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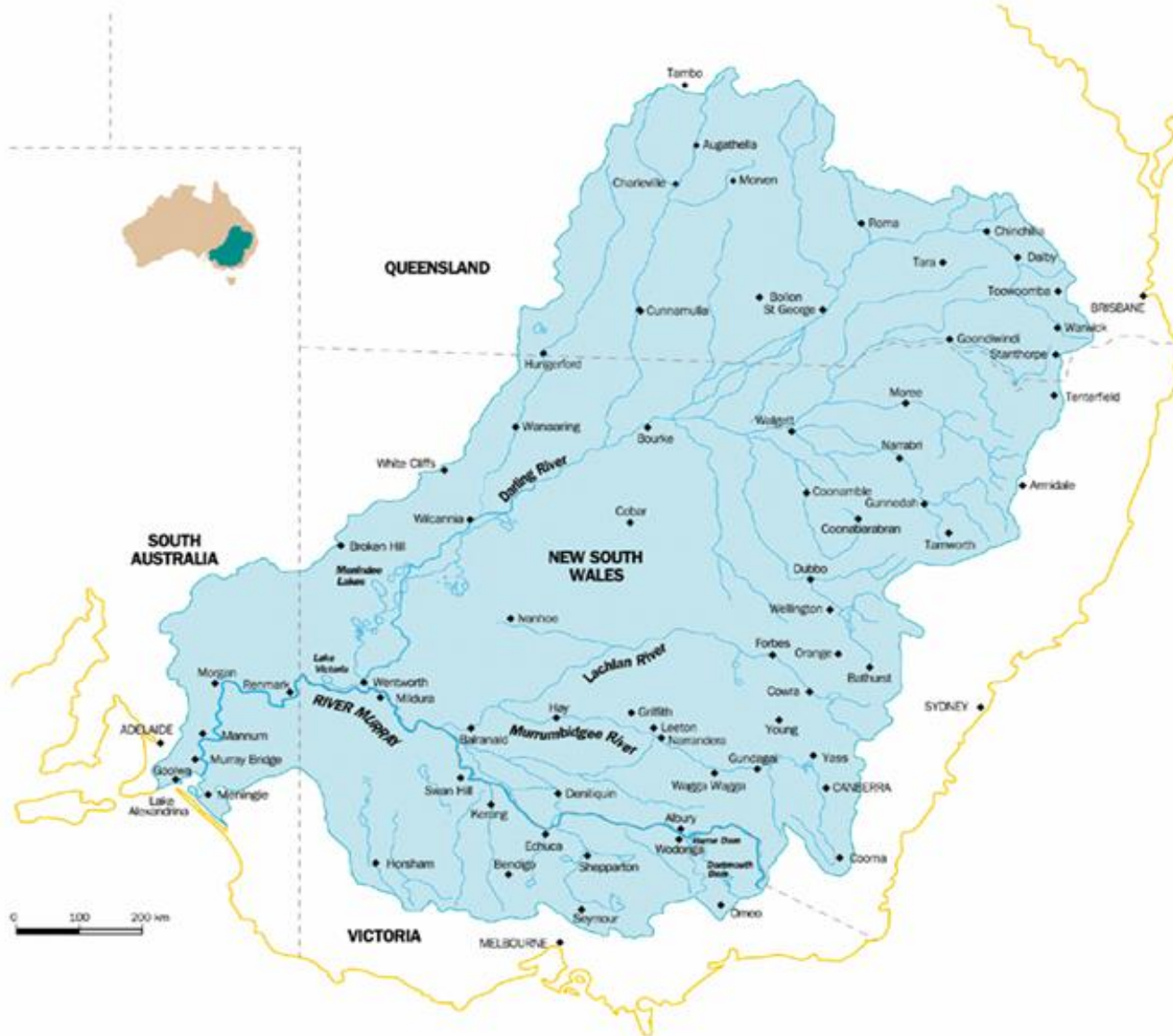


The River Murray System

Presentation to Engineers Australia Southern
Highlands & Tablelands Regional Group

28 April 2011 by Tony Morse
(General Manager Assets, MDBA)

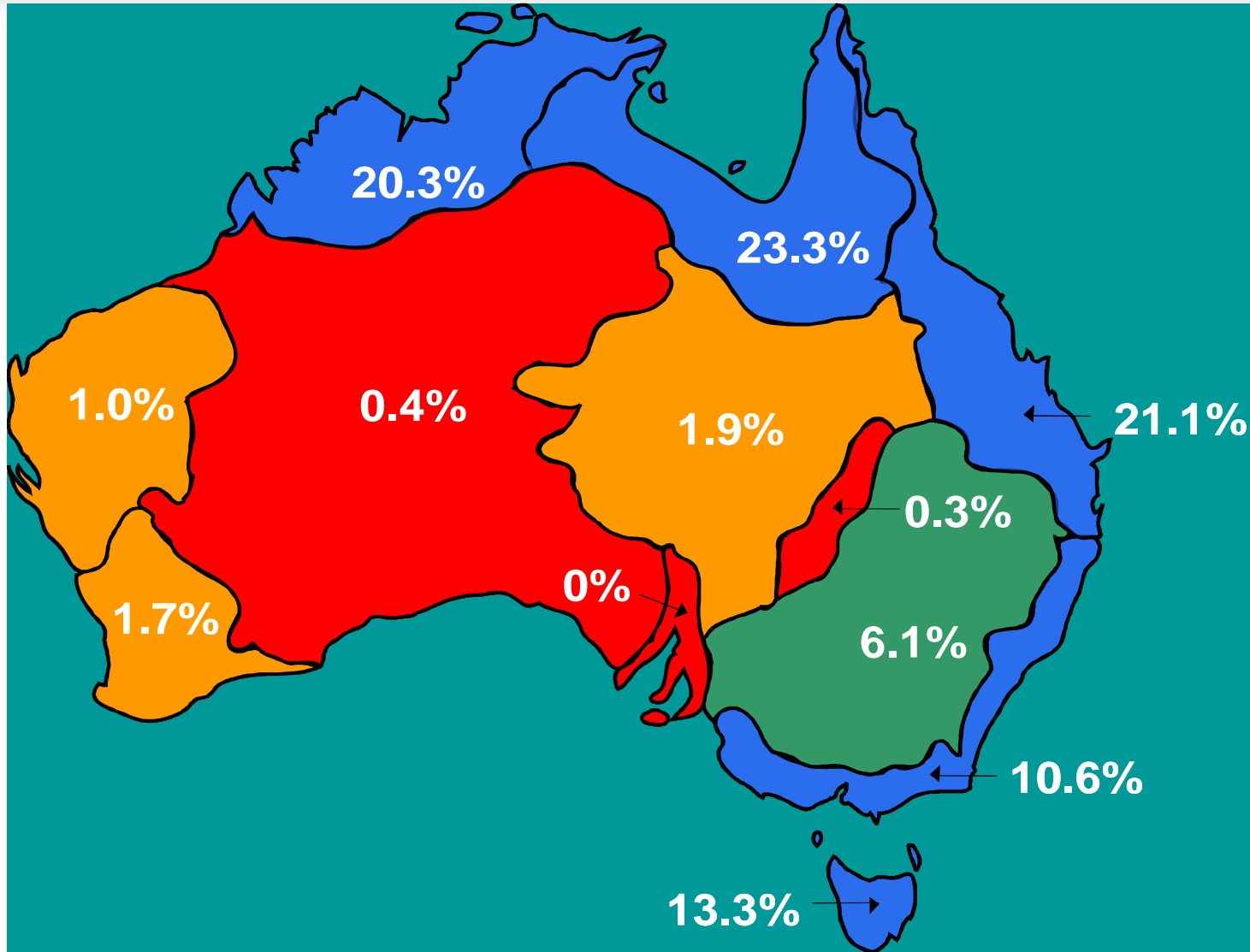
The Murray-Darling Basin



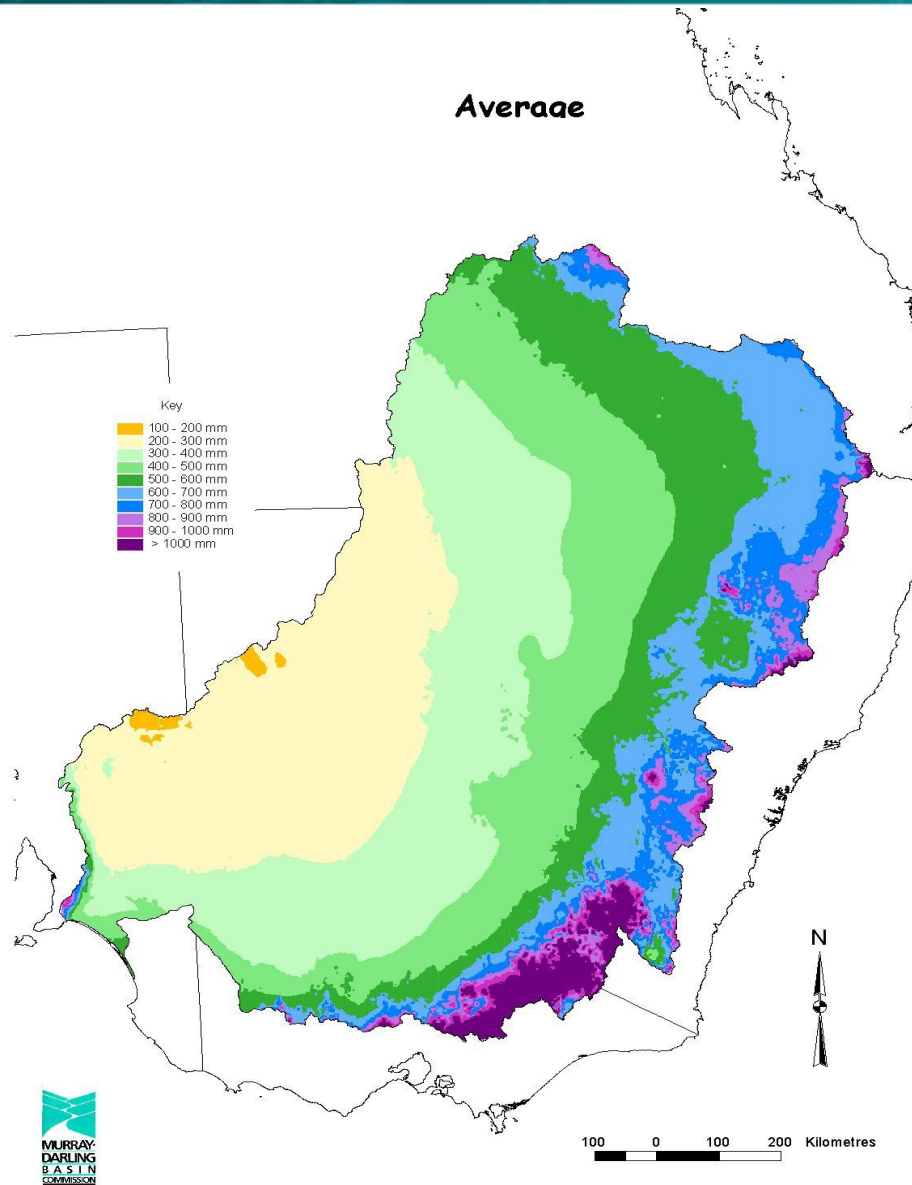
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Distribution of Australia's surface run-off



Average Yearly rainfall in the basin



Drivers to Construct Assets

- Federation drought 1895 to 1903
- Tension between states
 - Demand for reliable water supply for irrigation
 - Impact of increasing irrigation on navigation
- “Nation Building”
- River Murray Agreement Act 1915
(led to River Murray Commission)

RIVER MURRAY SYSTEM ASSETS SUMMARY

- Dartmouth Dam
- Hume Dam
- Yarrawonga Weir
- Menindee Lakes (leased from NSW)
- Lake Victoria
- 13 Weirs & Locks on River Murray
- 5 Barrages near Murray Mouth
- Salt Interception Schemes
- Environmental Works & Measures Assets (current program)



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Dartmouth Dam



- 4000 GL reservoir
- Completed 1979
- 180m high
- Highest dam in Australia
- Operated as a drought reserve

Hume Dam



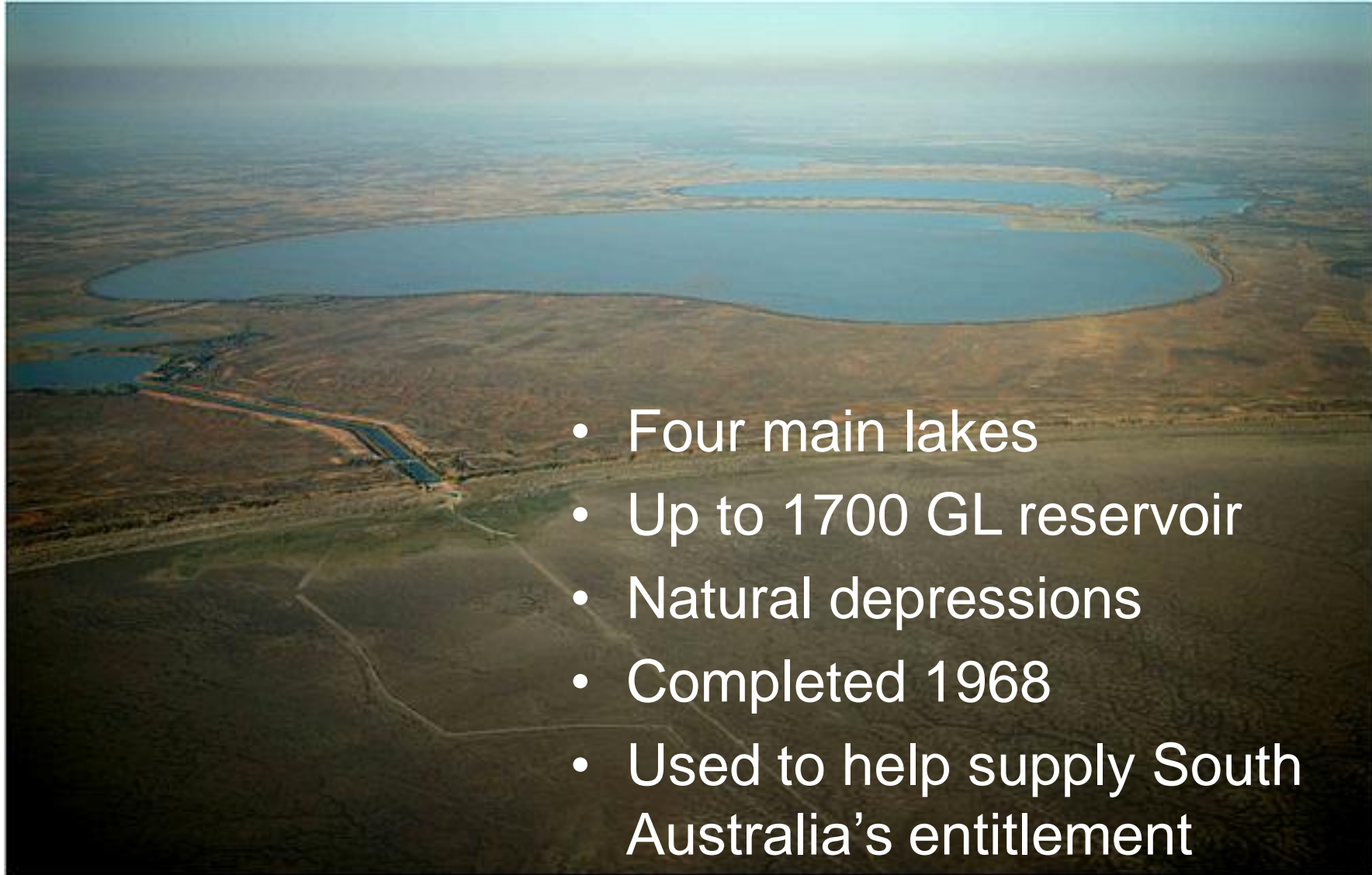
- 3000 GL reservoir
- 50m high
- Completed 1936 raised 1961
- Main operating storage

Yarrowonga Weir



- 118 GL weir
- Completed 1939
- Largest point of diversion from River Murray
- Operating storage

Menindee Lakes



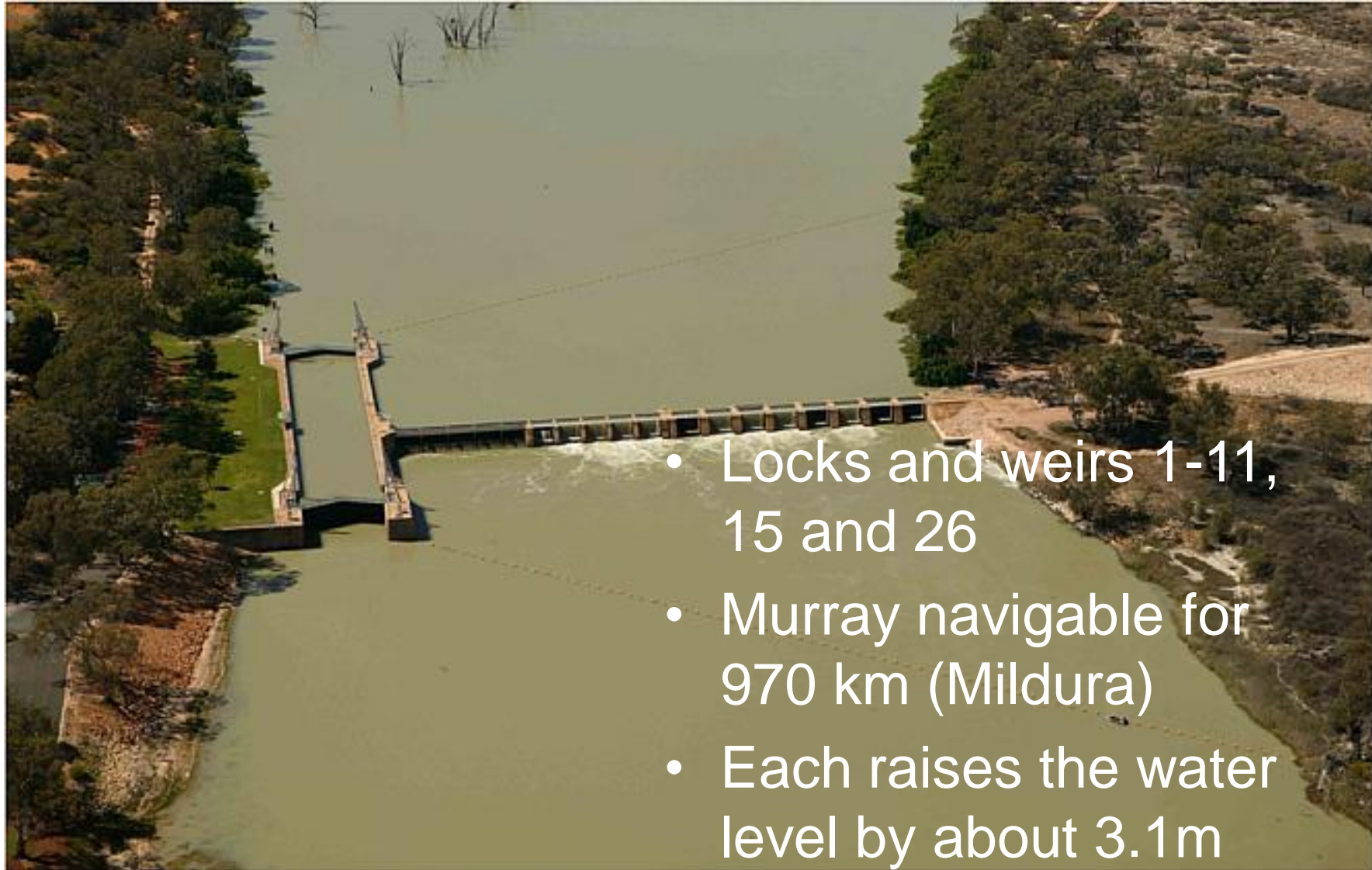
- Four main lakes
- Up to 1700 GL reservoir
- Natural depressions
- Completed 1968
- Used to help supply South Australia's entitlement

Lake Victoria



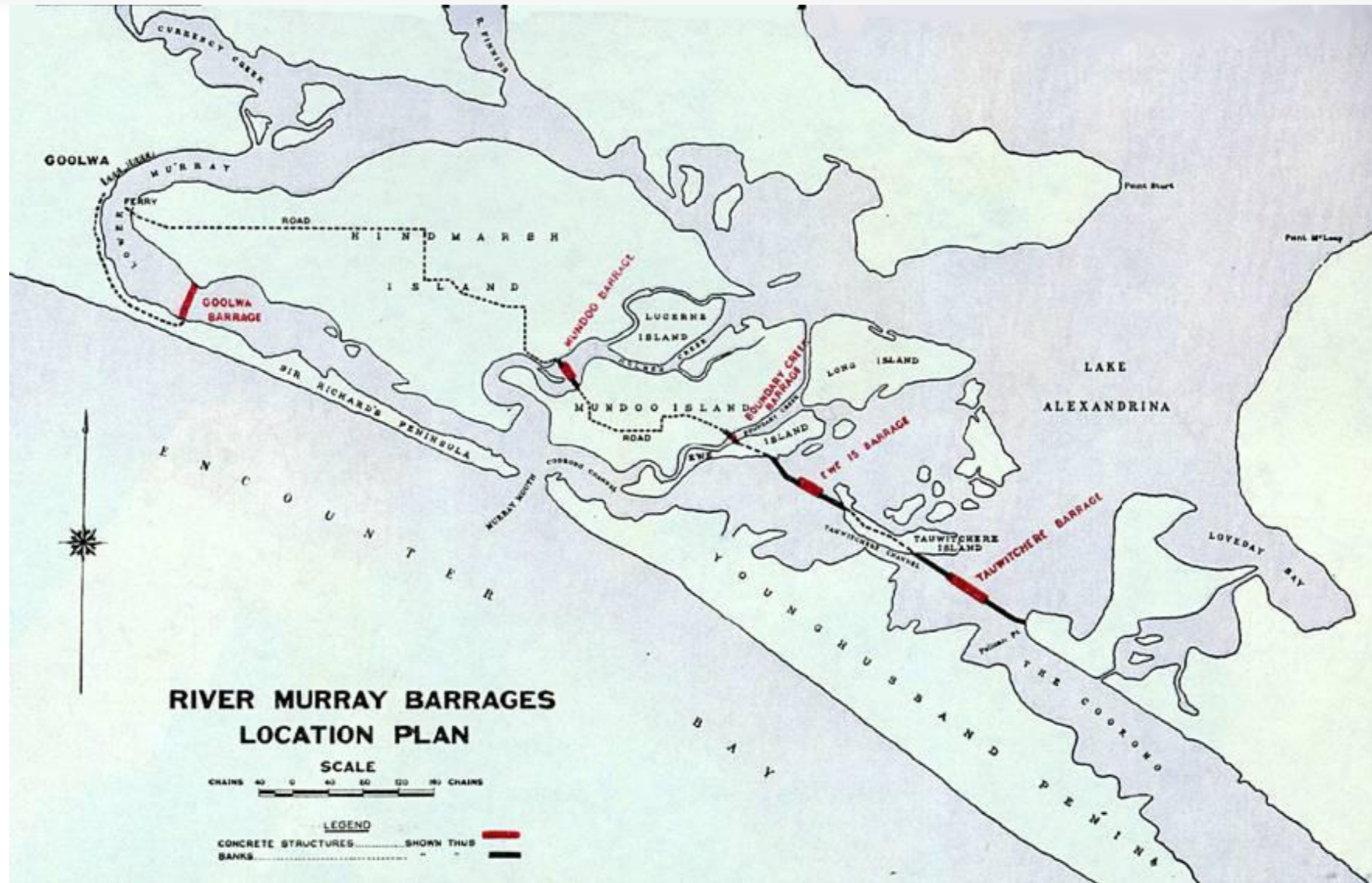
- 677 GL reservoir
- Formerly natural lake
- Constructed 1920's
- Mid river storage used to help supply South Australia's entitlement
- Cultural heritage

Locks and Weirs



- Locks and weirs 1-11, 15 and 26
- Murray navigable for 970 km (Mildura)
- Each raises the water level by about 3.1m

Murray Mouth and Barrages



Barrages



- Five barrages, two locks
- Upstream water level about 0.75m above sea level
- Completed 1940
- Used to supply freshwater locally

Tauwitchere Barrage



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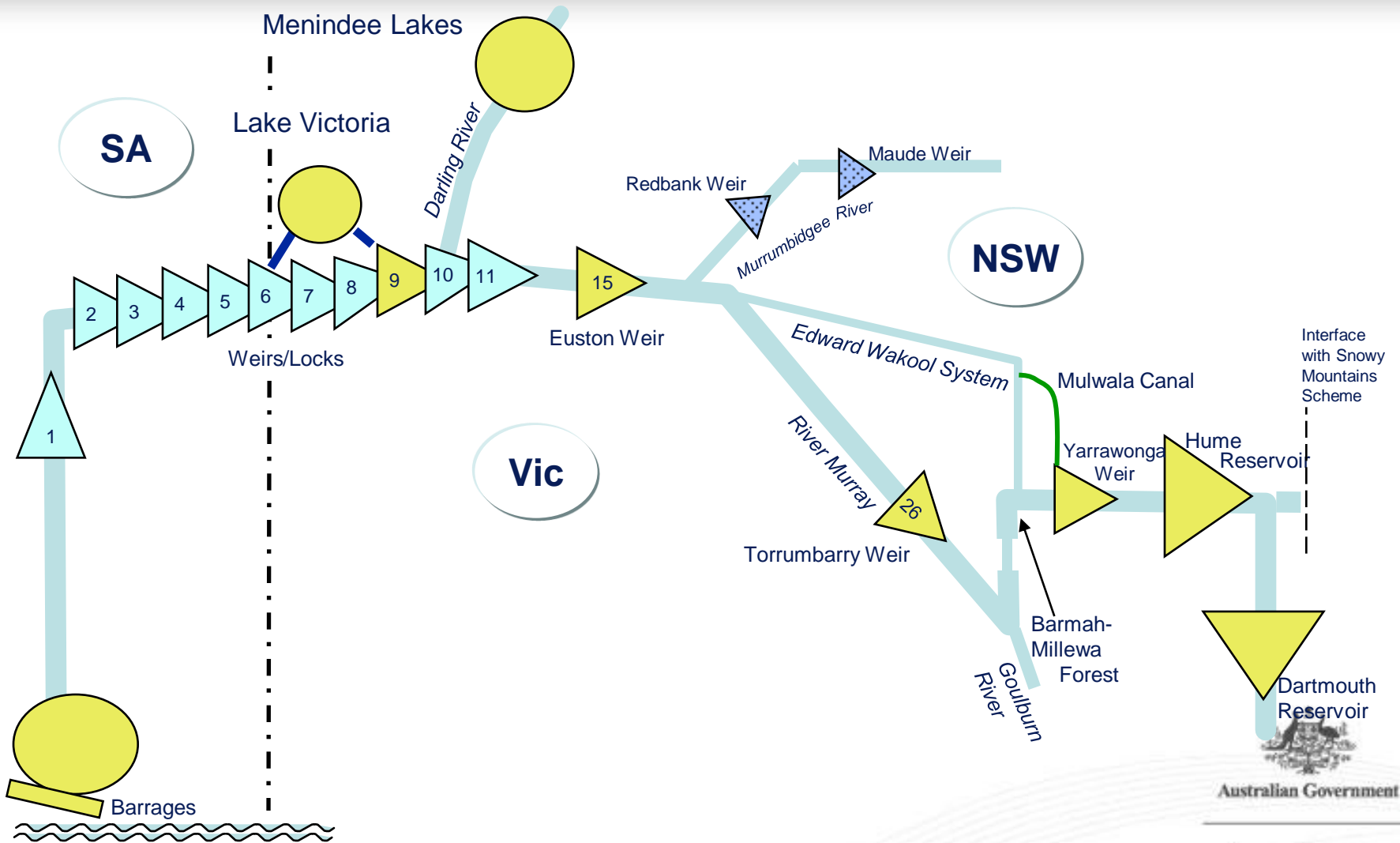
Asset Management

- Assets are “controlled” by the **River Murray Operations Joint Venture** comprising Australian Government and states of NSW, Victoria and South Australia
- The Authority is the agent of the Joint Venture, and funds and directs the Asset Management Program
- Each State has a **Constructing Authority (SCA)** which is responsible for design, construction, operation and maintenance

Asset Management Ct'd

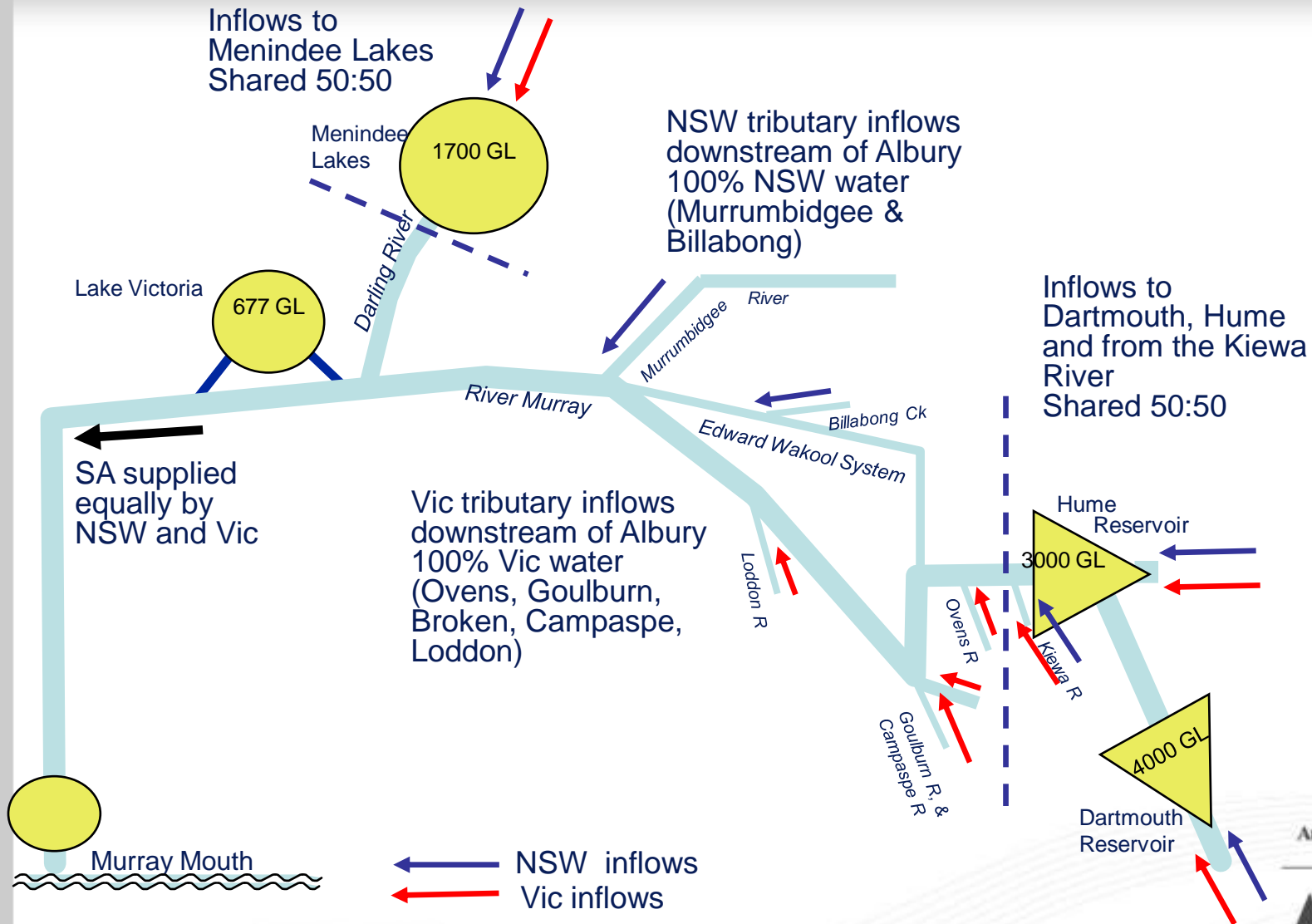
- **The Authority** is responsible for:
 - setting priorities for the overall program
 - ensuring uniformity of approach by the SCAs
 - overseeing the standard of service delivery
 - co-ordinating works programs
 - high level technical review
 - maintaining the infrastructure asset register
 - budget preparation (in liaison with SCAs)
 - risk management (including OH&S, dam safety management and public liability risks)

River Murray System in Schematic

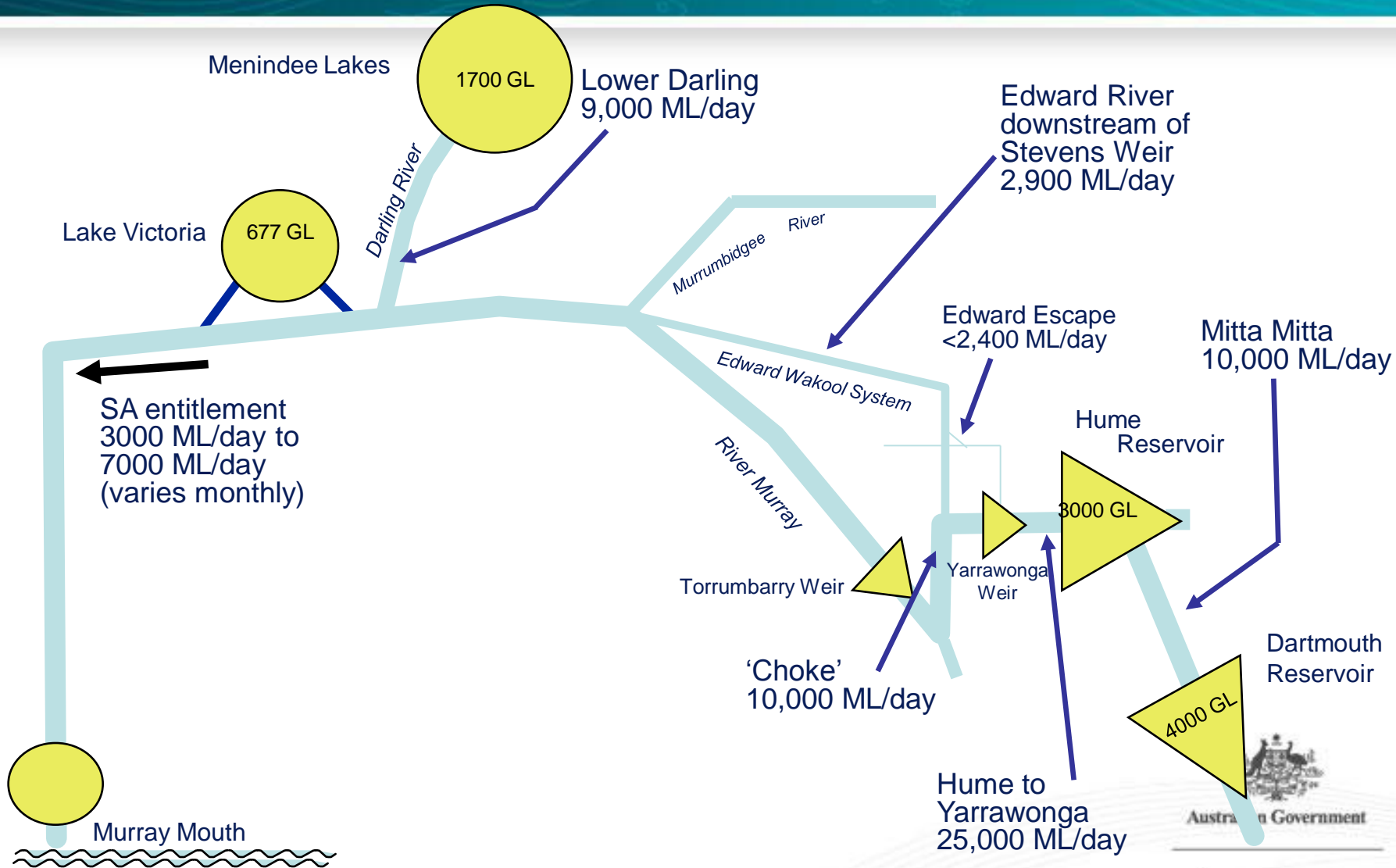


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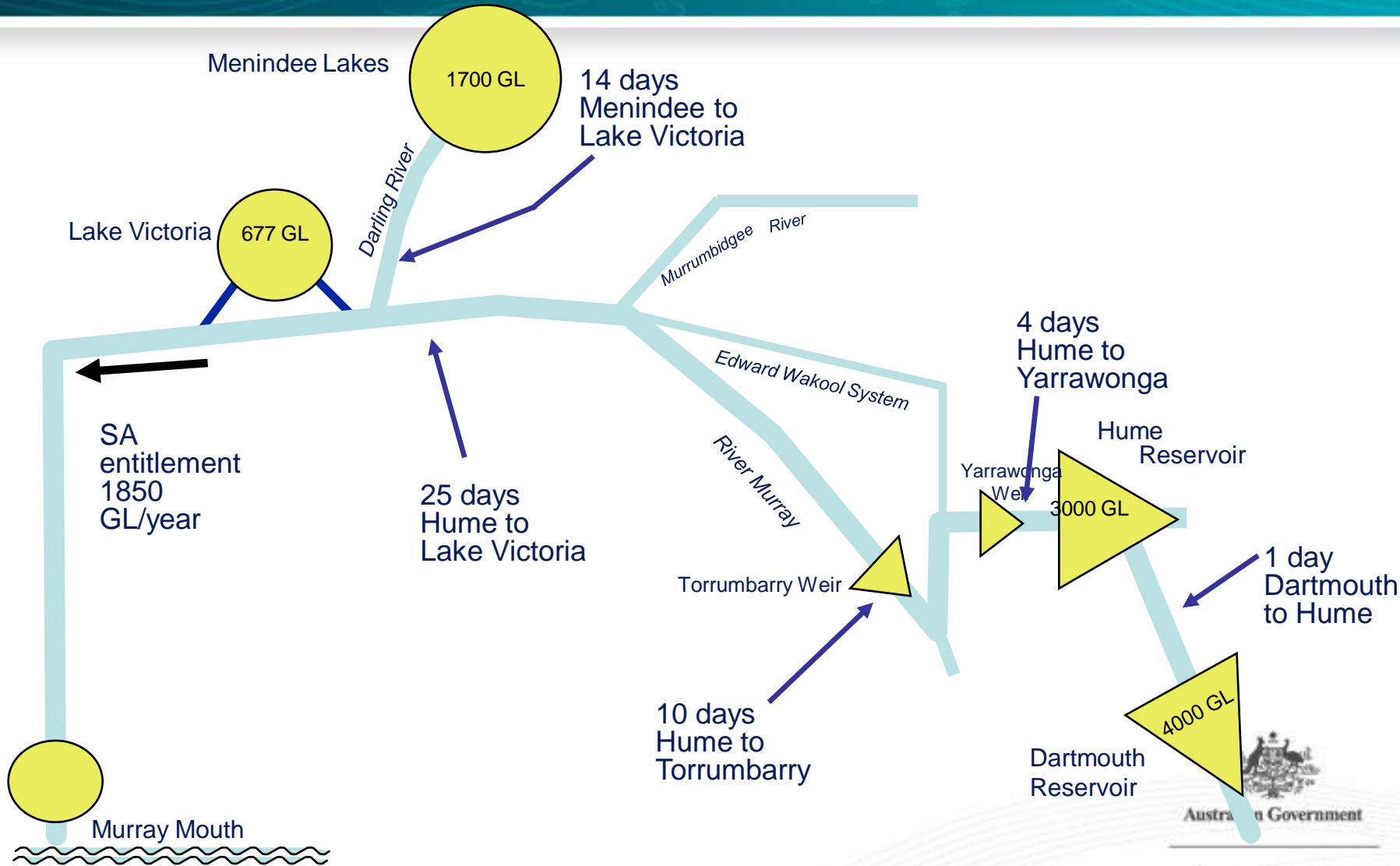
Water Sharing



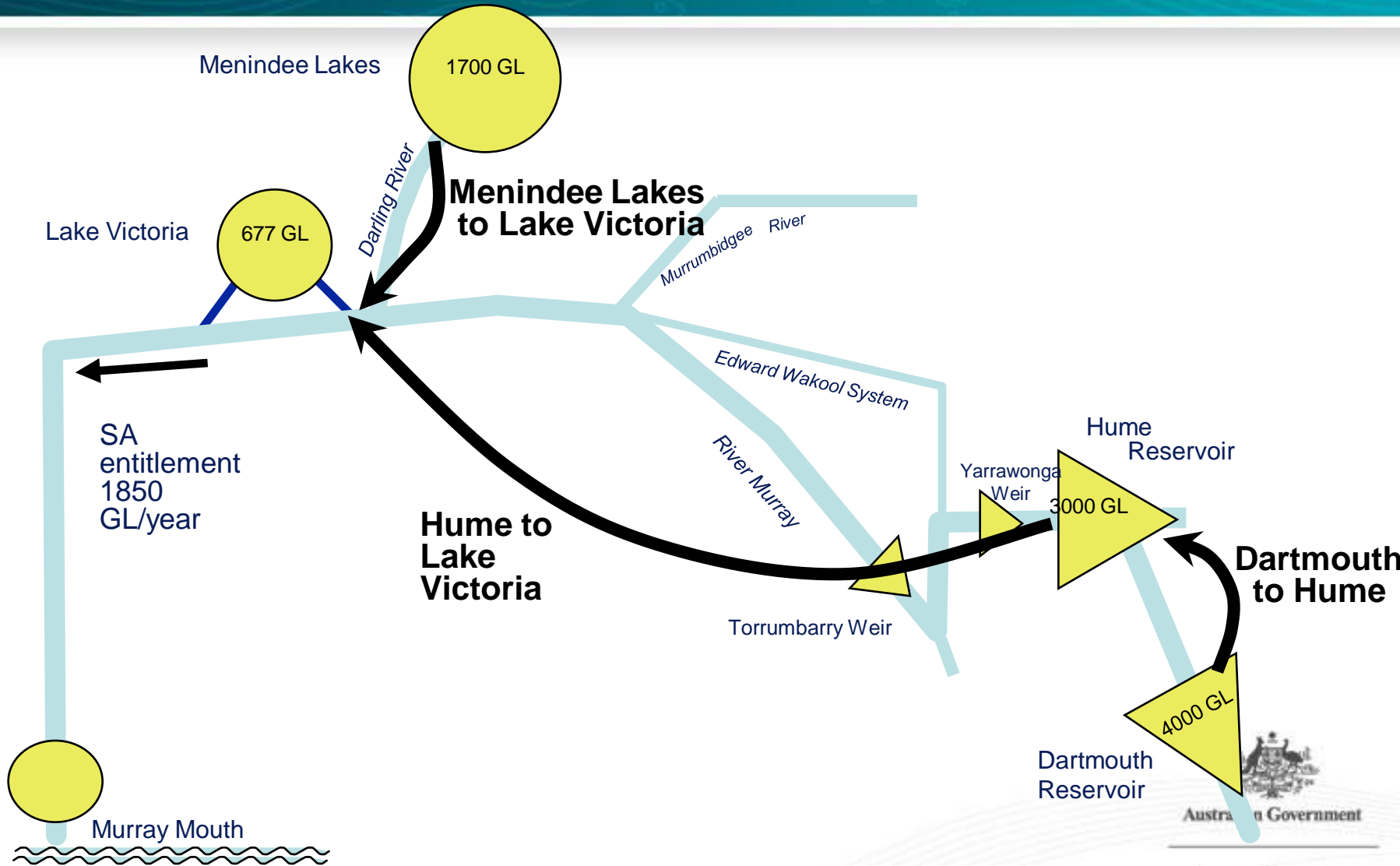
System Constraints



Travel Times



Bulk Water Transfers



RMW Accounts Diagram

November 2003
Operational Accounts

November 2003
Operational Accounts

| System Account | COG | WV | WV |
|--------------------|--------|-------|-------|
| Supply of Lake | 1 02.0 | 101.0 | 201.0 |
| Flow of Melbourne | 0.0 | 0.0 | |
| Supply of Lake | 458.0 | 101.0 | 201.0 |
| Supply from Murray | 300 | 104 | 104 |
| Total | 458.0 | 101.0 | 201.0 |

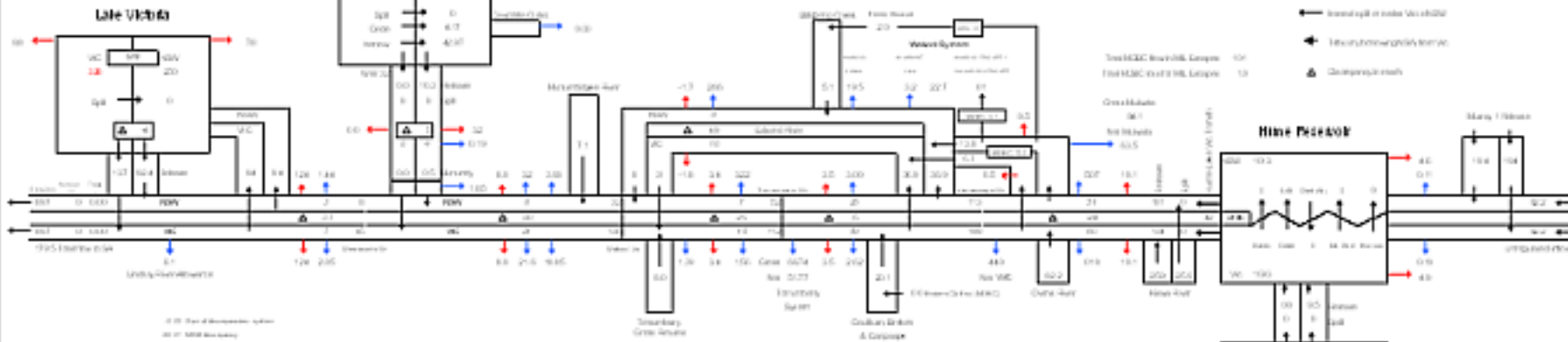
Melbourne Lakes

| System | Flow | Level |
|--------|-------|-------|
| Supply | 102.0 | 101.0 |
| Flow | 102.0 | 101.0 |
| Level | 102.0 | 101.0 |

| System | Flow | | Level | |
|--------|-------|-------|-------|-------|
| | Flow | Level | Flow | Level |
| Supply | 102.0 | 101.0 | 102.0 | 101.0 |
| Flow | 102.0 | 101.0 | 102.0 | 101.0 |
| Level | 102.0 | 101.0 | 102.0 | 101.0 |

Legend

- Supply of Lake
- Melbourne
- Flow
- Demand of Lake
- Demand of Lake
- Demand of Lake



RIVER MURRAY SYSTEM ACCOUNTS

| System | Flow | | Level | | Flow | | Level | | Flow | Level |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | Flow | Level | Flow | Level | Flow | Level | Flow | Level | | |
| Supply | 102.0 | 101.0 | 102.0 | 101.0 | 102.0 | 101.0 | 102.0 | 101.0 | 102.0 | 101.0 |
| Flow | 102.0 | 101.0 | 102.0 | 101.0 | 102.0 | 101.0 | 102.0 | 101.0 | 102.0 | 101.0 |
| Level | 102.0 | 101.0 | 102.0 | 101.0 | 102.0 | 101.0 | 102.0 | 101.0 | 102.0 | 101.0 |

Note: All flow levels are in m³/s and flow rates are in m³/s.

Chlorination

| | |
|-------|-------|
| Flow | 102.0 |
| Level | 101.0 |
| Flow | 102.0 |
| Level | 101.0 |

Special Account

| System | Flow | Level | Flow | Level |
|--------|-------|-------|-------|-------|
| Supply | 102.0 | 101.0 | 102.0 | 101.0 |
| Flow | 102.0 | 101.0 | 102.0 | 101.0 |
| Level | 102.0 | 101.0 | 102.0 | 101.0 |

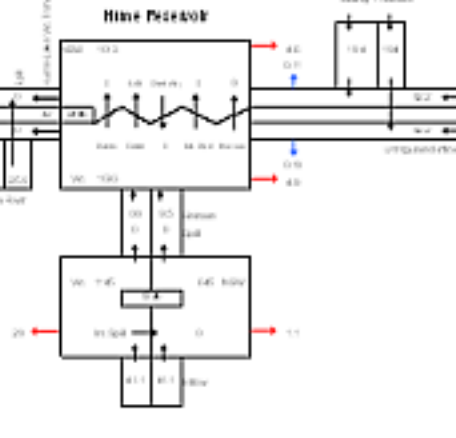
Note: All flow levels are in m³/s and flow rates are in m³/s.

Special Account

| System | Flow | Level | Flow | Level |
|--------|-------|-------|-------|-------|
| Supply | 102.0 | 101.0 | 102.0 | 101.0 |
| Flow | 102.0 | 101.0 | 102.0 | 101.0 |
| Level | 102.0 | 101.0 | 102.0 | 101.0 |

Note: All flow levels are in m³/s and flow rates are in m³/s.

Darwin Reservoir



Account prepared by: **Dr. Brian**
1 December 2003
Reference: 3112002

Water Acceptance and by-product diagram

River Murray Water, New South Wales, Victoria, South Australia

- Includes complete NSW hydrographic (or better) quality data to October 2003 inclusive with the following exceptions:
Richmond, Farnsworth, Warrumbungle, Murrumbidgee (September & October 2003)
Warrumbungle (July to October 2003)
Eildam Dam, Goulburn Dam, Uswah, Franklin, Waddy Gully, Stevens Well, Bank, Duffield Dam, Yarrakon Dam, Stanley Crossing (October 2003)
Warrumbungle (August to October 2003)
- Includes complete Victorian hydrographic (or better) quality data to October 2003 inclusive with the following exceptions:
Mt. Goy's Dam, McAlister, National Channel, Koorndook Spillway, Karing Well, Capital Crossing YMC, WMC Outlet, Apple South, M'Elroy (October 2003)
Moor's Well (September & October 2003)

Hume Dam Upgrade



12/03/2007

Hume Dam Upgrade



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MURRAY-DARLING
BASIN AUTHORITY

V.
20.
10. P. 28

Hume Dam Upgrade



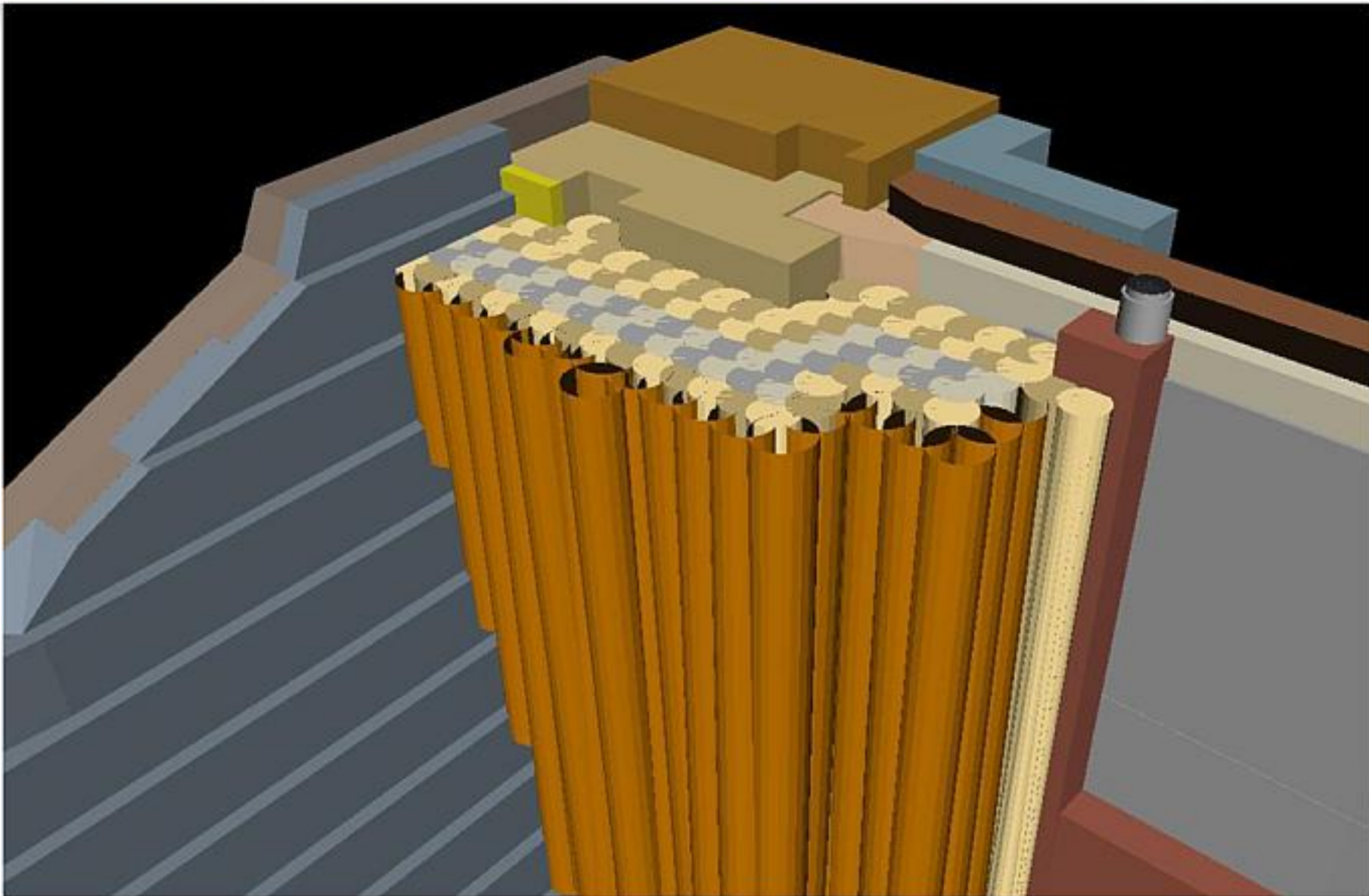
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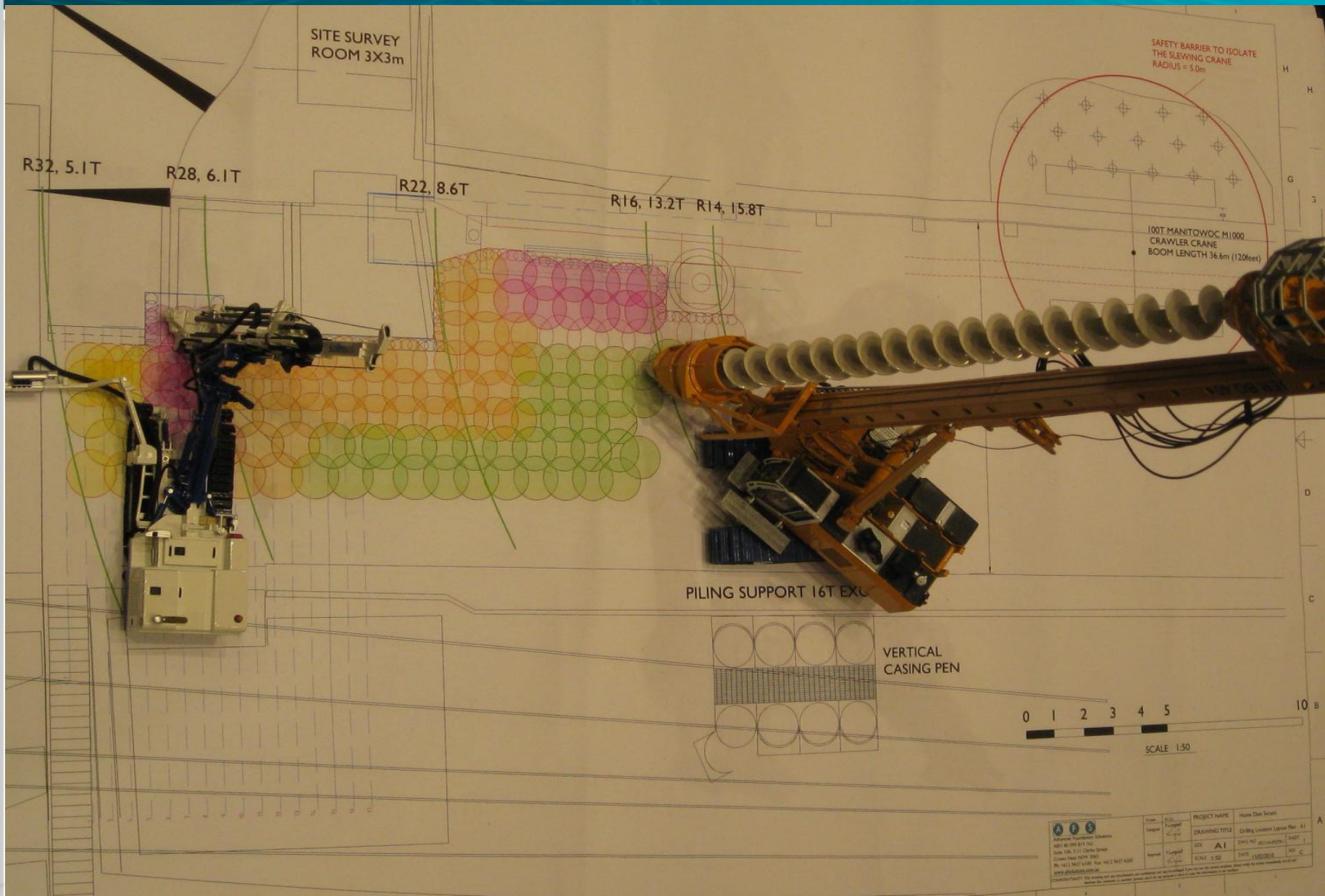
Hume Dam Upgrade



Hume Dam Upgrade



Hume Dam Upgrade



Hume Dam Upgrade



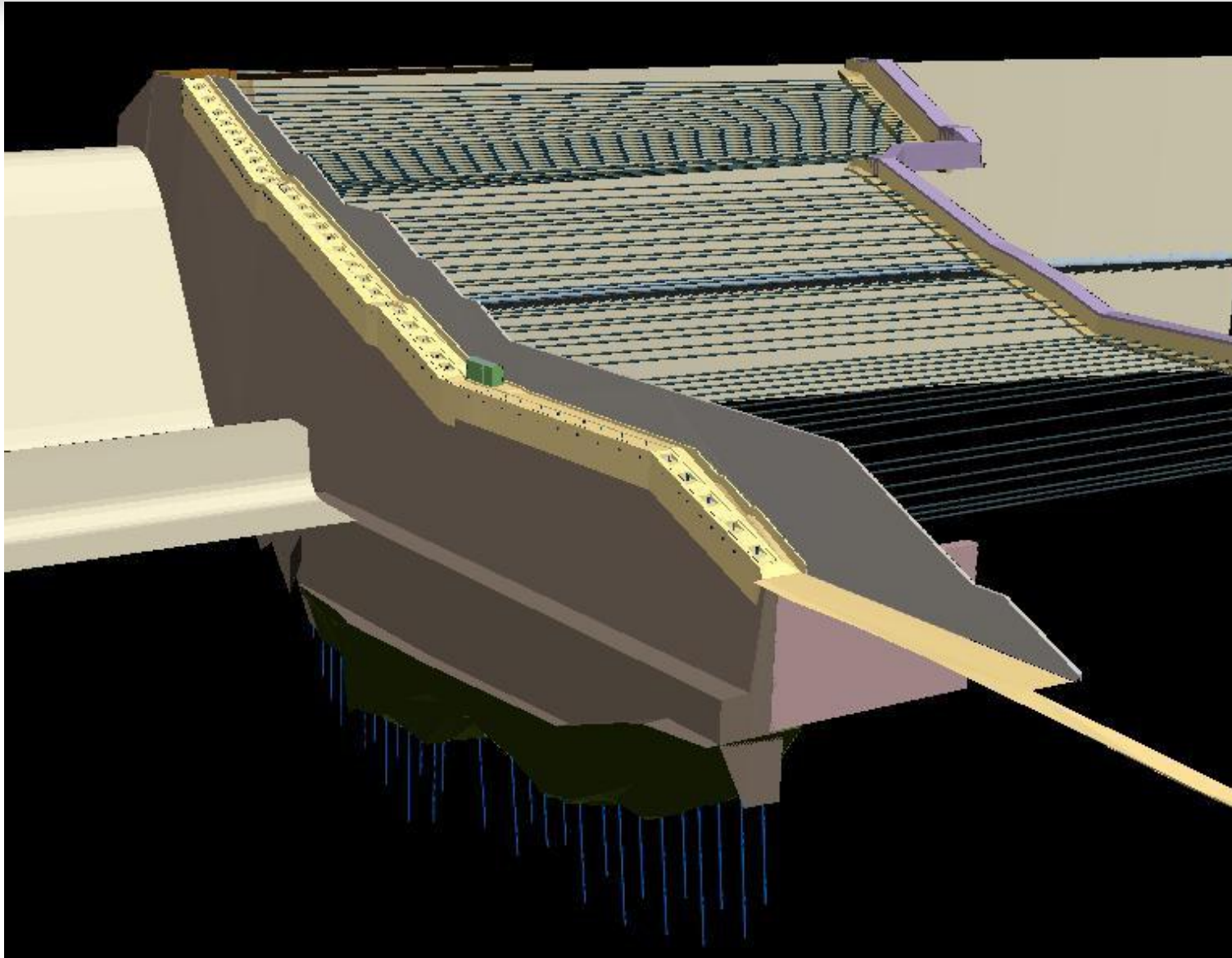
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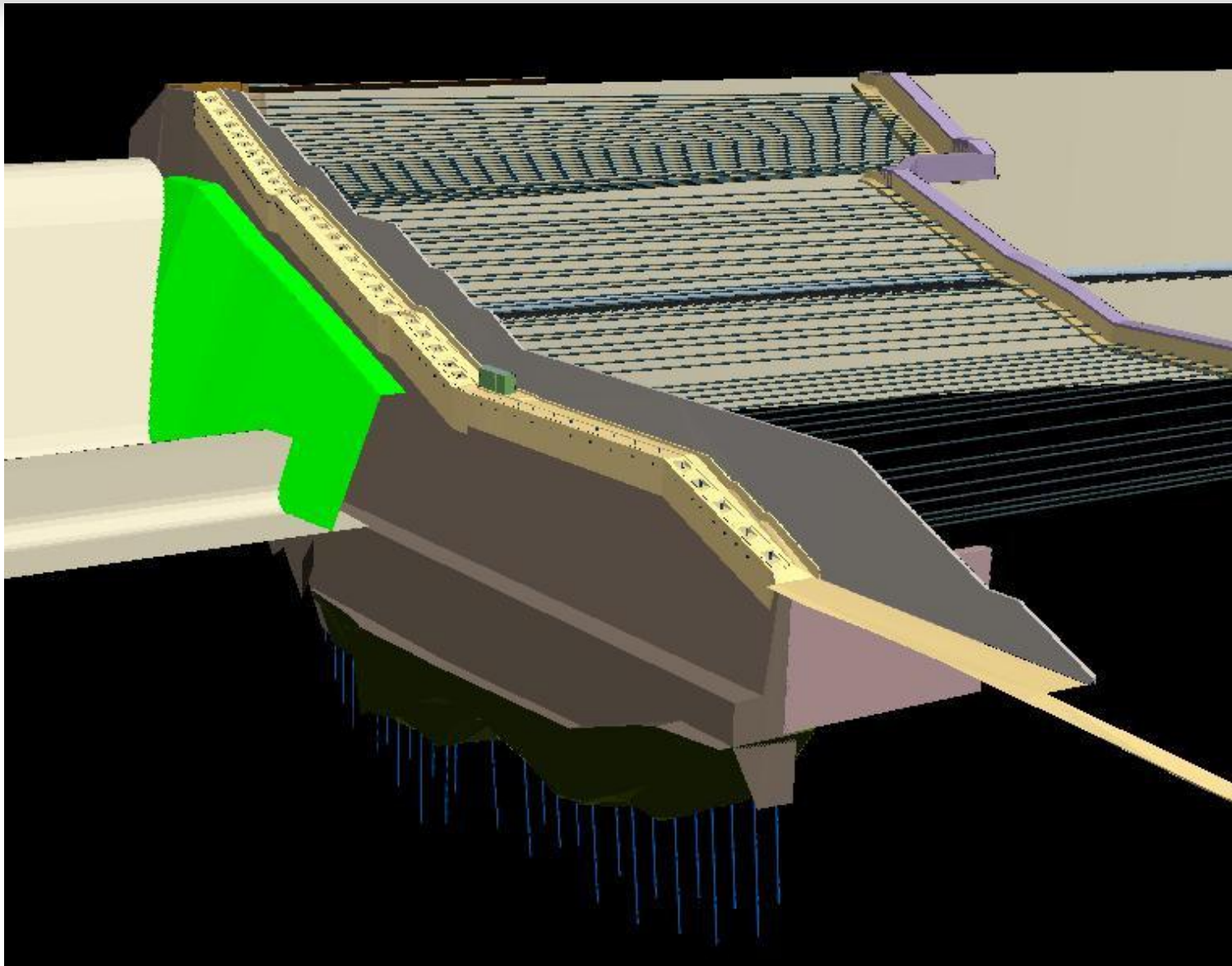
Hume Dam Upgrade



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Hume Dam Upgrade



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Dartmouth Dam Upgrade



Dartmouth Dam Upgrade



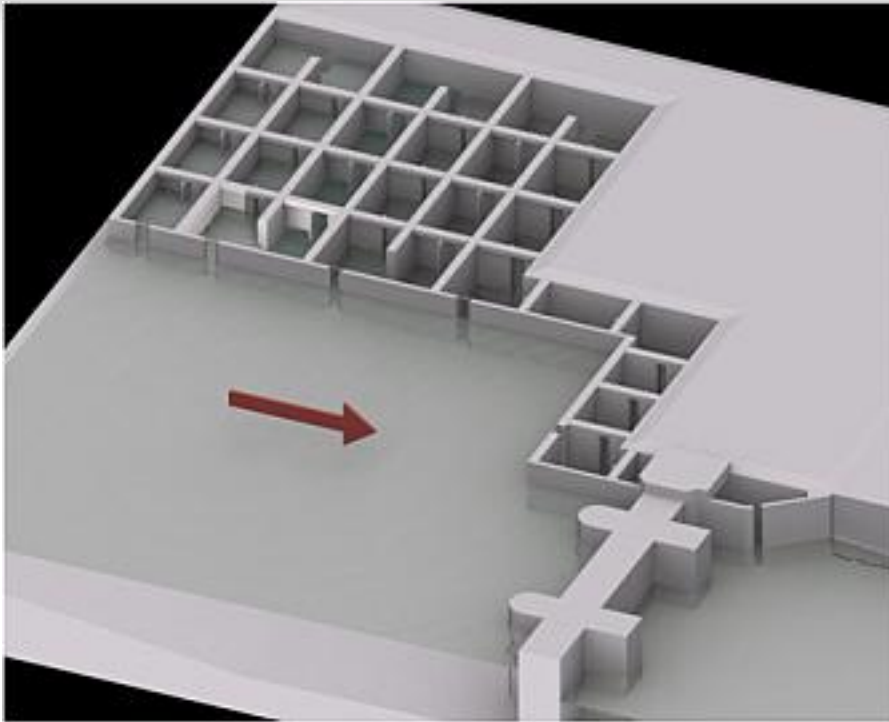
Dartmouth Dam Upgrade



Dartmouth Dam Upgrade



Lock 8 Fishway



Lock 8 Fishway



Lock 8 Fishway

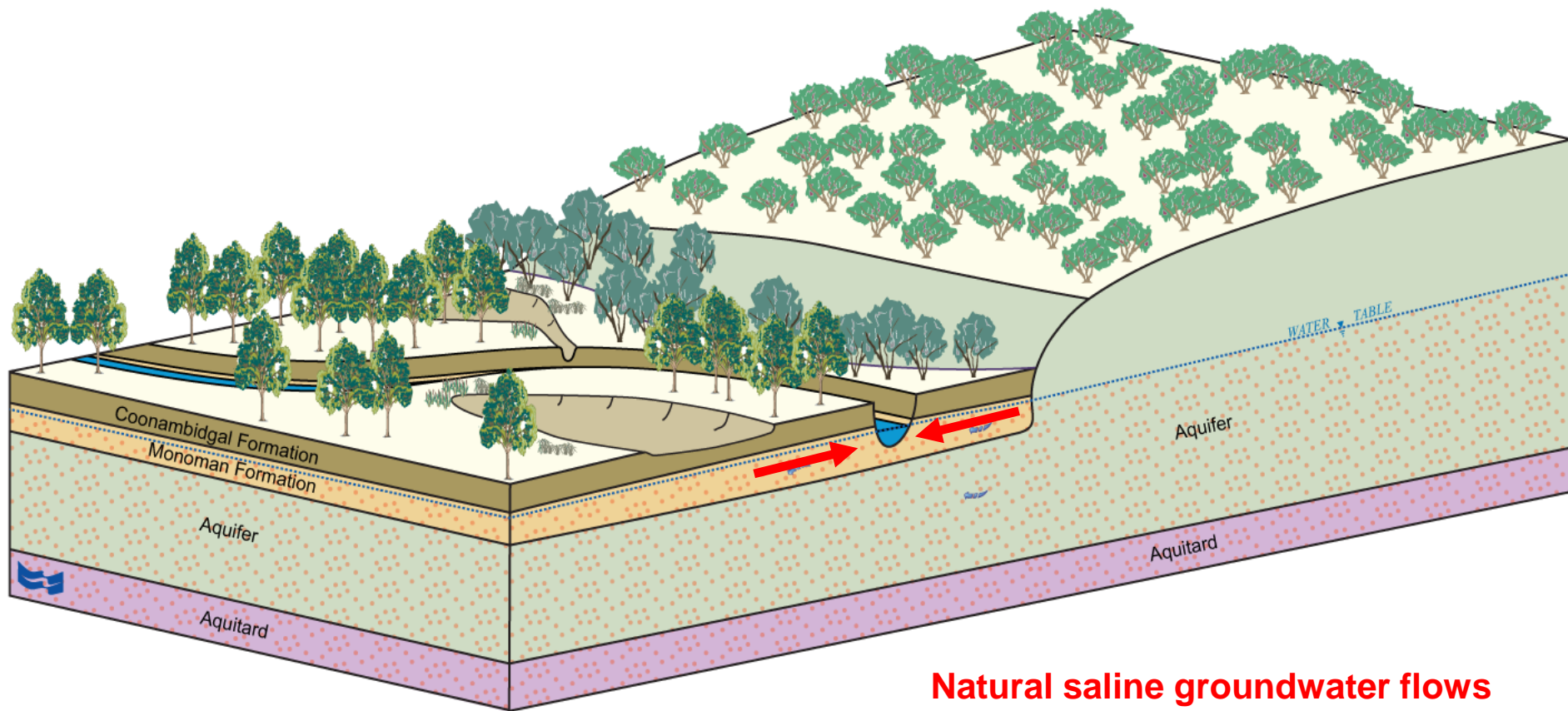


Lock 8 Fishway



River Salinity Causes

Pre – European Settlement



Natural saline groundwater flows

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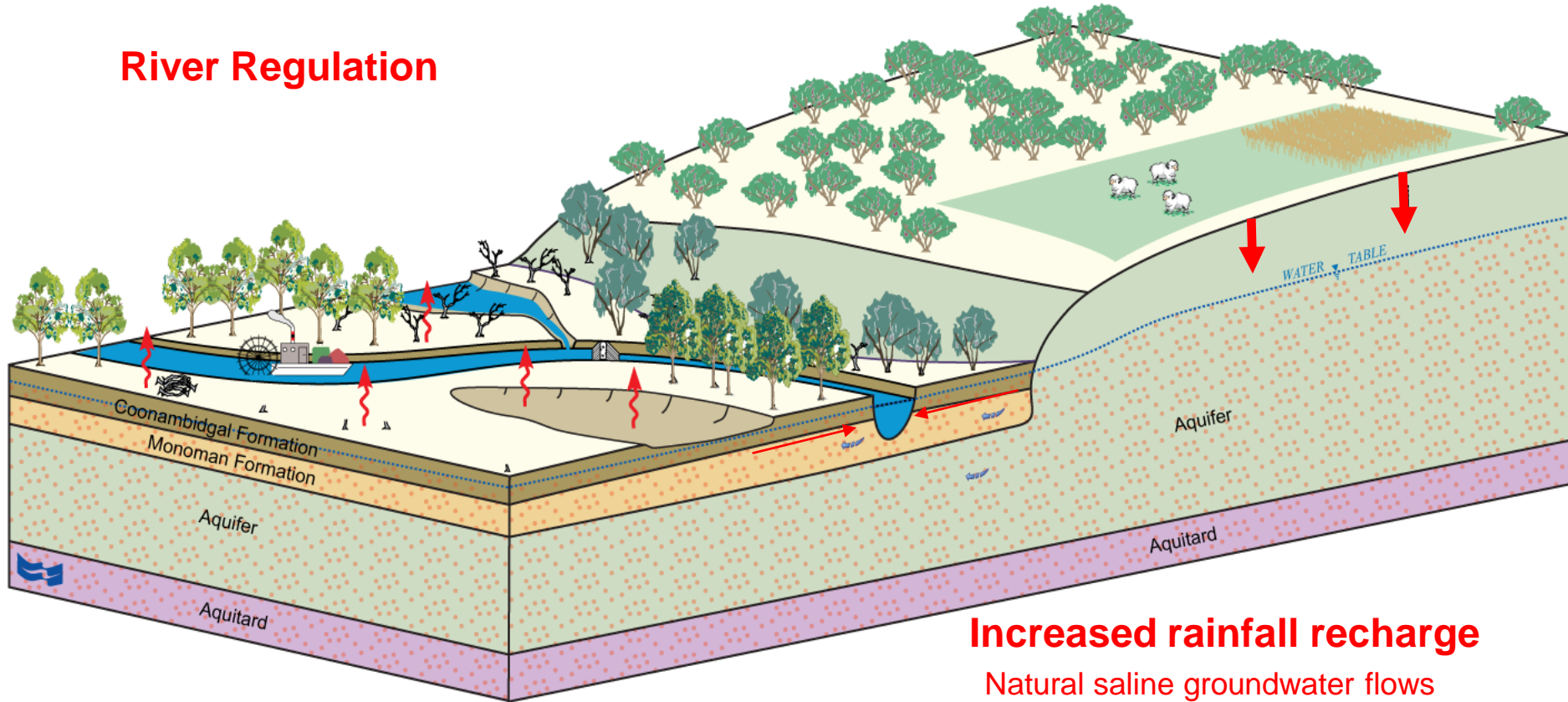


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River Salinity - Causes

Post Lock Construction and Mallee Clearance

River Regulation



Increased rainfall recharge
Natural saline groundwater flows



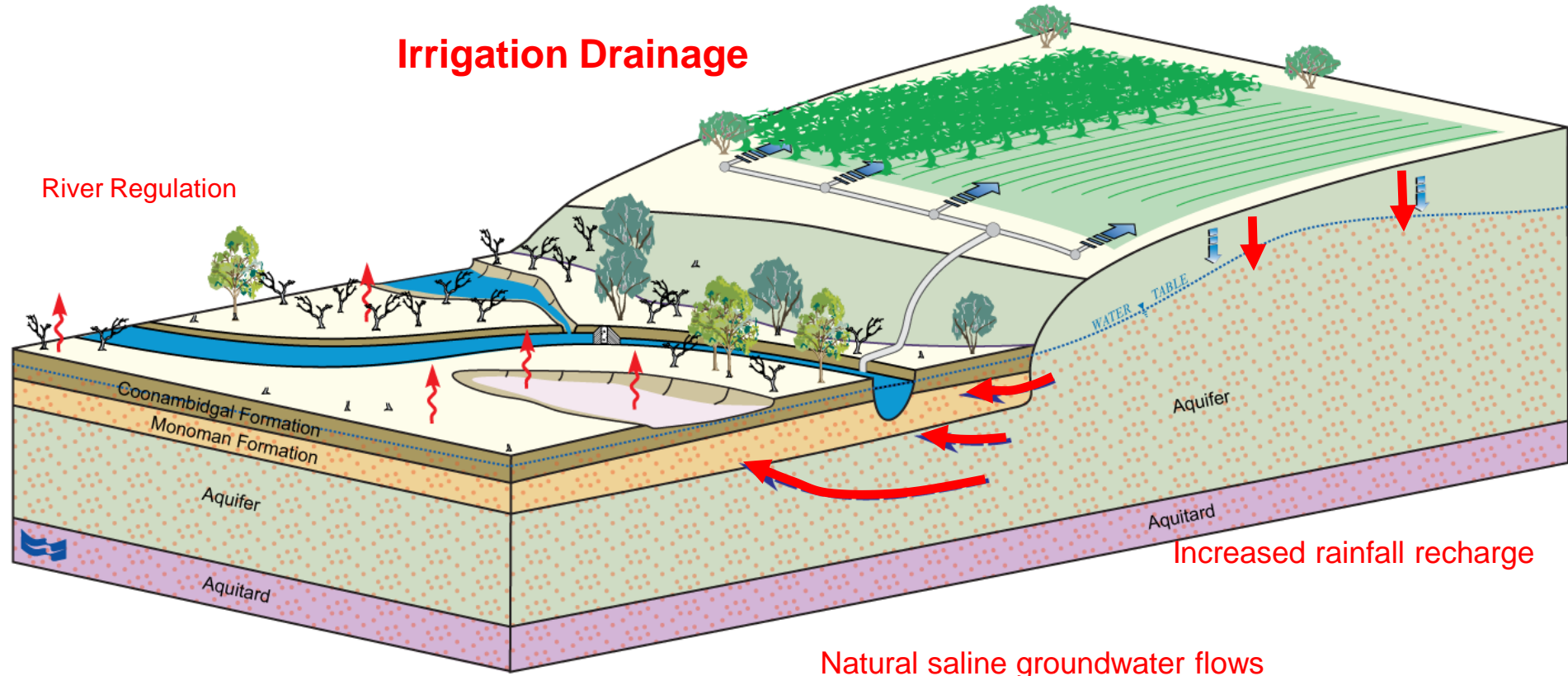
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Causes of River Salinity

Post Lock Construction and Mallee Clearance with Irrigation

Irrigation Drainage

River Regulation





Options for Salinity Control

- River flow management
- Targeted revegetation
- Dryland farming practice changes
- Conservation of existing native vegetation
- Improved irrigation delivery and efficiency
- Direct new development to lower impact areas
- **Salt Interception Schemes**



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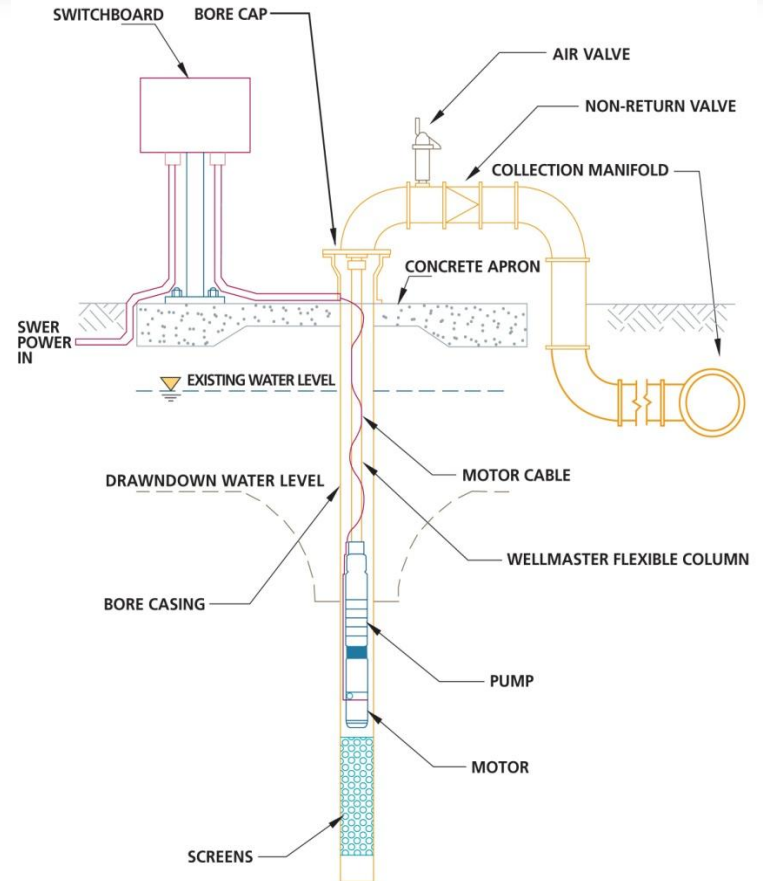
Salt Interception

What is it ?

- Large scale Groundwater pumping & drainage schemes that intercept saline water flow before it enters the River Murray system

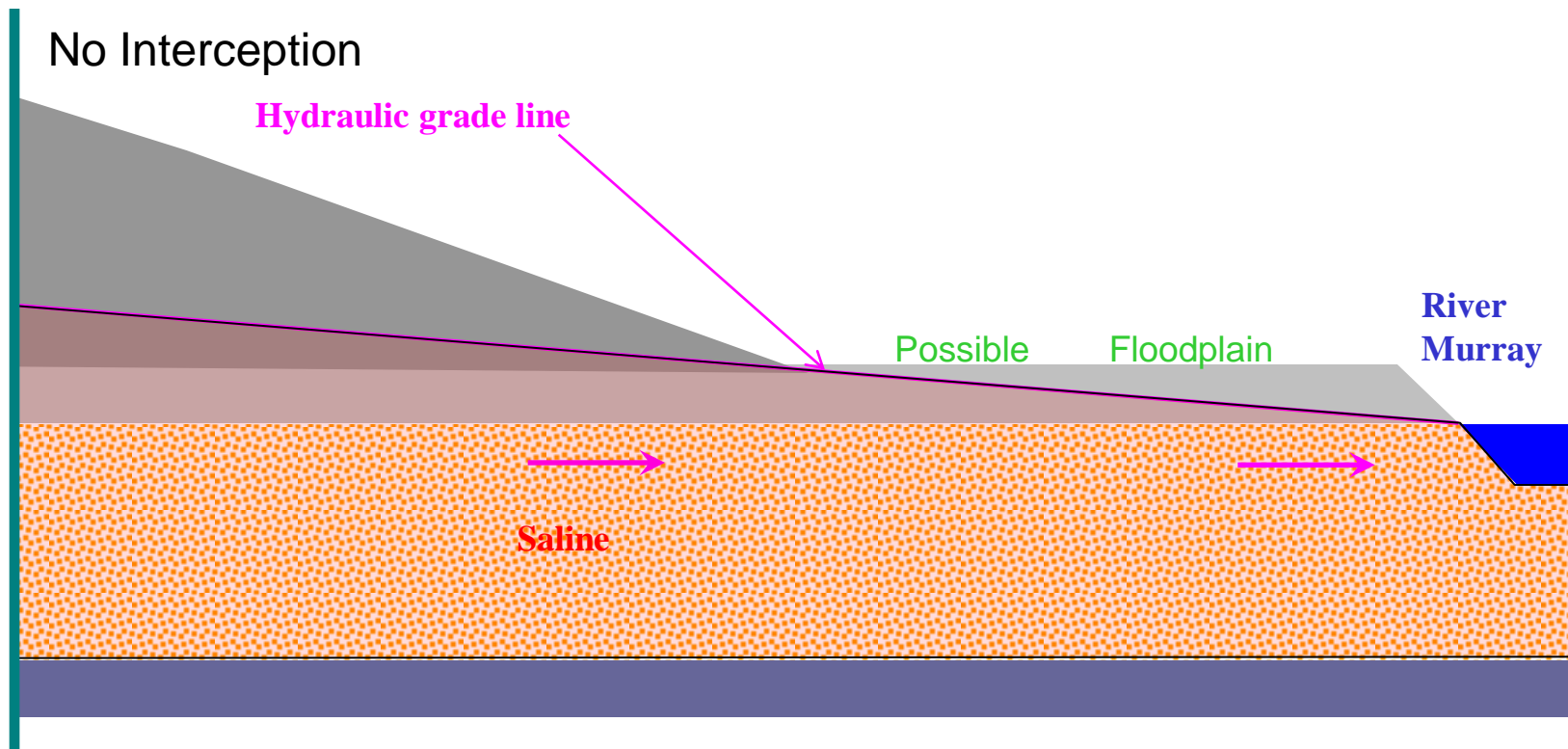


Typical Submersible Configuration



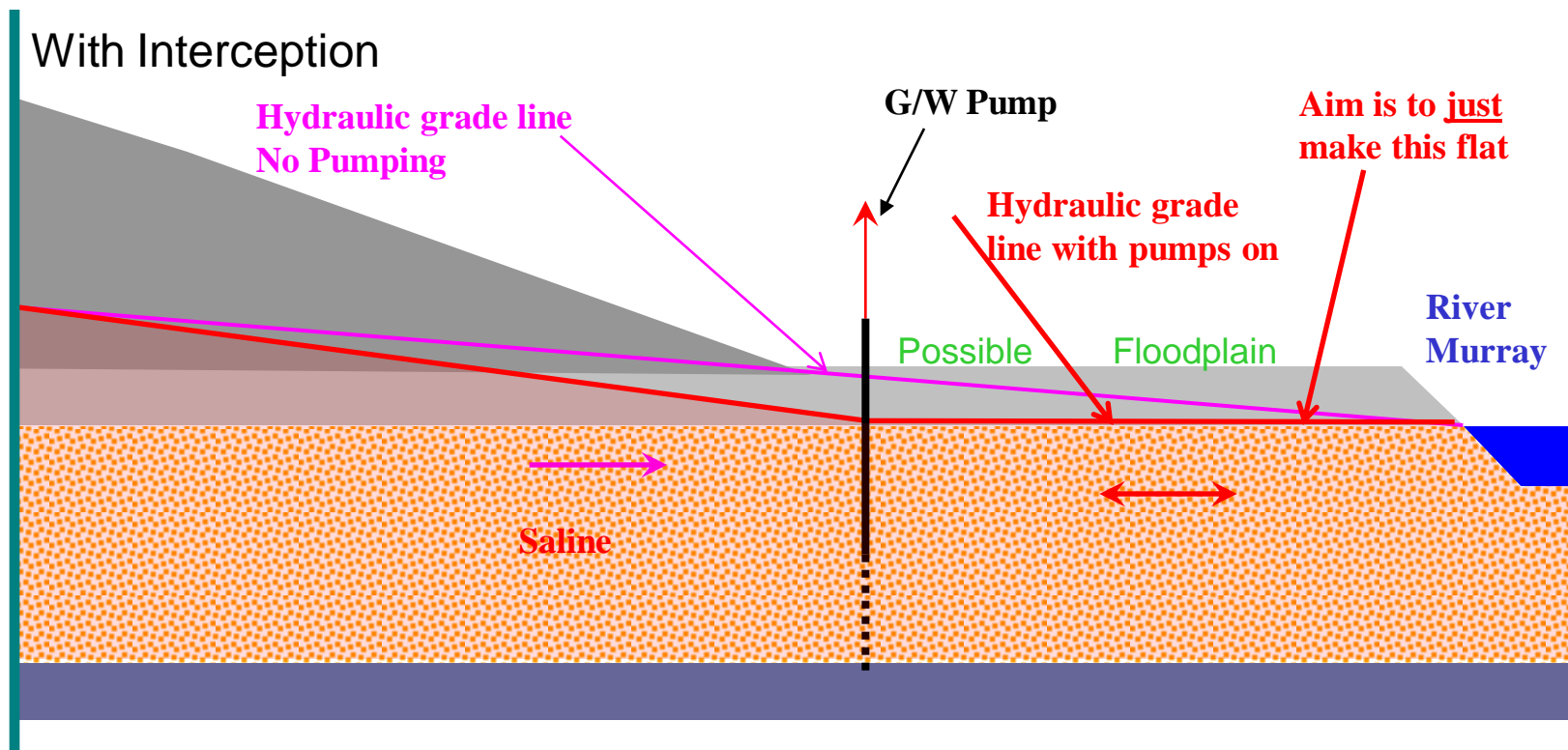
**Salt Interception is
not Desalination**

Salt Interception – How Does it Work?



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Salt Interception – How does it Work?



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Salt Interception Schemes



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Salt Interception Schemes



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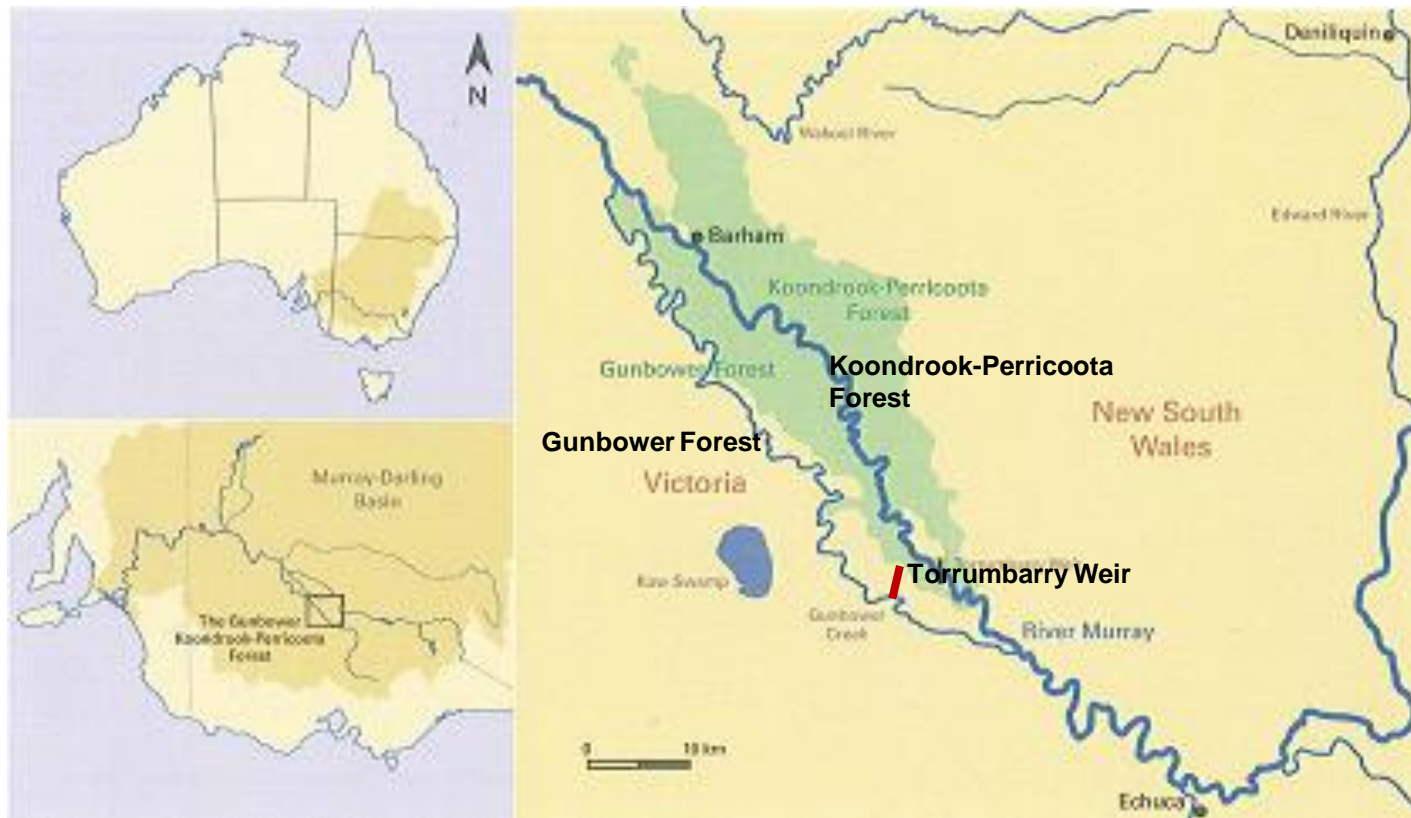
Salt Interception Schemes



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Environmental Works & Measures

- Koondrook-Perricoota
- Gunbower



Gunbower Works



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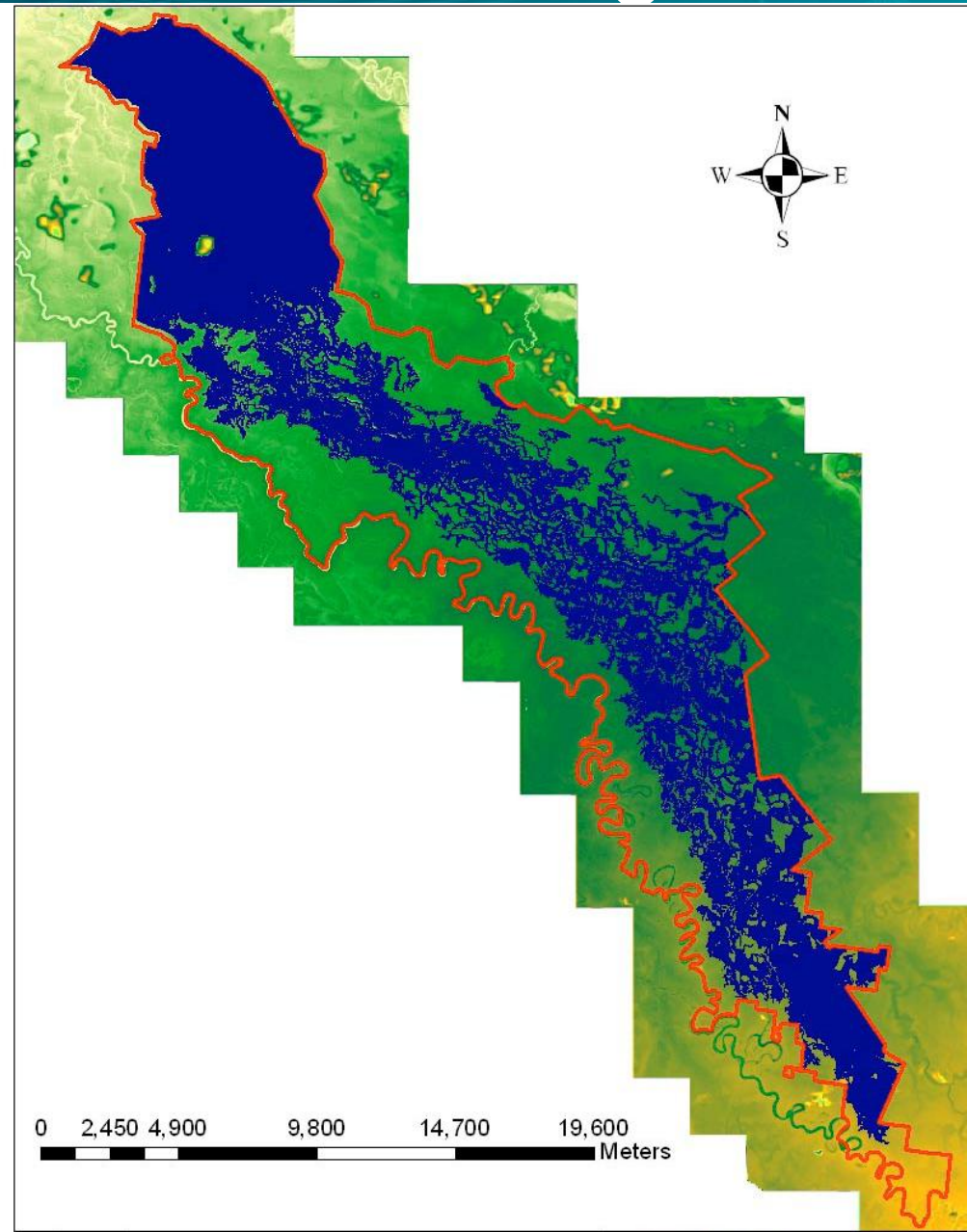


KPF Works

- Upstream Works
 - 3.8 Km inlet channel
 - Inlet regulator and fishway
 - 2 regulators at Swan Lagoon
- Downstream Works
 - 5 Stop Log regulators
 - 42km levee bank
 - Return channel and regulator
 - 3 By-washes



Koondrook watering extent



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