Marine and Coastal

National Environmental Science Program

Coastal contaminants

Contaminants of Emerging Concern: PFAS, antimicrobials, microplastics

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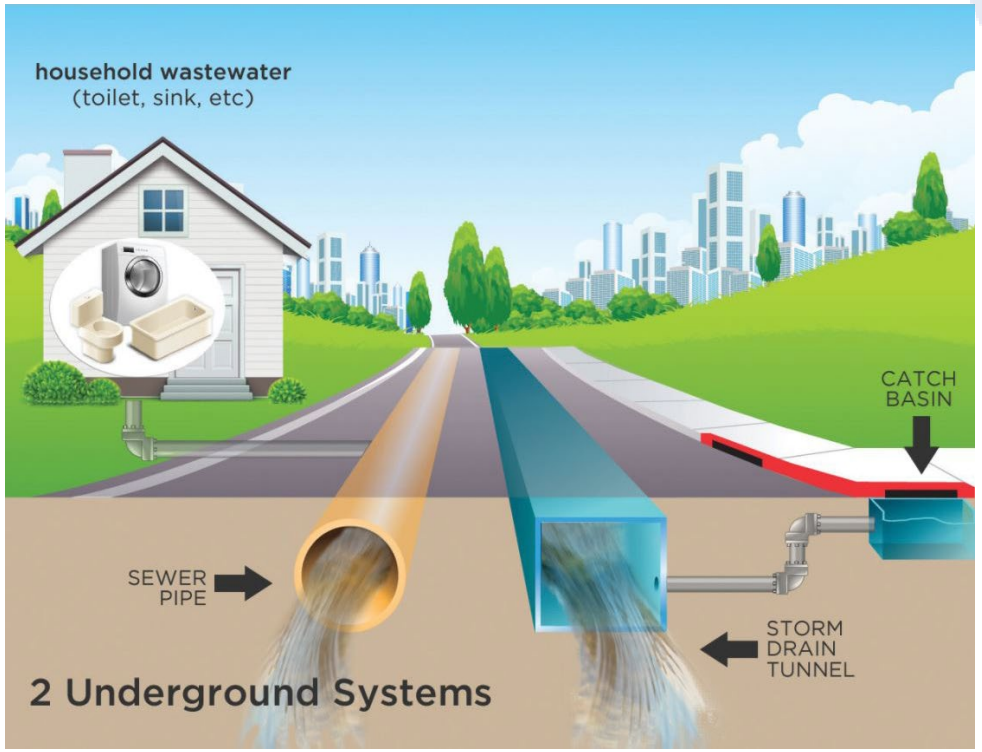
Coastal pollution

- Point sources
  - Waste Water Treatment Plants (WWTP)
  - Industrial discharges
- Diffuse sources
  - Land runoff
    - Urban stormwater (heavily modified catchment)
  - Atmospheric deposition



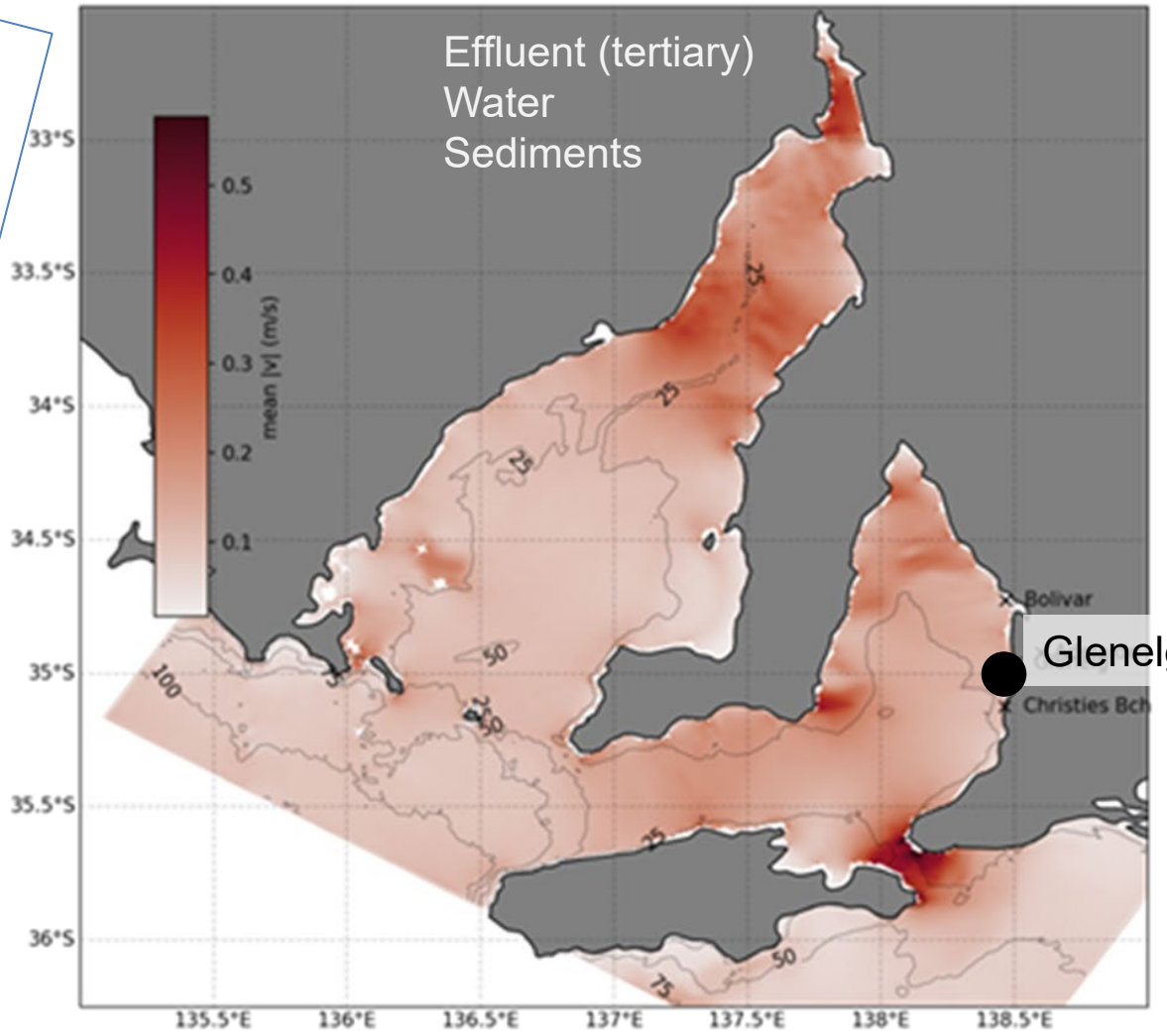
Study Objectives

- 4 nutrients
- 39 metals
- 15 antibiotics
- microplastics (<5 mm)
- 26 species of PFAS

- Sample marine environments receiving effluent from WWTPs and determine concentrations of CECs

- Assess whether the concentrations of marine contaminants are affecting the ecological health of the lower marine foodweb

Kuarna: Retentive receiving environment



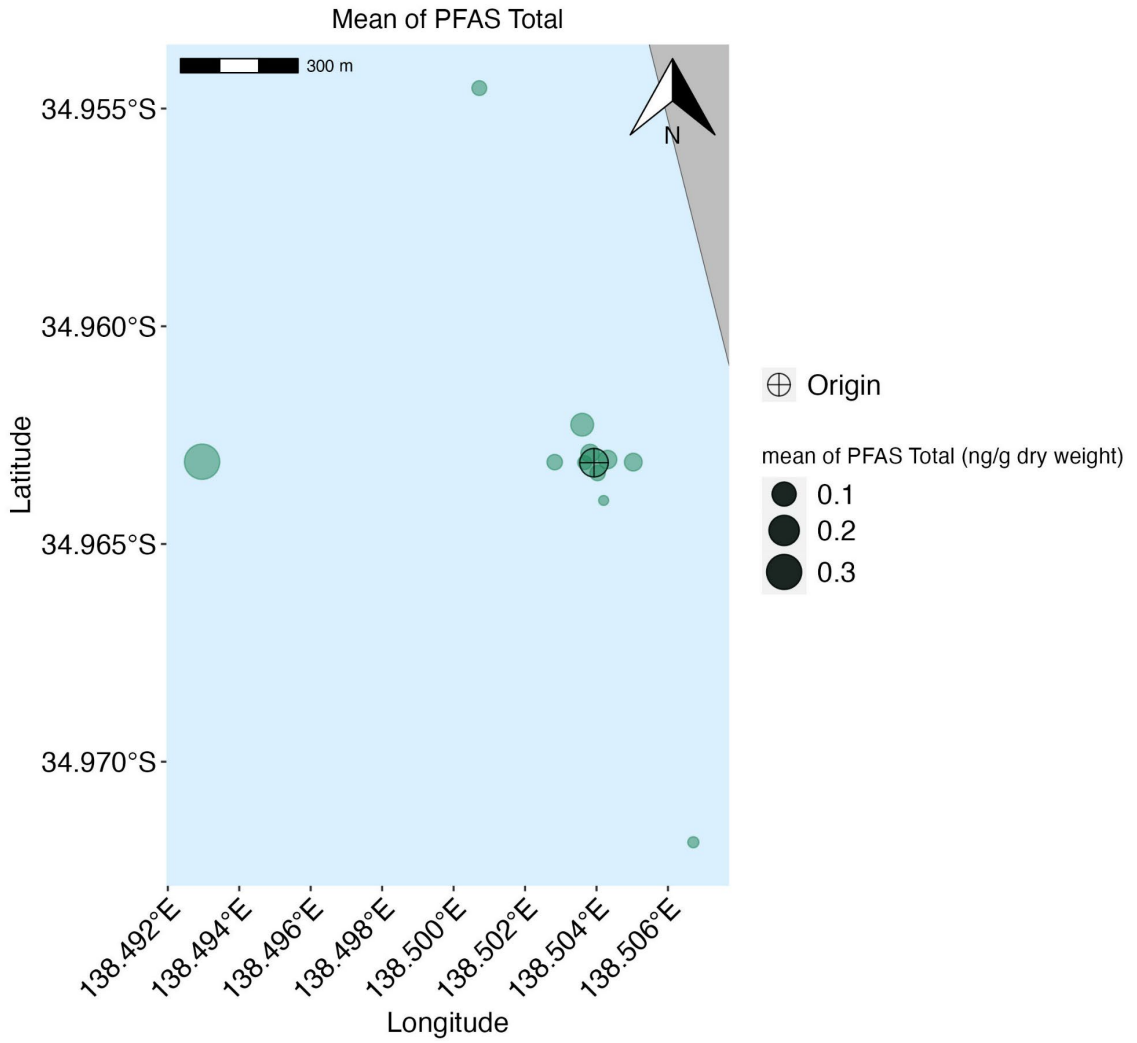
WWTP Study Findings: Environmental concentrations

- Microplastic particles in low abundance

  Effluent: 0 – 4 fibres/L
  Water: 1.2 fibres/L
  Seds: 306/kg

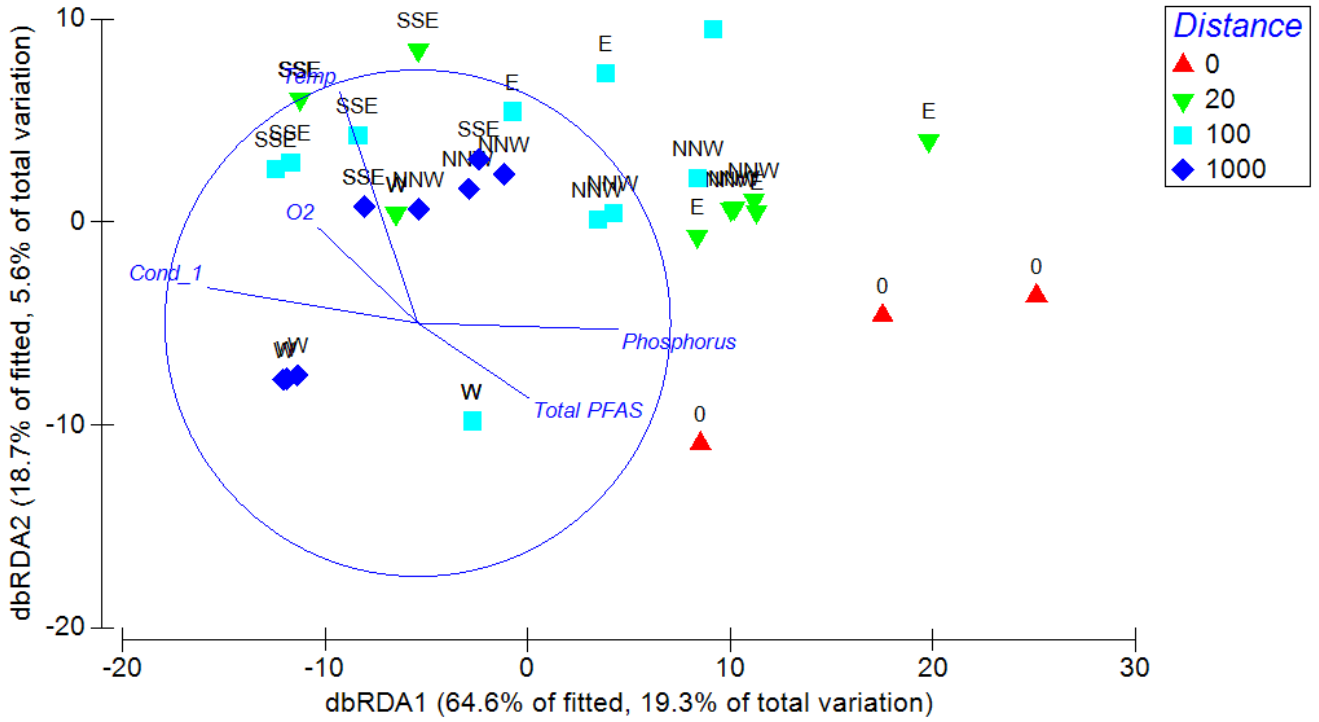
- PFOS, PFOA, Antibiotics detected in effluent and environmental samples

  PFOS in freshwater channel and at outfall exceeded Guideline



WWTP Study Findings: Ecological impacts

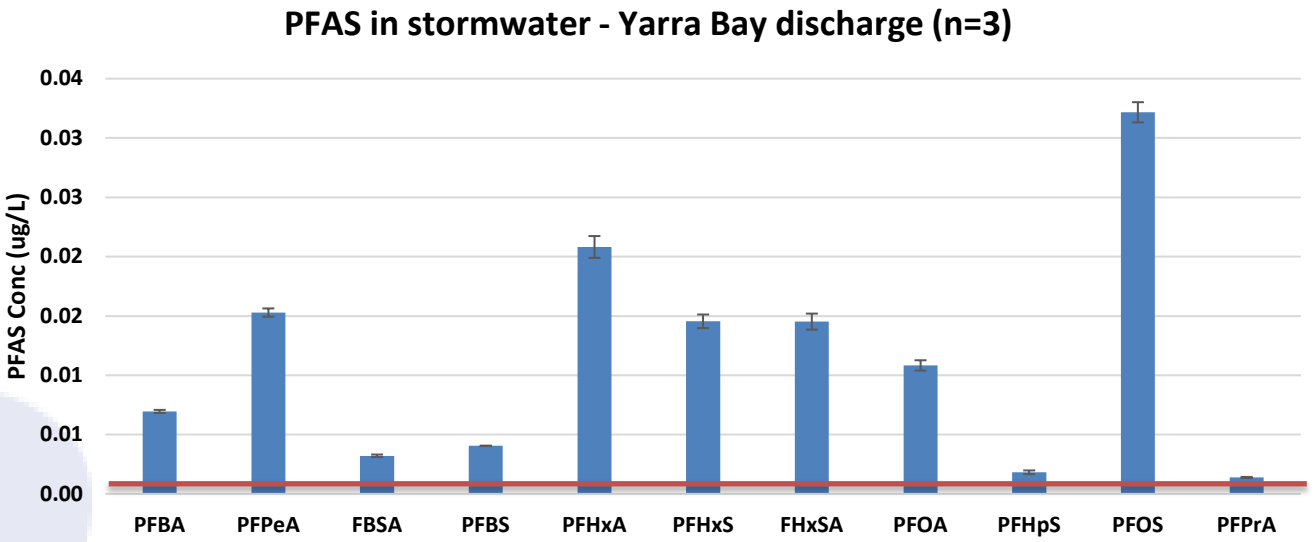
- Approx. 25% variation in bacteria composition mapped onto seawater composition
- Conductivity, temperature P concentration and total PFAS influenced microbial composition



Significance and implications

- 114 coastal WWTP discharging into Australian coastal waters
  Some exceedance of PFOS Guidelines in the context of tertiary treated effluent into a retentive receiving environment
- Many more stormwater discharges into estuaries and coastal waters

Stormwater Findings: Environmental concentrations



PFOS 0.00023 (ug/L)

Exposure scenario	Guideline value	PFOS µg/L	PFOA µg/L
Interim marine[d]	99% species protection – high conservation value systems	0.00023	19
	95% species protection – slightly to moderately disturbed systems	0.13	220
	90% species protection – highly disturbed systems	2	632
	80% species protection – highly disturbed systems	31	1824

Botany Bay's Tower Beach will undergo fresh testing for 'forever chemicals'. Picture: NewsWire / Flavio Brancaleone

The NSW environmental watchdog has ordered the fresh testing of a popular beach potentially contaminated by cancer-causing "forever chemicals" after signs failed to alert swimmers and fishermen of the danger.

Significance and implications

- 2 of 114 coastal WWTP sampled
  Some exceedance of PFOS Guidelines in the context of tertiary treated effluent into a retentive receiving environment
- Many more *untreated* stormwater discharges into estuaries and coastal waters
  Some exceedance of Guidelines adjacent to largest urban centre in Australia in proximity to Ramsar wetland (5.5 km away)
- Worst-case scenario yet to be sampled: Baseline versus intense rainfall events
- Ecological impact evident by changes to microbial composition – other indicators being explored

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Thank you

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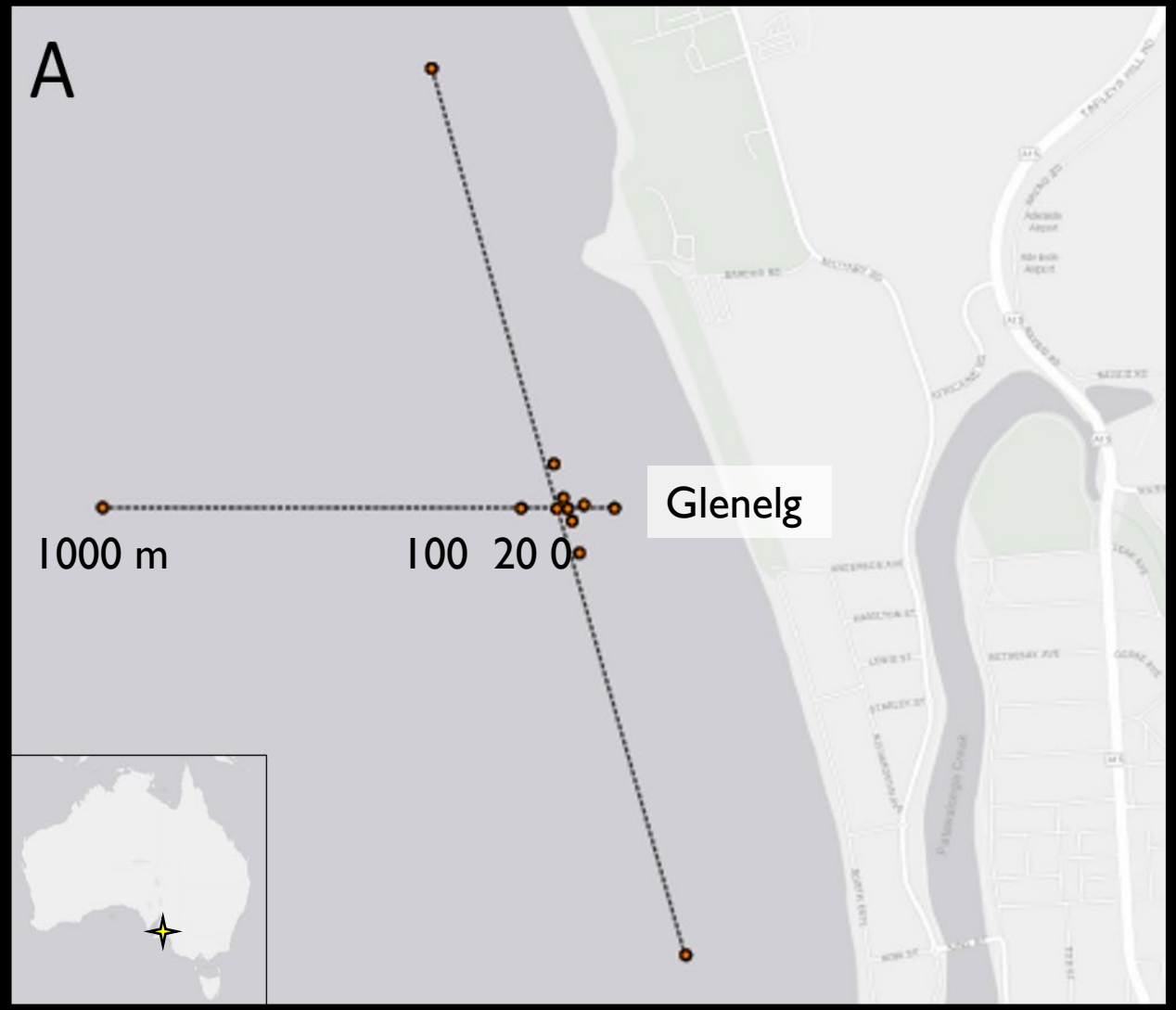
Spatially structured sampling design



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