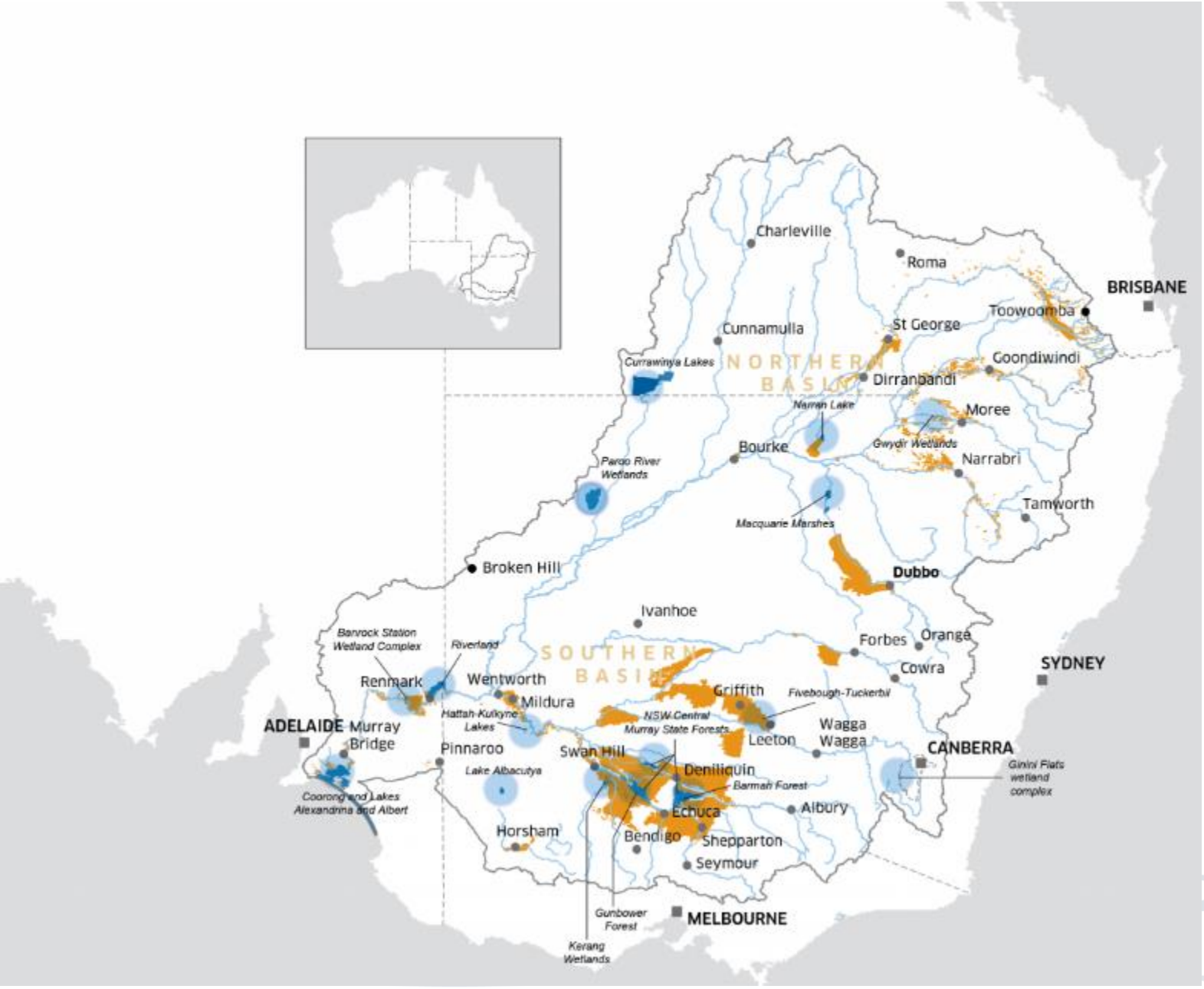
Use of models to inform integrated assessments and planning in the Murray-Darling Basin

Dr Geoffrey Adams

Why model the water resources in a river system?

We don’t do water policy without modelling it first!

Consider Australia's River Murray



http://www.mdba.gov.au/report/basin-plan-annual-report-2015-16/about-report/about-basin-plan-annual-report-2015-16

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Water use in the 1,000,000 square km Murray-Darling Basin

MDB average long-term annual inflow and water use		
Surface water GL		
Inflows		
Inflows to the Basin	31,599 GL/year	31.6 km^3/year
Transfer into the Basin	954 GL/year	1.0 km^3/year
Total	32,553 GL/year	32.6 km^3/year
Water Use		
Watercourse diversions	10,903 GL/year	10.9 km^3/year
Interceptions	2,720 GL/year	2.7 km^3/year
Water used by the environment & losses	13,788 GL/year	13.8 km^3/year
Outflows from the Basin	5,142 GL/year	5.1 km^3/year
Total	32,553 GL/year	32.6 km^3/year

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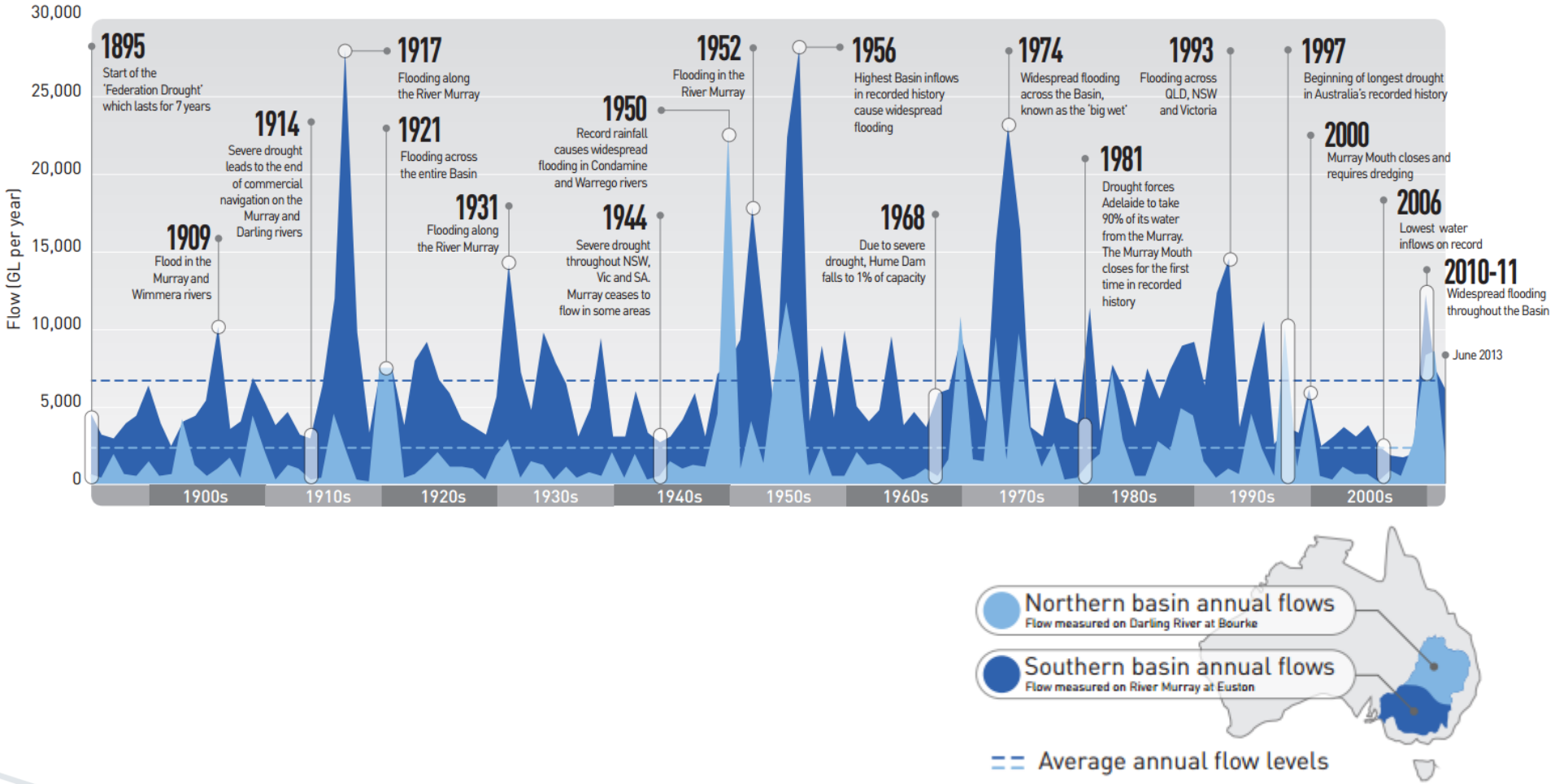

http://www.mdba.gov.au/sites/default/files/pubs/MDBA%20-%202014%20inflows%20for%20map%20poster%20copy.pdf

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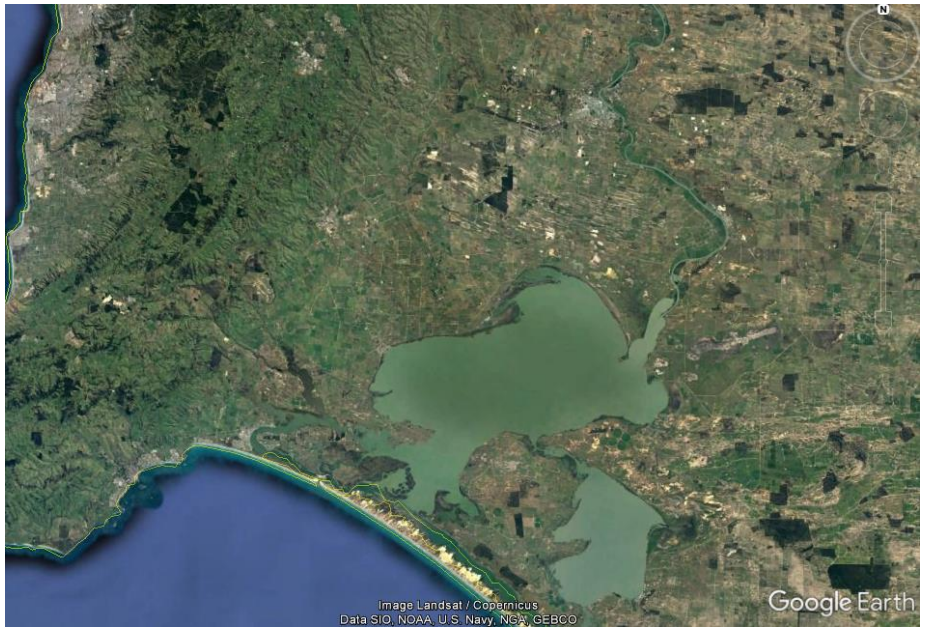
A little history of declining river health:

MDBA.gov.au



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What can the hydrological system model tell us?

We can observe and monitor the current status, but the model helps us understand it,
And then:

Comparing scenarios with baseline conditions ->

- Primarily statistics on water supply-see later
- Data on agricultural production
- Changes in expected flood behaviour
- Hydro generation
- Broad sediment behavior
- Supplies to environmental assets
- In Myanmar, navigation

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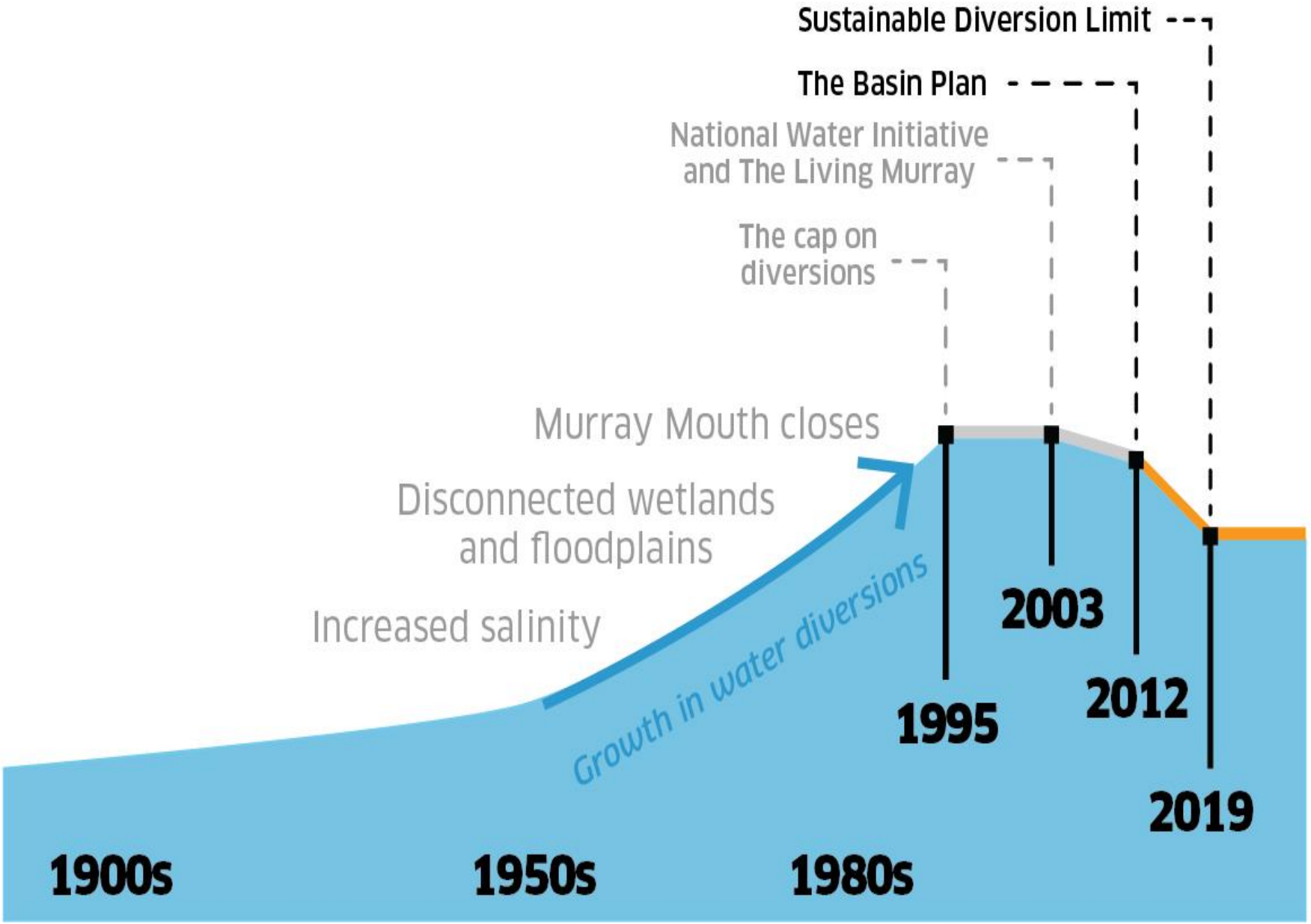
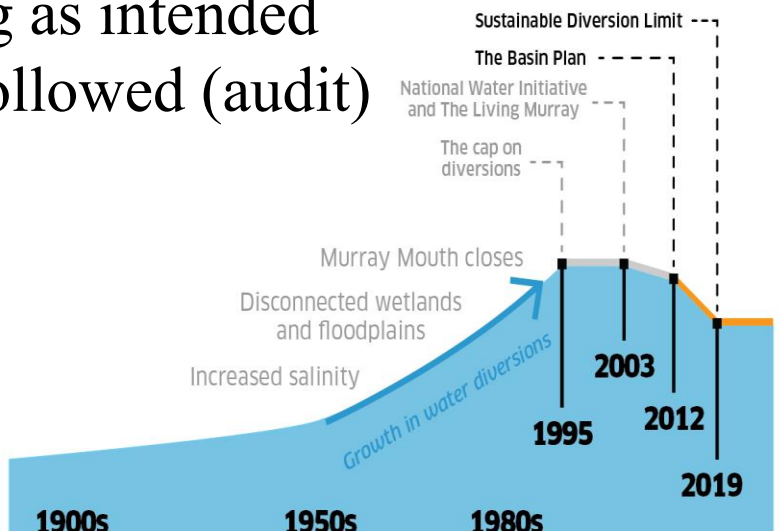

Sustainable Diversion Limit
The Basin Plan
National Water Initiative
and The Living Murray
The cap on
diversions
Murray Mouth closes
Disconnected wetlands
and floodplains
Increased salinity
Growth in water diversions
1995
2003
2012
2019
1900s
1950s
1980s

What do we use the model for?

Different modes of use:

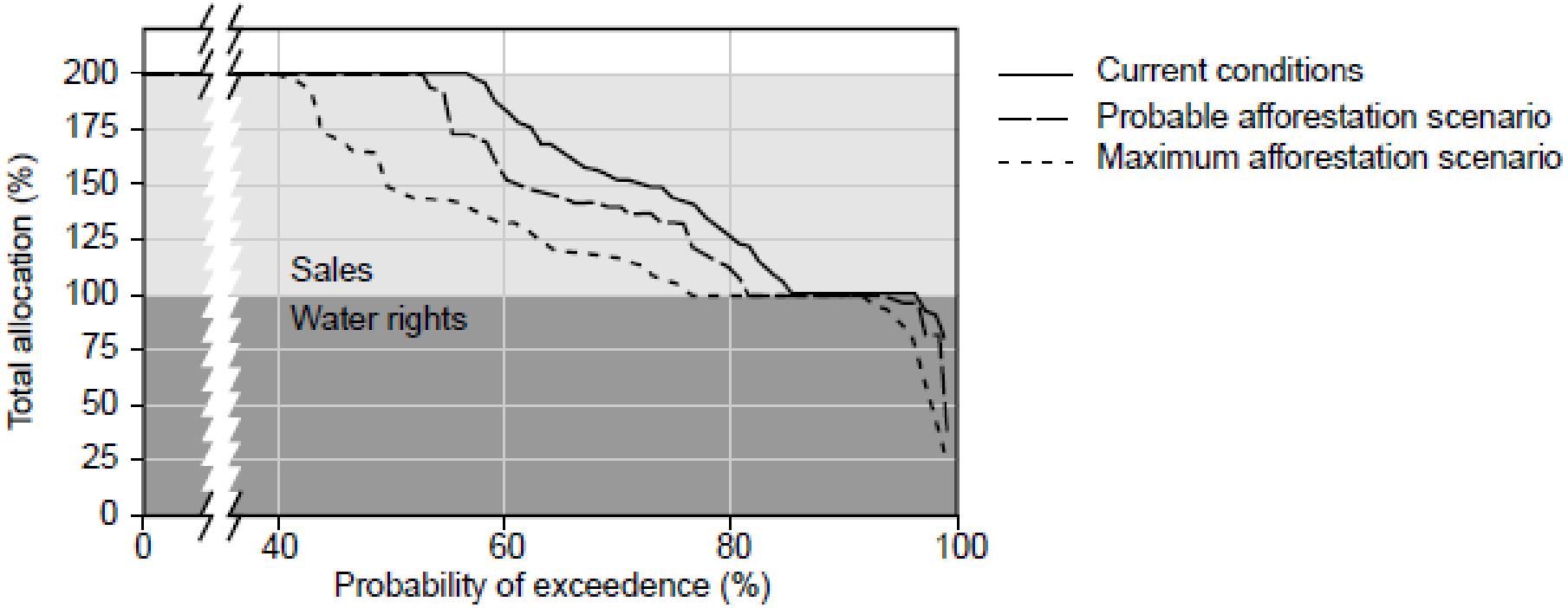
- Planning
  - ❑ Inform development of water sharing plans
  - ❑ Trade off analysis
  - ❑ Policy analysis

- Review
  - ❑ Is the water sharing plan working as intended
  - ❑ Is the water sharing plan being followed (audit)



What does the model tell us?

For water sharing plans we want to know reliability of supply:



Zhang L, Dowling T, Hocking M, Morris J, Adams G, Hickel K, Best A, Vertessy R., 2003. Modelling the effects of large-scale plantation on streamflow and water allocation: A case study for the Goulburn-Broken catchments. In: D.A. Post (Editor), MODSIM 2003, International Congress on Modelling and Simulation. Modelling and Simulation Society of Australia and New Zealand Inc, Jupiters Hotel and Casino, Townsville, Australia, pp. 702-707.

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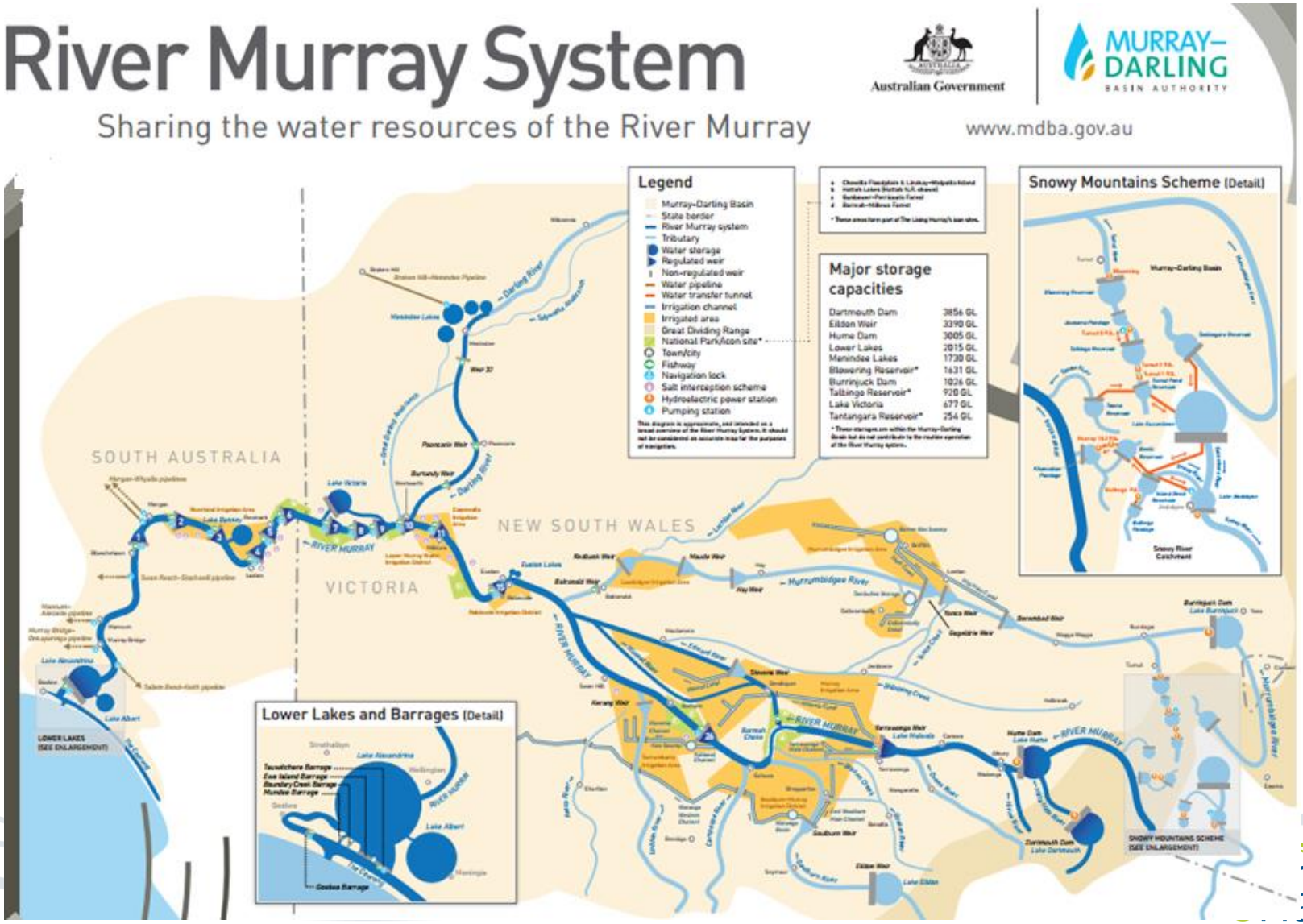
What does a model look like?



http://www.mdba.gov.au/sites/default/files/pubs/River-Murray-System-poster.pdf

The Murray Model

Inflow and Storage

MDBA.gov.au

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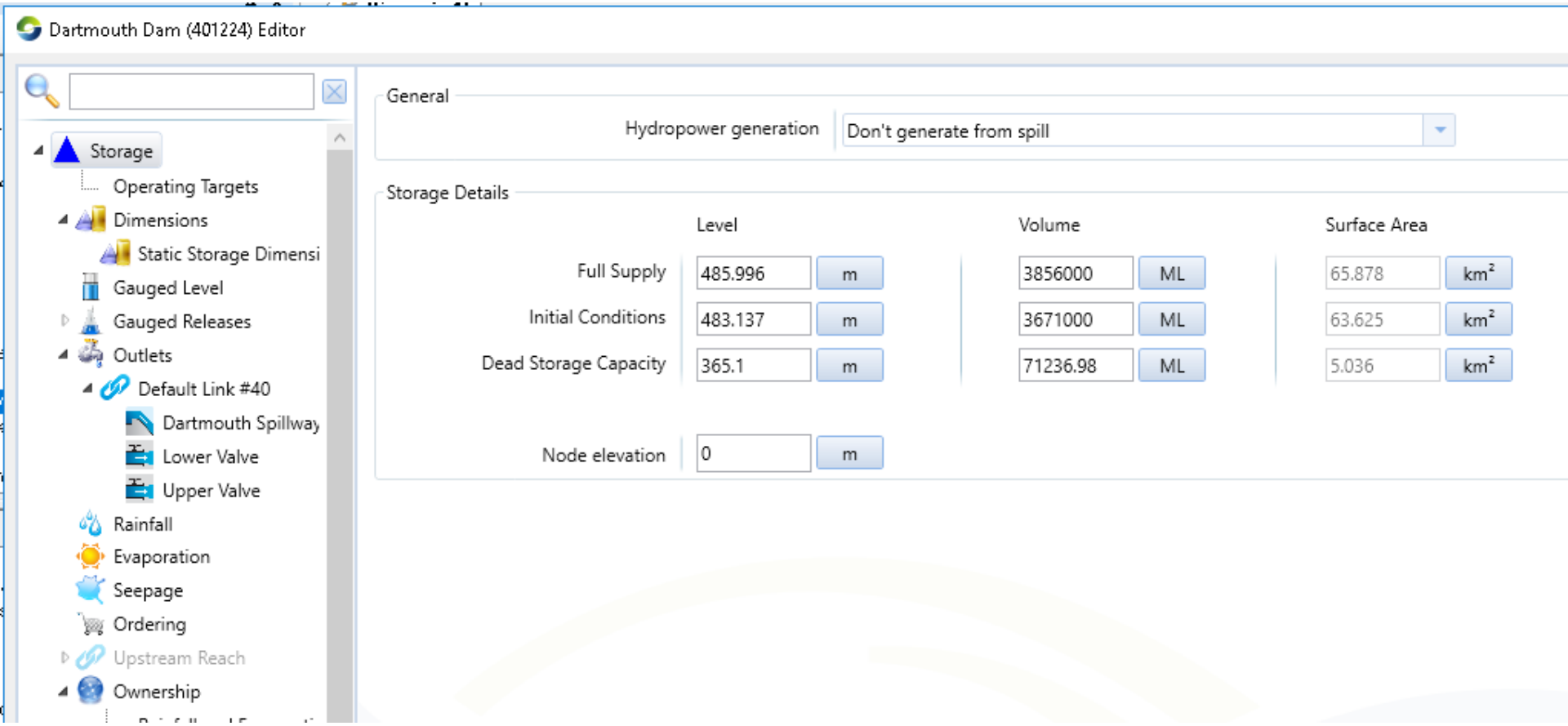
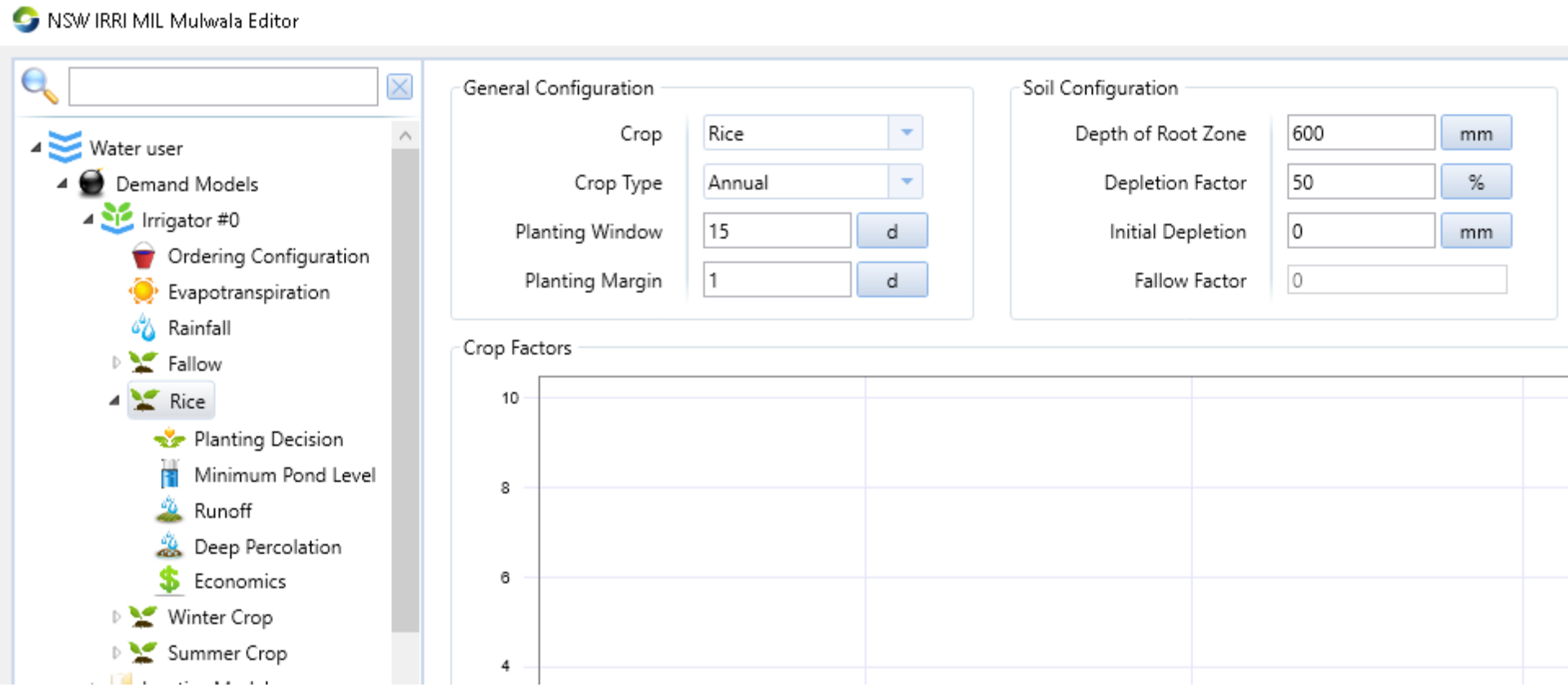
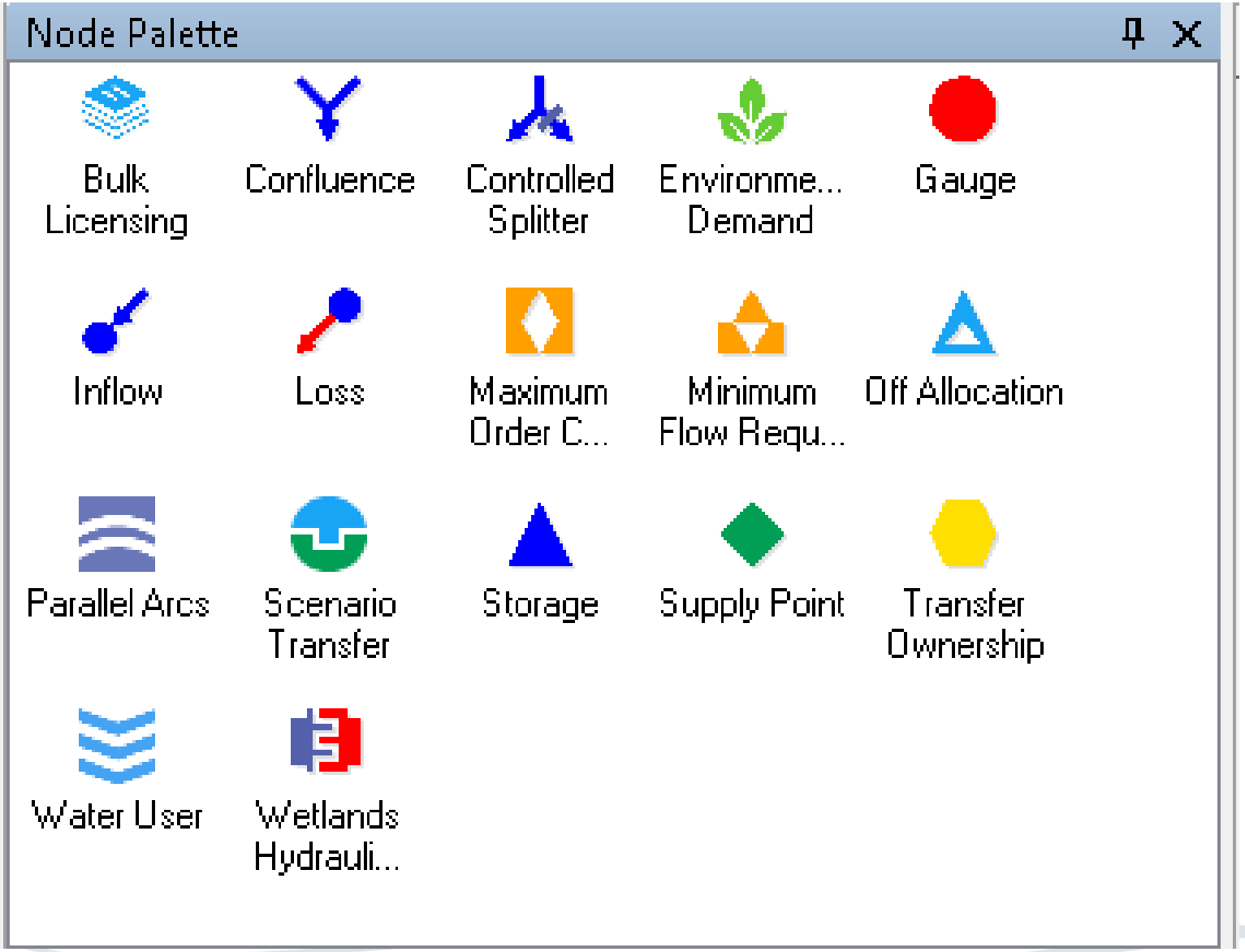
Storage Information



Modelling crop water use, and production



Many node types



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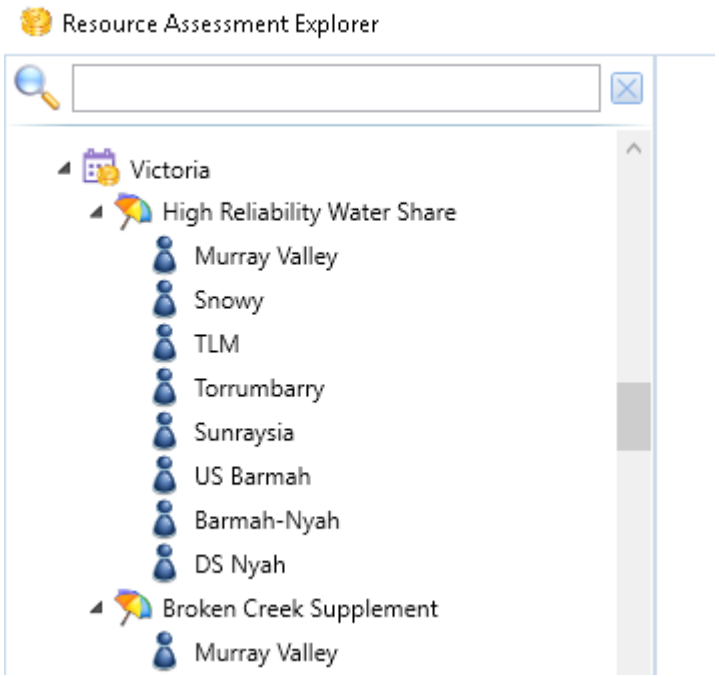
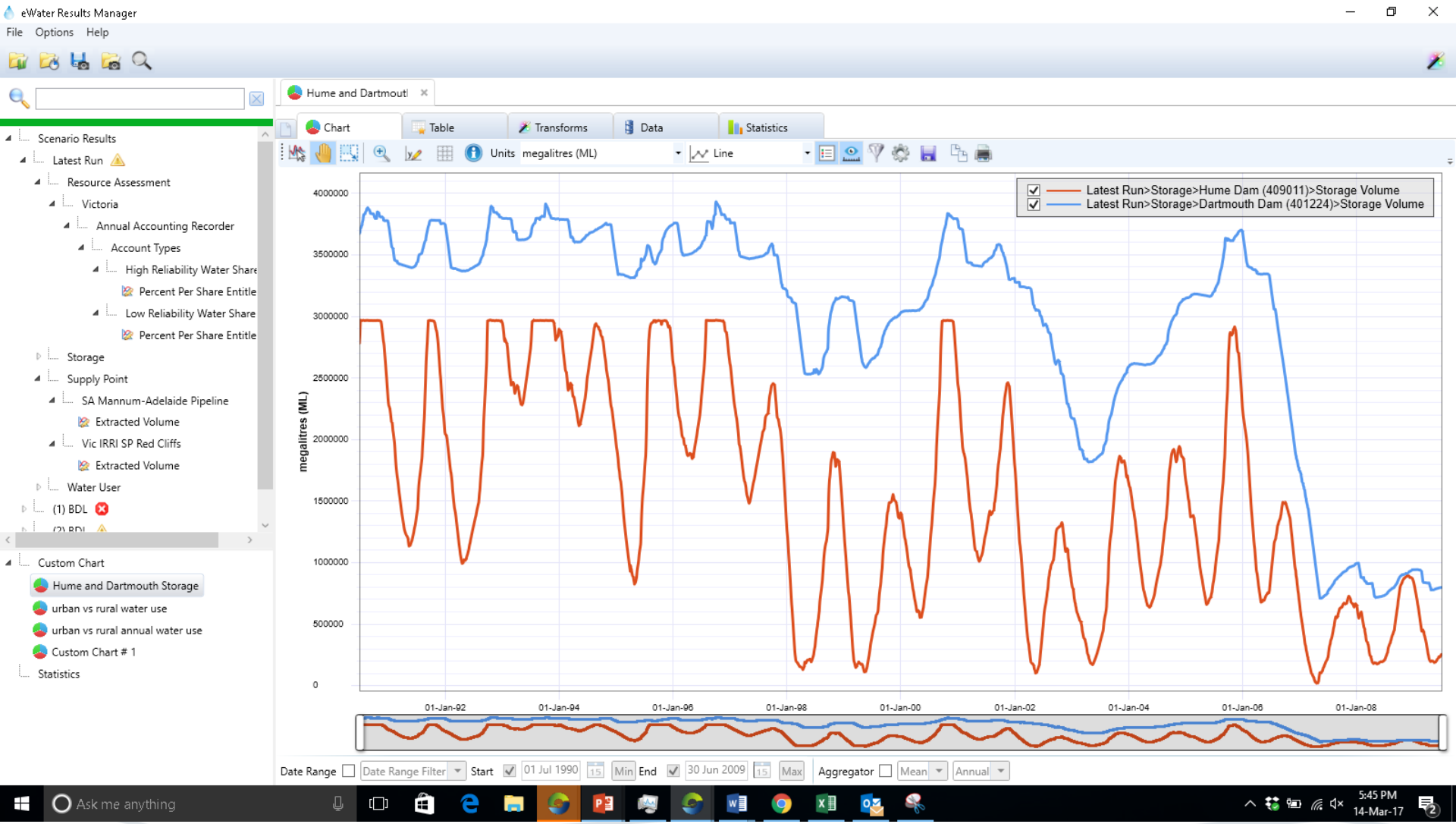
Water assessment and accounting



Output



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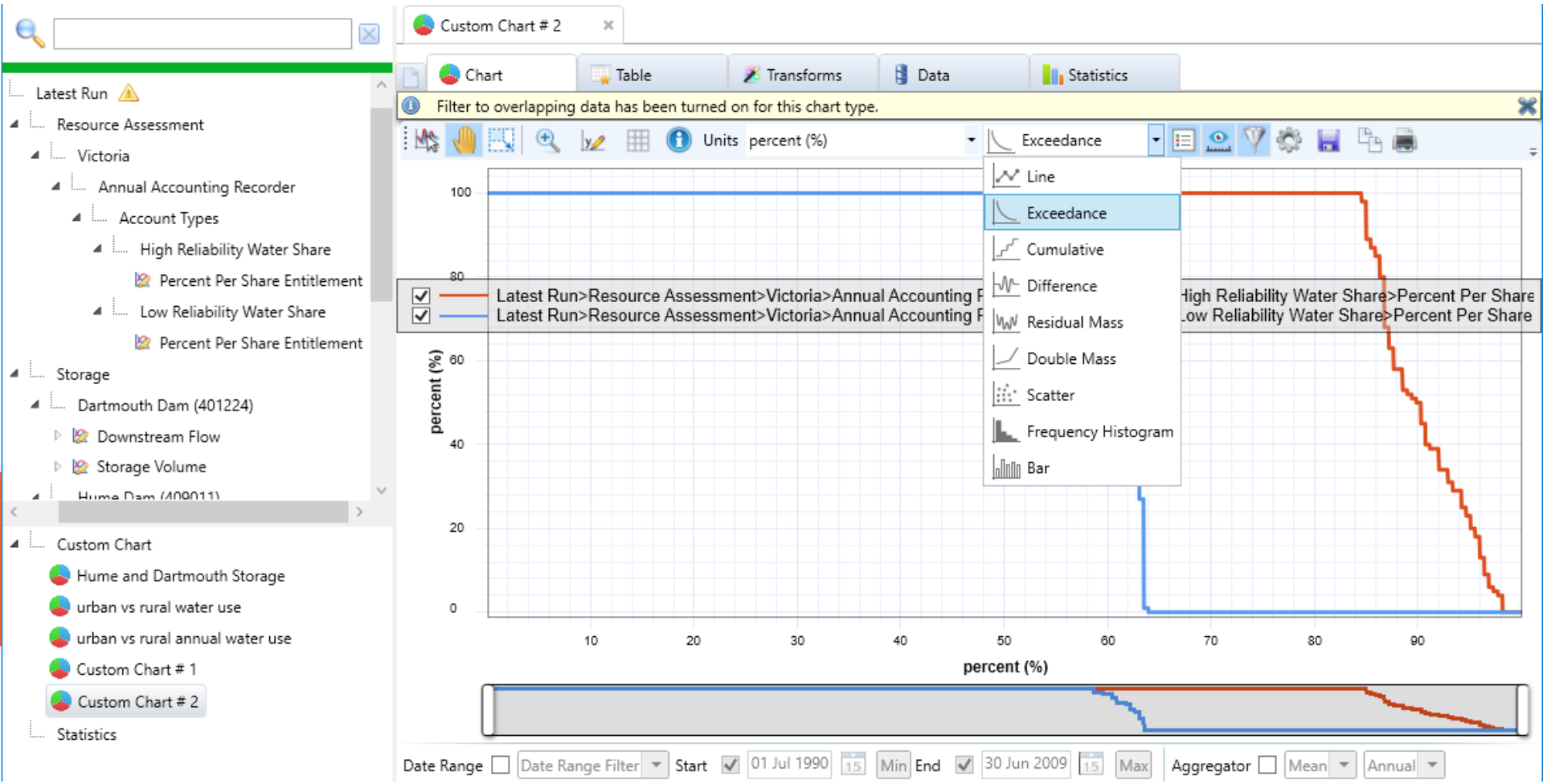
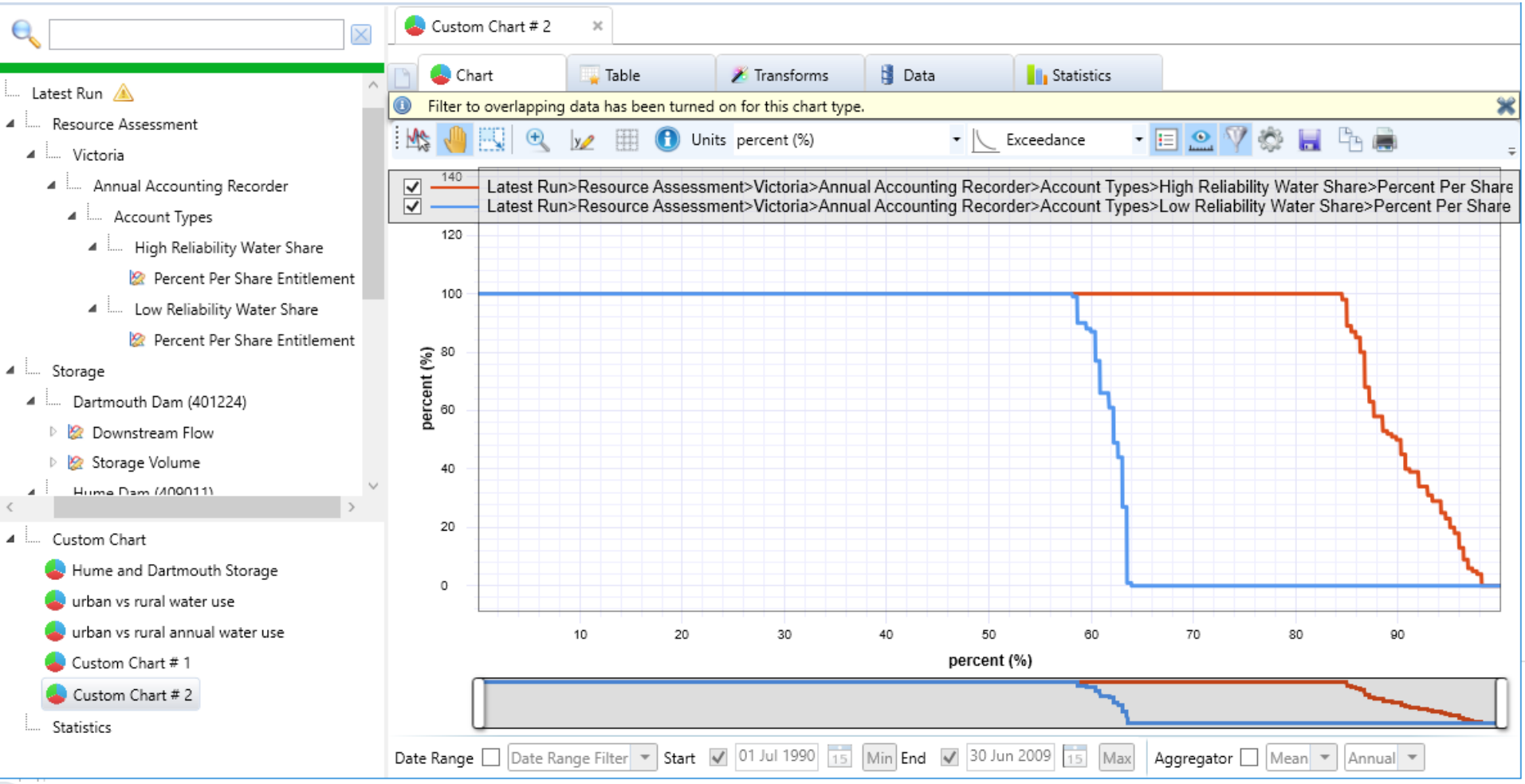
Output


Custom Chart # 2
Chart
Table
Transforms
Data
Statistics
Filter to overlapping data has been turned on for this chart type.
Units
percent (%)
Exceedance
Line
Exceedance
Cumulative
Difference
Residual Mass
Double Mass
Scatter
Frequency Histogram
Bar
Latest Run>Resource Assessment>Victoria>Annual Accounting
Latest Run>Resource Assessment>Victoria>Annual Accounting
percent (%)
percent (%)
Date Range
Date Range Filter
Start
01 Jul 1990
Min
End
30 Jun 2009
Max
Aggregator
Mean
Annual
Latest Run
Resource Assessment
Victoria
Annual Accounting Recorder
Account Types
High Reliability Water Share
Percent Per Share Entitlement
Low Reliability Water Share
Percent Per Share Entitlement
Storage
Dartmouth Dam (401224)
Downstream Flow
Storage Volume
Custom Chart
Hume and Dartmouth Storage
urban vs rural water use
urban vs rural annual water use
Custom Chart # 1
Custom Chart # 2
Statistics

Output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Statistics
Filter to overlapping data has been turned on for this chart type.
Units
percent (%)
Exceedance
Latest Run>Resource Assessment>Victoria>Annual Accounting Recorder>Account Types>High Reliability Water Share>Percent Per Share
Latest Run>Resource Assessment>Victoria>Annual Accounting Recorder>Account Types>Low Reliability Water Share>Percent Per Share
percent (%)
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Date Range
Date Range Filter
Start
01 Jul 1990
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In conclusion, what can we use the model for?

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