groundwater extraction data
- Groundwater time series modelling
- Regional depth to water maps



Thank you

Questions?

www.bom.gov.au/water/groundwater

groundwater@bom.gov.au