Hydrodynamic modelling to inform infrastructure options

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The next phase of two modelling projects

• DEW hydrodynamics
  • Water level, salinity, flow, velocity
  • 3 year period (2013-2016): Optimisation with fine resolution model
  • 30 year simulations (1990 – 2019): Assessment with coarse resolution model

• Water quality and ecosystem state (BMT and UWA)
  • Same base fine resolution TUFlow model
  • Also add nutrients, sediment, turbidity/clarity, Ruppia, algae, fish
  • 6 year period (2017-2019 x 2)
  • 10 scenarios:
    • Two different base case conditions (dry and wet)
    • 9 infrastructure combinations
Options refinement: Step 1

- Phase 1 ecological investigations identified options to investigate further to determine the appropriate scale of infrastructure.

35 x 3 year scenarios testing:
- Pump out with water level trigger
- Pump out & dredge
- Pump in/out (one location)
- Pumping – circulation
- Passive connection – CSL and ocean
Options adopted for long term simulations

- Pumping water out of the CSL combined with dredging;
- Pumping water out of the CSL with water level triggers to minimise impacts on CSL water levels;
- Pumping water in and out from one location (i.e. pumping only one direction at a time);
- Circulation pumping, i.e. pumping water out from one location, while pumping water in at a second location;
- A passive connection between the CSL and southern ocean.

30 year coarse model scenarios
- Base case & 10 infrastructure scenarios
- Historical, current & climate change conditions
Coarse Model Confidence – salinity

North Lagoon sites

Salinity (g/L)

Beacon 1

Pelican Point

Long Point

South Lagoon sites

Parnka Point

Woods Well

Snipe Island
Coarse Model Confidence – water level

North Lagoon sites

- Beacon 1
- Pelican Point
- Long Point

South Lagoon sites

- Parnka Point
- Woods Well
- Snipe Island

Water Level (m AHD)
Modelling boundary conditions & outputs
Lake Albert Connector & dredging

- 250 ML/d with dredge
- 1,000 ML/d when water level > 0.3 m AHD
- 350 ML/d in and out (seasonal fluctuation)

Dredging

- 350 ML/d circulation pumping
- Passive pipe connection

Legend:
- Monitoring station
- Modelled pump locations
- North lagoon
- South lagoon

Government of South Australia
Department for Environment and Water
Critical water levels for Ruppia reproduction & waterbird foraging habitat availability

Ramsar Management Plan ecological targets

100 g/L
60 g/L

0.25 mAHD
0.1 mAHD
Pump out 1000 ML/d when WL > 0.3 m AHD

Pump out 350 ML/d seasonal fluctuations

Pump out 250 ML/d with dredging

Base case
Pump out 350 ML/d Parnka South & in 350 ML/d PolicemanPt

Salinity (g/L)

Water Level (m AHD)

Date

1990  2000  2010  2020
10 x 2m diameter passive pipes connecting CSL to ocean

Salinity (g/L)

Water Level (m AHD)

Date

1990  2000  2010  2020
Summary

- Two model resolutions used for scenarios
  - 3 year high resolution - approx. 50,000 nodes 50 m apart
  - 30 year coarse resolution - approx. 2,200 nodes 300 m apart

- Both models perform very well against observed data
  - Particularly for hydrodynamics
  - Focused on Coorong South Lagoon

- Large number of scenarios undertaken to refine and optimise infrastructure options
  - Most promising also with water quality and ecological habitat

- Provide basis for ecological risk assessment
The South Australian Government’s *Healthy Coorong, Healthy Basin Program* is jointly funded by the Australian and South Australian governments.