Summary Pilot Monitoring Trial – Warriewood Beach

Samples of water were collected by surfers at Warriewood and Turimetta Beaches (north and south of the Warriewood outfall) in North Sydney, on three occasions in the surf zone by members of Surfrider as part of citizen science research conducted for the National Outfall Database.

The intention of the pilot survey was to determine if variations in water quality caused by a known outfall could be scientifically detected by recreational water users/citizen scientists.

Beaches either side of the Warriewood outfall, North Sydney, were selected for monitoring due to:

- Existing concerns acknowledged by two stakeholders Sydney Water and Surfrider
- An existing notification system for by-pass events making potential changes in water quality to easier to detect.
- Warriewood beach having no other major source of local runoff contributing to contamination (ie. stormwater outfalls, creeks etc.)

Surfers were trained in sterile sampling techniques and a NATA accredited Lab was used to analyse samples. One (1 litre) sample was collected at each site.

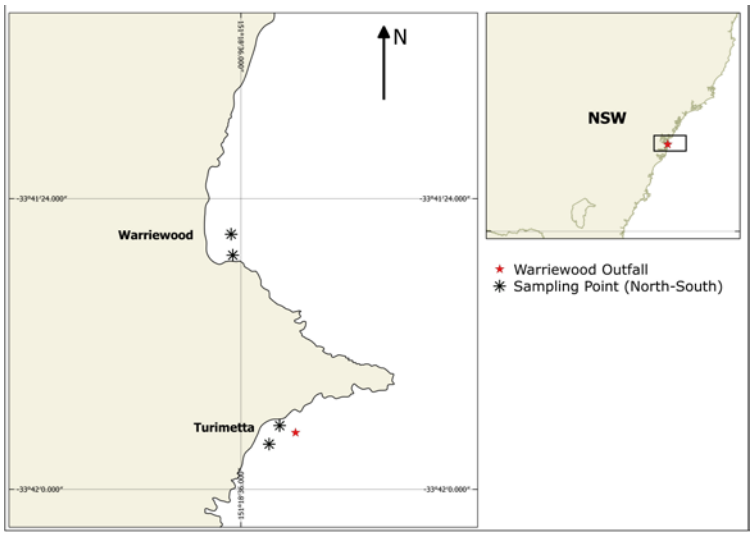
				26/05/2017 Baseline for April	08/06/2017 Bypass event 7-8th June	21/06/2017 Baseline after June Bypass
Warriewood	**North**	Enteroccci	CFU/100ml	<1	95	<1
		Faecal Coliforms	CFU/100ml	N	230	<1
		Escherechia	CFU/100ml	N	180	<1
Warriewood	**South**	Enteroccci	CFU/100ml	<1	78	<1
		Faecal Coliforms	CFU/100ml	N	250	<1
		Escherechia	CFU/100ml	N	250	<1
Turimetta	**North**	Enteroccci	CFU/100ml	<1	8	<1
		Faecal Coliforms	CFU/100ml	N	6	<1
		Escherechia	CFU/100ml	N	3	<1
Turimetta	**South**	Enteroccci	CFU/100ml	<1	1	<1
		Faecal Coliforms	CFU/100ml	N	6	<1
		Escherechia	CFU/100ml	N	3	<1

N – Not tested

Methods

Location of sampling points.

Note: collection point estimated by surfer collecting sample hence some variation likely +/- 15 metres.



Warriewood North	33°41'28.4"S 151°18'34.8"E
Warriewood South	33°41'31.0"S 151°18'35.0"E
Turimetta North	33°41'52.1"S 151°18'40.8"E
Turimetta South	33°41'54.4"S 151°18'39.5"E
Warriewood Outfall	33°41'48.4"S 151°18'50.3"E

Surfers (members Surfrider Australia) trained in sterile sampling technique and collection in 1 litre sample jar provided by laboratory. These were then placed in backpack and brought to shore. The samples where then decanted into jars sterile vessels as specified by laboratory, packed in an esky with ice and delivered to laboratory (ALS Sydney) laboratory by courier within stipulated time (3-4 hours) for analysis of coliforms etc.

Initially it was intended for surfers to also measure certain parameters at the beach, for correlation with laboratory results. It was hoped that these observed parameters might provide some low cost indicators that could be done on regular basis leaving only the more expensive tests (coliforms etc.) to be employed when suspicion of contamination was high. These were to include: turbidity, pH, specific gravity, nitrate and phosphate.

However concerns were raised by the participating surfers that these were too complicated and it quickly became apparent that compliance would become an issue with these volunteers if the sampling became too rigorous. Importantly the surfers were aware that the incidence of coliforms occurred only at times of bypass and felt little motivation to monitor the water outside of these times.

It was therefore decide to focus on sample collecting for laboratory analysis only.

The first baseline sample took two sample at each beach (sample north and south). After review of results and observation of the area it was decided that because of the observable uniformity of water quality only one sample would be collelcted on baseline days. Two samples (one at each location north/south) would be collected on bypass days).

Summary

The bypass event samples were collected between 10 and 11am on the 8th July approximately 12 hours after notification at by Sydney Water at (approx.) 11pm on the 7th of July.

The samples collected from the surf zone after the bypass event showed higher than baseline measurements of Ecoli/Faecal Coliforms and Escherechia organism concentrations in the water.

Concentrations of coliforms were higher at Warriewood than at Turimetta which is consistent with ocean conditions at the time with a “sweep” from South to North. It is likely that the source of the increased coliform count was discharge of wastewater from the Warriewood Treatment Plant during the bypass event.

Discussion

Warriewood presents a good opportunity to examine the impacts of wastewater treatment plant outfalls on water quality as it is not conflicted with the discharges of stormwater to the same area. The land surrounding this beach drains away from the beach to the hinterland.

The results of one test regime for the water in the surfzone at either side of the outfall gave positive levels of coliforms to the north and south of the outfall. The levels to the south were single digit CFU/100ml but still above background both before and 2 weeks after the event. The levels detected to the north of the outfall (Warriewood North and South) were more than 10 times the south of the outfall (Turimetta North and South) levels. This was consistent with the wind and current conditions at the time.

The coliform levels particularly at Warriewood following the bypass event are cause for concern for recreational water users. It is not possible to determine the level of risk from one set of tests. Further background and tests during abnormal operating conditions of the wastewater treatment plant are necessary to provide a good picture of the outcomes. These should also be compared to the condition of the outfall effluent itself so that dilution factors and the relationship between the outfall condition and the water can be drawn.

Conclusions

From this small pilot study of one bypass event the indication is that surfers trained in proper sampling techniques can be used to sample water quality on an ongoing basis. These techniques can be adapted to detect changes in water quality that might potentially impact on the health of recreational water users.

Abnormal wastewater treatment plant conditions can release detectable concentrations of pathogens into an ocean waterbody and this may increase the health risk to recreational water users after such events.

John A Gemmill - CEO Clean Ocean Foundation
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https://www.nod.org.au/
http://www.cleanocean.org/
https://www.nespmarine.edu.au/

Marine Biodiversity Hub
National Environmental Science Programme

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Table 5.7 Basis of derivation of percentile values for determining microbial water-quality assessment categories

Category[a]	95th percentile value for intestinal enterococci/ 100 mL (rounded values)	Basis of derivation	Estimation of probability
A	≤40	This value is below the NOAEL in most epidemiological studies.	GI illness risk: < 1% AFRI risk: < 0.3% The upper 95th percentile value of 40/100 mL relates to an average probability of less than one case of gastroenteritis in every 100 exposures. The AFRI burden would be negligible.
B	41–200	The 200/100 mL value is above the threshold of illness transmission reported in most epidemiological studies that have attempted to define a NOAEL or LOAEL for GI illness and AFRI.	GI illness risk: 1–5% AFRI risk: 0.3–1.9% The upper 95th percentile value of 200/100 mL relates to an average probability of one case of gastroenteritis in 20 exposures. The AFRI illness rate would be 19 per 1000 exposures or approximately 1 in 50 exposures.
C	201–500	This represents a substantial elevation in the probability of all adverse health outcomes for which dose–response data are available.	GI illness risk: 5–10% AFRI risk: 1.9–3.9% This range of 95th percentile values represents a probability of 1 in 20 to 1 in 10 risk of gastroenteritis for a single exposure. Exposures in this category also suggest a risk of AFRI in the range of 19–39 per 1000 exposures or a range of approximately 1 in 50 to 1 in 25 exposures.
D	> 501	Above this level there may be a significant risk of high levels of illness transmission.	GI illness risk: > 10% AFRI risk: > 3.9% There is a greater than 10% chance of illness per single exposure. The AFRI illness rate at the guideline value of 500 enterococci per 100 mL would be 39 per 1000 exposures or approximately 1 in 25 exposures.

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