



National Environmental Science Program

Coastal contaminants

Contaminants of Emerging Concern:
PFAS, antimicrobials, microplastics

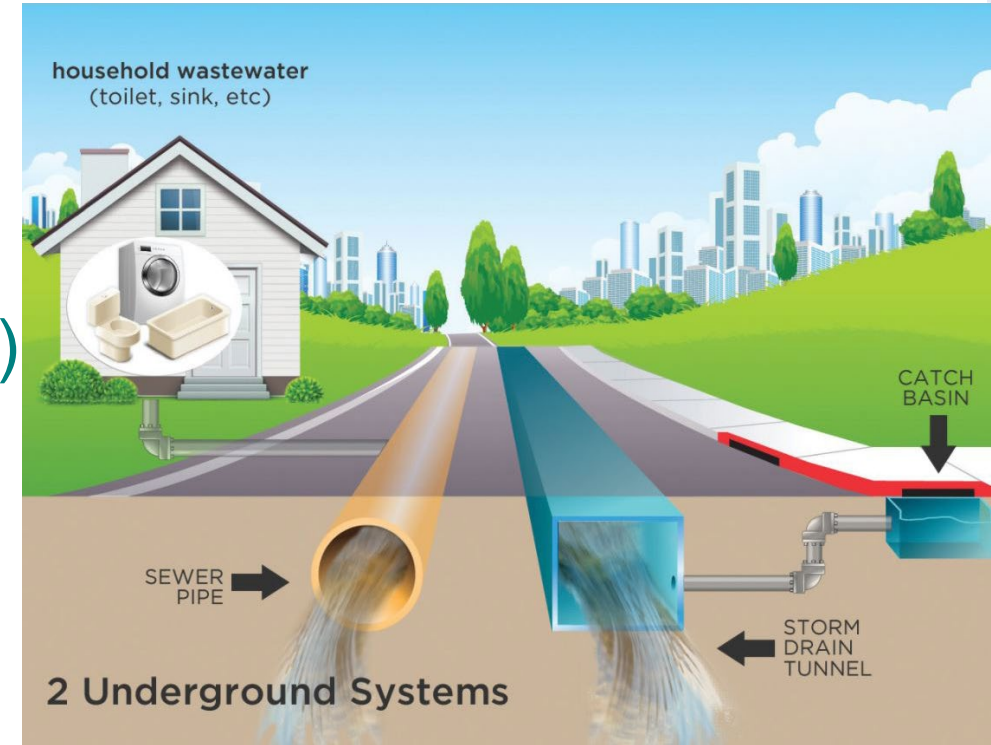
Prof Martina A. Doblin
University of Technology Sydney

On behalf of project 2.4, 4.22



Coastal pollution

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

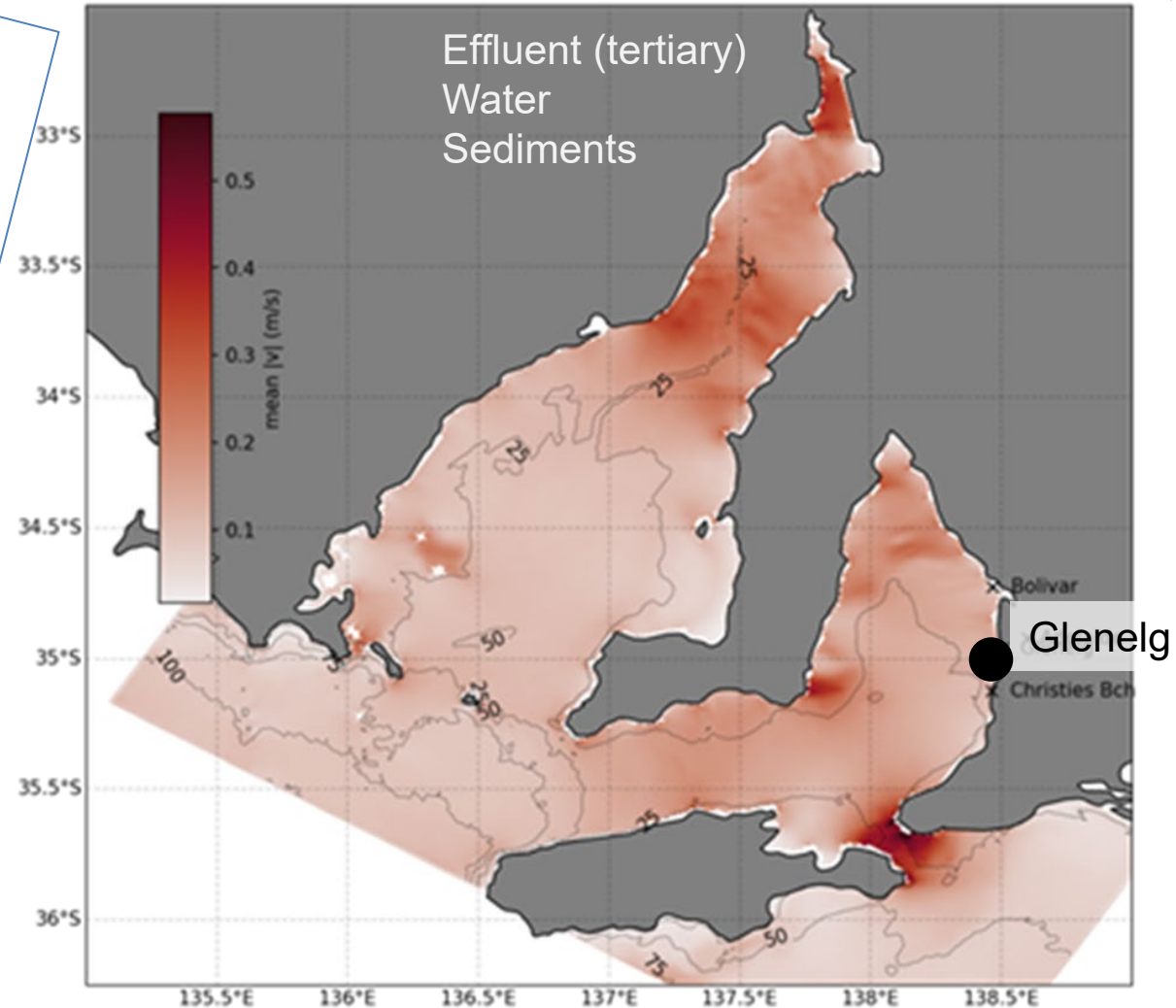


Study Objectives

- 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

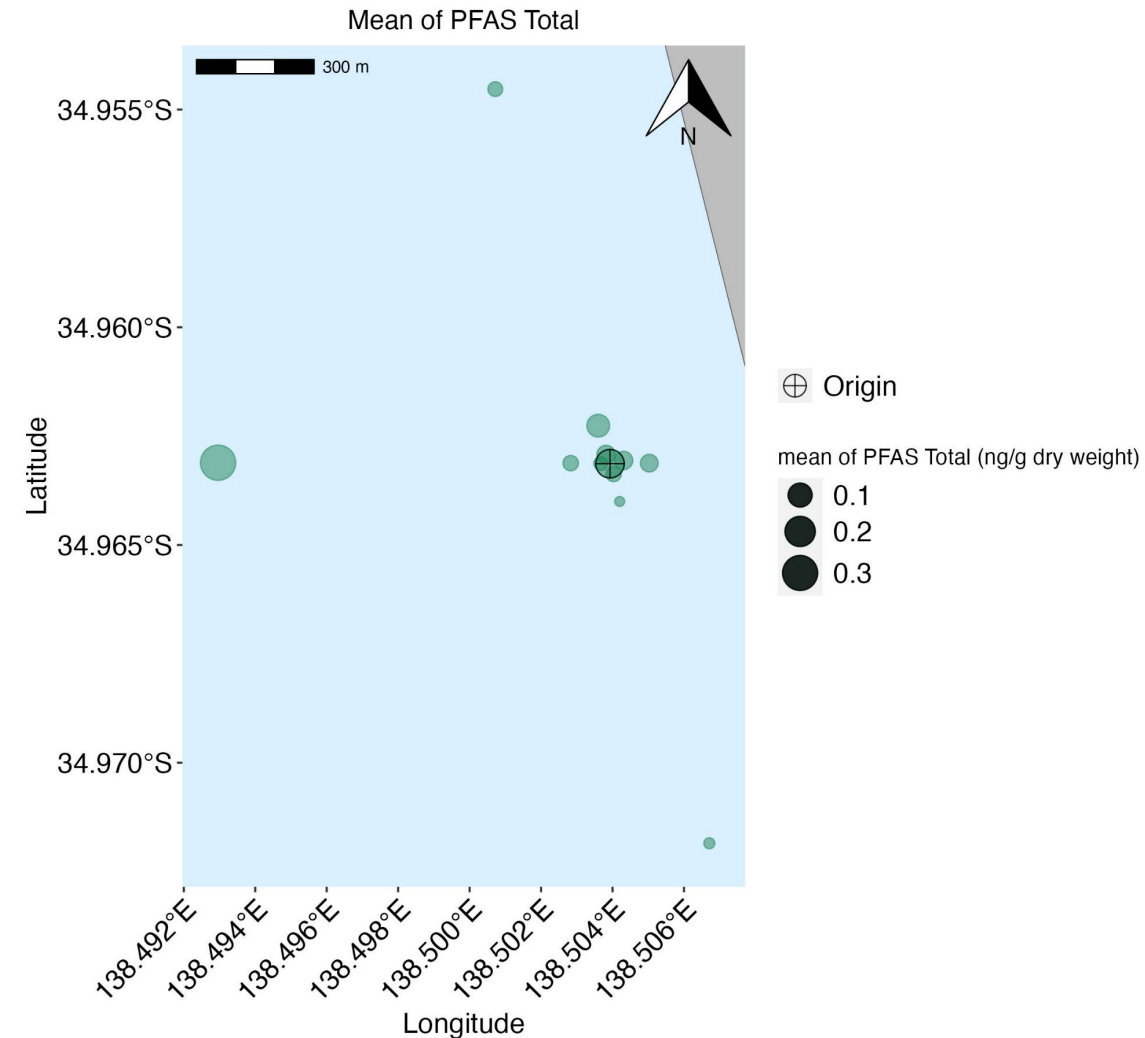
- 4 nutrients
- 39 metals
- 15 antibiotics
- microplastics (<5 mm)
- 26 species of PFAS

Kuarna: Retentive receiving environment



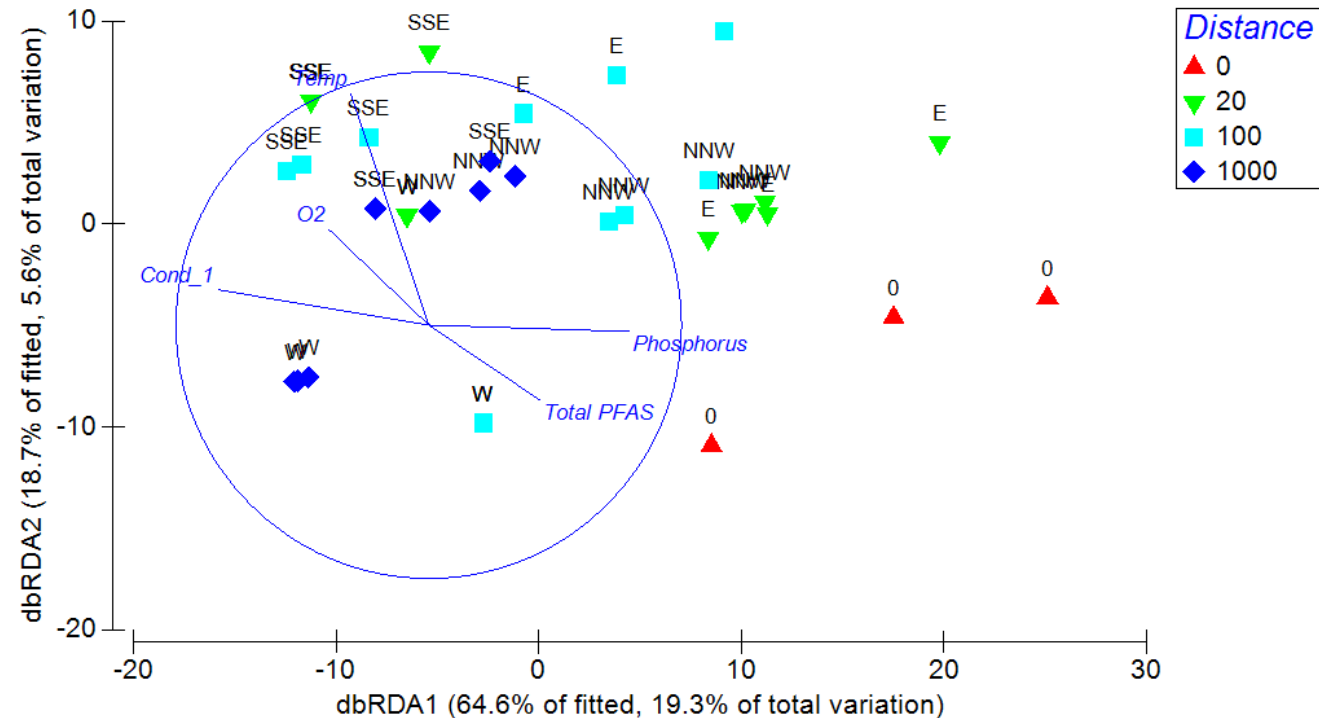
WWTP Study Findings: Environmental concentrations

- 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

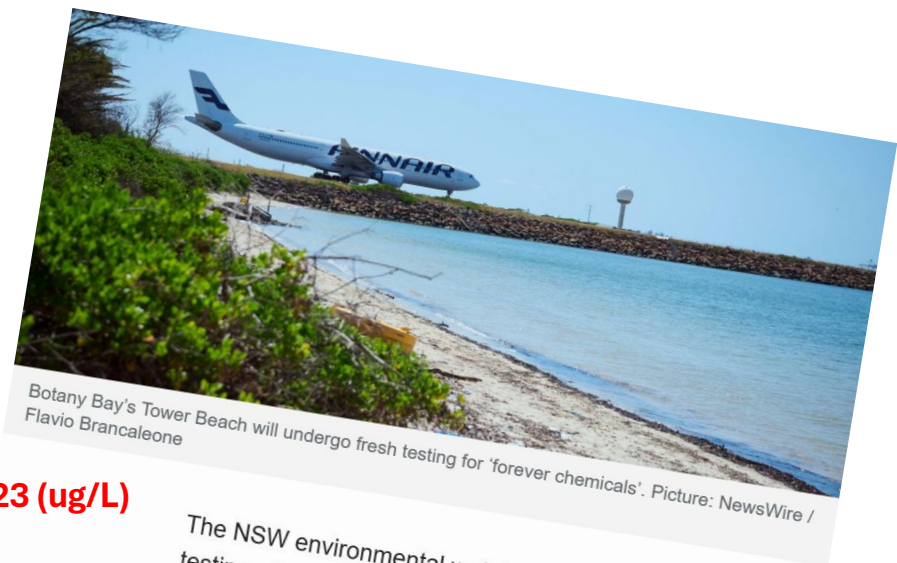
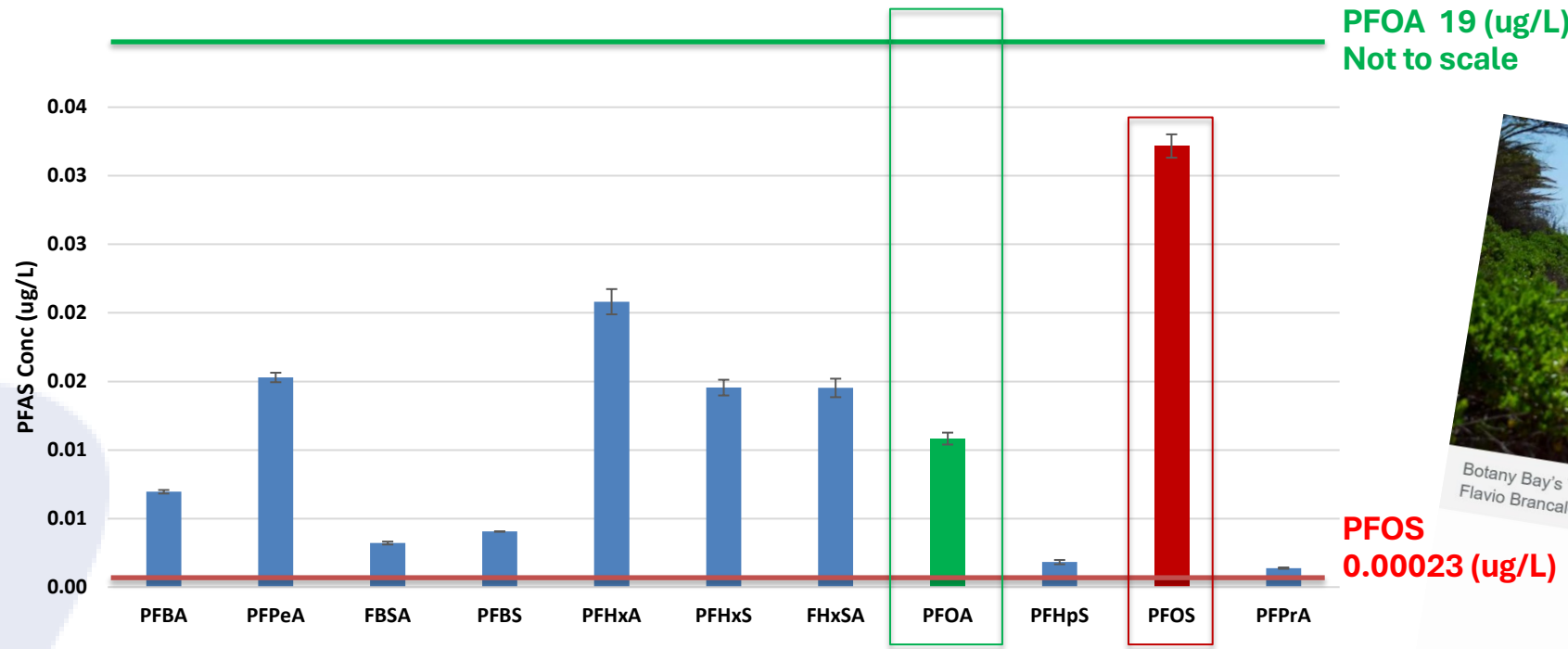
Some exceedance of PFOS Guidelines in the context of tertiary treated effluent into a retentive receiving environment

- Many more stormwater discharges into estuaries and coastal waters



Stormwater Findings: Environmental concentrations

PFAS in stormwater - Yarra Bay discharge (n=3)



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

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

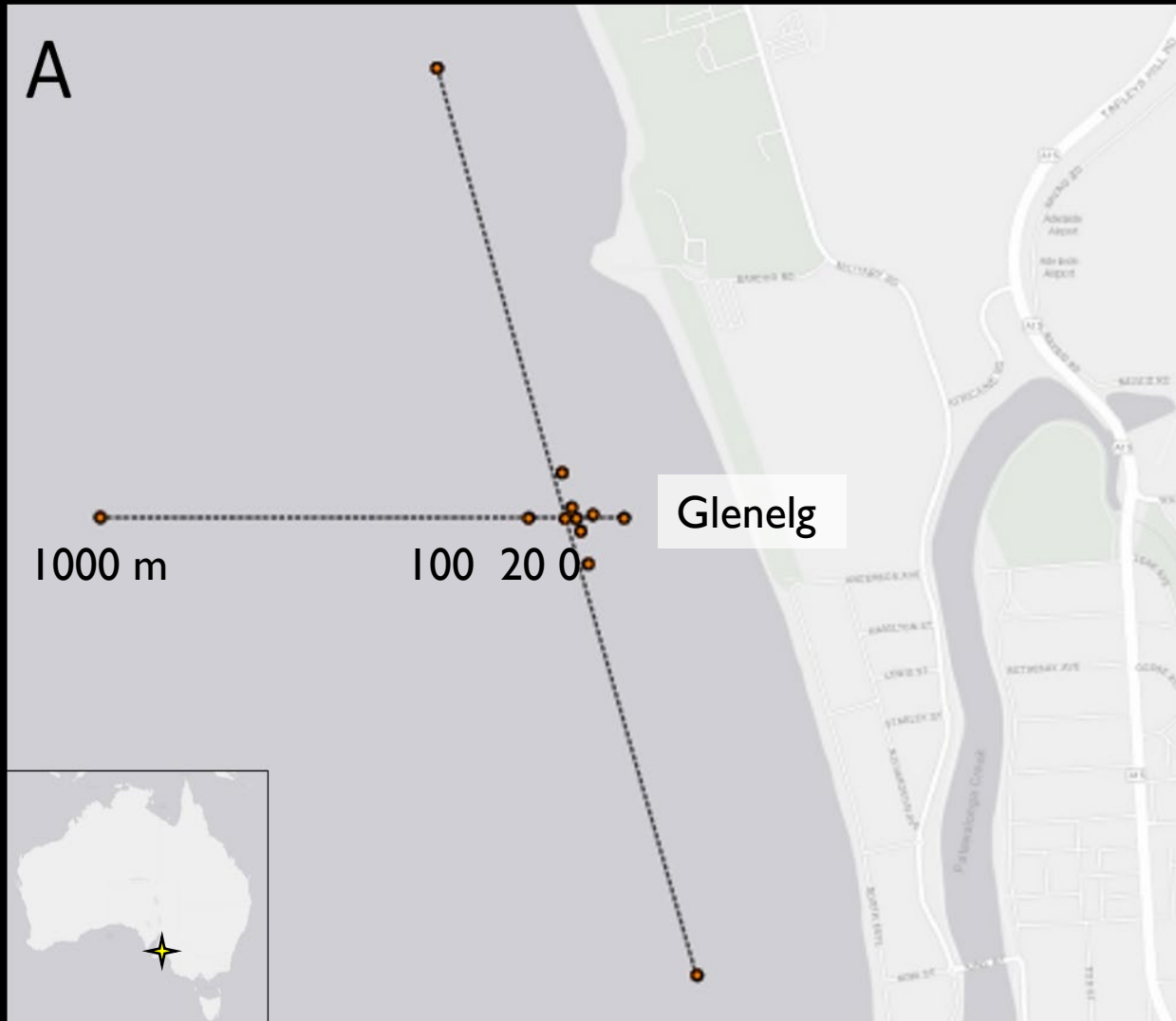
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Spatially structured sampling design



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