SUBMISSION:
INQUIRY INTO PLASTIC POLLUTION IN AUSTRALIA'S OCEANS AND WATERWAYS

For House Standing Committee on Climate Change, Energy, Environment and Water – December 2022

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Introduction

Clean Ocean Foundation thanks the committee for the opportunity to submit this information and would be happy to discuss it in more detail if required.

The views and comments expressed in this submission are Clean Ocean Foundation's alone, and in no way should be interpreted as those of any other body.

Who is Clean Ocean Foundation?

Clean Ocean Foundation (COF) is a community based environmental charity seeking to stop all forms of ocean and river pollution.

What do we know?

Our body of knowledge has been gained through both collaborative and independent research. Over the past two decades, we have been recognised as honest brokers supporting communities with concerns related the water sector.

COF has also learnt much since it began producing the National Outfall Database (NOD) in 2015. The NOD is an initiative for the National Environment Science Project (NESP) which assists decision makers and the wider community to understand the issues related to the impact of outfall discharges on the marine environment and recreational users.

COF believes that Australia cannot afford to make costly decisions about our nation's water infrastructure without thoroughly and scientifically assessing the impacts on our aquatic environment today and into the future.

What do we want?

Our Clean Water Clean Ocean policy seeks wherever possible to stop the contribution that discharges from waste water treatment plants make to the pollution of this nation's ocean and waterways. It recommends a 3-point plan is designed to maximise water recycling and minimise aquatic pollution by embracing a circular economy approach to water policy.

1. UPGRADE ALL OUTFALLS
2. POLLUTANT CAP NOW/DATE & ZERO BY DATE FOR AND RIVERINE AND COASTAL OUTFALLS
3. CITIZEN JURY/FORUM ON PURIFIED RECYCLE WATER FOR DRINKING PURPOSES

What have we done?

Clean Ocean Foundation timeline:

2000 Clean Ocean Foundation is established as an environmental charity.

2006 After a long campaign, welcomes Victorian government's decision to upgrade Eastern Treatment Plant to discharge Class A+ advanced.

From 2015 – Produces the National Outfall Database annually under auspices of the Federal National Environment Science Program (Marine and Coastal Hub)

2020 – Independently releases National Outfall Upgrade Strategy (NOUS 2030) advocating for a national approach to waste water treatment and water recycling.

2022 – Releases national Clean Ocean Clean Water Policy.

Large scale microplastic pollution from waste water treatment plants

"1 million T-Shirts a year dumped into our ocean from Australia's outfalls"

Equivalent amount of plastic microfibres from discharged Australia's outfalls.

"A plastic thread long enough to reach the moon and back four times"

If Microfibres from one outfall over a year were joined together

We have estimated that nationally we discharge into our coastlines and waterways the equivalent of over *1 million T-Shirts a year from our waste water treatment plants (WWTPs)* as microplastic fibres[i].

What are microplastics?

Microplastic are defined as any particles of synthetic plastic smaller than 5mm.

What are microfibres?

Microfibres, a subset of microplastics, are from synthetics make up a 35% of all microplastic pollution[ii] in the environment.

Microfibres are fibrous in shape and can be smaller than 20 micrometres in size.[iii]

What risk is related to these pollutants?

The risks related to microplastics are well documented.

Microplastics are also known to also act as vectors for additives in the manufacturing process and organic pollutants adsorbed from the surrounding environment. They can be transported by deep sea currents to important biodiversity hotspots.

Fiore 2022 states: "Dispersed in the environment, microplastics threaten the equilibrium of many ecosystems and affect nearly all living beings…. Animals of lower trophic levels ingest microplastics mistaking them for food, and animals of upper trophic levels assume microplastics too, indirectly through "polluted" prey or directly through water ingestion".

One major concern is also the leachates from the plastic itself. A recent study showed how sea urchins raised in sea water with high levels of plastic pollution died from developmental abnormalities.[iv]

Ingested by the smallest organisms, microplastics enter the food chain and ascend to the top threatening human beings. The most dangerous foods are fish, in particular shellfish and crustaceans due to their filter feeding behaviour.

Microfibres just one of the pollutants from Australia's waste water treatment plants

Waste water discharged around Australia routinely contains microplastic microfibres from synthetic clothing along with other contaminants including forever chemicals, pharmaceuticals, pathogens and nutrients. These discharges are regulated by state and territory EPAs.

Australia's coastline has 193 coastal outfalls that discharge enough effluent from WWTPs to fill Sydney Harbour almost three times. [v]

Inland in NSW alone, there 214 outfalls from WWTPs that discharge into Australia's waterways.[vi]No accurate number is known for the rest of Australia.

What is known about microplastic discharges from our Australia's Waste Water Treatment Plants (WWTPs)?

Little data is publicly accessible related to microplastic discharges from WWTPs in Australia.

Water treatment authorities are only required to publicly release data as specified by their relevant Environment Protection Agency (EPA) license. Although there is a developing body of knowledge that exists within Water Treatment Authorities (WTAs) related to microplastics, it is difficult and time-consuming for community, who have a different perspective on risk management and the value of externalities to access this data in an effective manner.

There is no EPA license issued to a waste water treatment plant in Australia, that regulates or requires monitoring of microplastic fibres in any context. This includes the setting of permitted discharge levels.

CSIRO research into microplastic in wastewater stated that both Malabar and Cronulla WWTPs discharged up to "Tens of millions to hundreds of billions of microplastics are released to the marine environment each day from two Sydney WWTPs"[vii] . Malabar, one of Australia's big three ocean outfalls that only receive primary treatment before discharge (all located in Sydney), is likely to be one of the largest point sources of microplastic pollution in Australia.

It is generally accepted that the more comprehensive the treatment of wastewater the more microplastic is removed. Treatment of wastewater can broadly be categorised into primary, secondary and tertiary, advanced tertiary and purified recycled water.

Table 1 Removal efficiency of each treatment step and final content of MPs in outlet effluent and sewage sludge

Removal efficiency				MP content		References
Preliminary	Primary	Secondary	Tertiary	In effluent	In sludge	
n.a	25%	75%	98%	n.a	n.a	Poerio et al. (2019)
35–59%	50–98%	86–99.8%	98–99.9%	0.1–2%	69–80%*	Sun et al. (2019)
6–58.6%	19.1–99%	66.7–92.6%	72.7–99.9%	n.a	n.a	Cheng et al. (2021)
n.a	25–45.31%	51–72.82%	90–99%	15–35%	n.a	Xu, Zhang, et al. (2021)
35–59%	15–40%	3–37%	0–24%	1–35%	80–99.9%*	Hou et al. (2021)
35.1–58.6%	56.8–98.3%	84.3–99.7%	92.2–99.9%	0.1–7.8%	n.a	Xu, Bai, et al. (2021)

*Of retained MPs; *n.a.* not available

Table from: Tackling Marine Microplastics Pollution an Overview of Existing Solutions viii

Research has indicated that microplastic capture rates in WWTPs are as low as 50% for primary treatment, 86% for secondary treatment and 98% for tertiary treatment. However, there is a great deal of uncertainty due in large part to of different technologies employed.[ix] [x]

Current removal of microplastics by WWTPs involves the collection of microplastics in sewage sludge, like other intercepted solids. These are often used as a soil conditioner (biosolids). Hence microplastics are not eliminated but will either enter the waterways as stormwater runoff or end up in cultured products for human consumption.[xi] Comprehensive information on this is not currently publicly available in Australia but is collected by the Australian and New Zealand Biosolids Partnership[xii].

This is potentially very serious problem but outside the scope of this submission.

Which Australian WWTPs are the top microplastic emitters?

Using data collected from the NOD and estimates from the top emitters of microfibres along the Australian coastline are shown below:

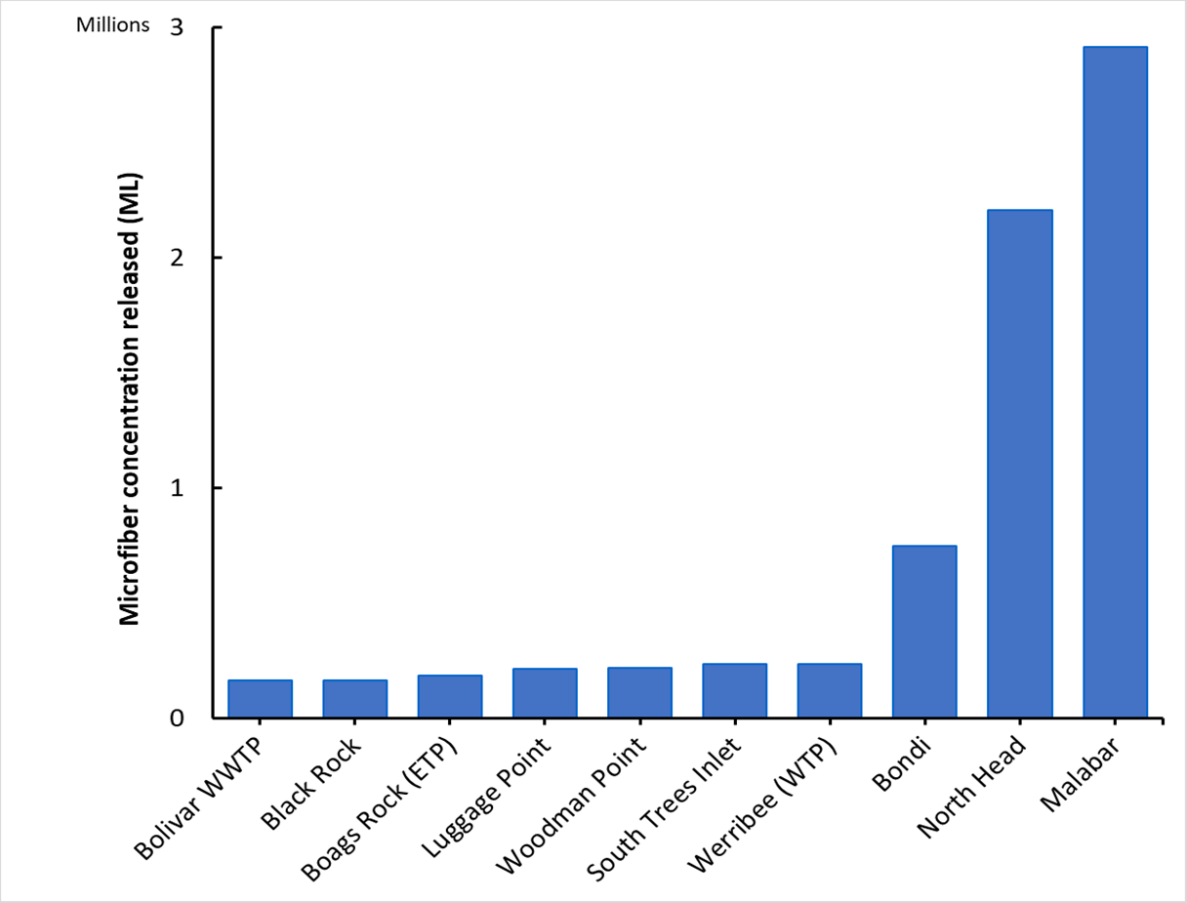


Table 1 Top Emitters Microfibres 2018/2019 – Clean Ocean Foundation

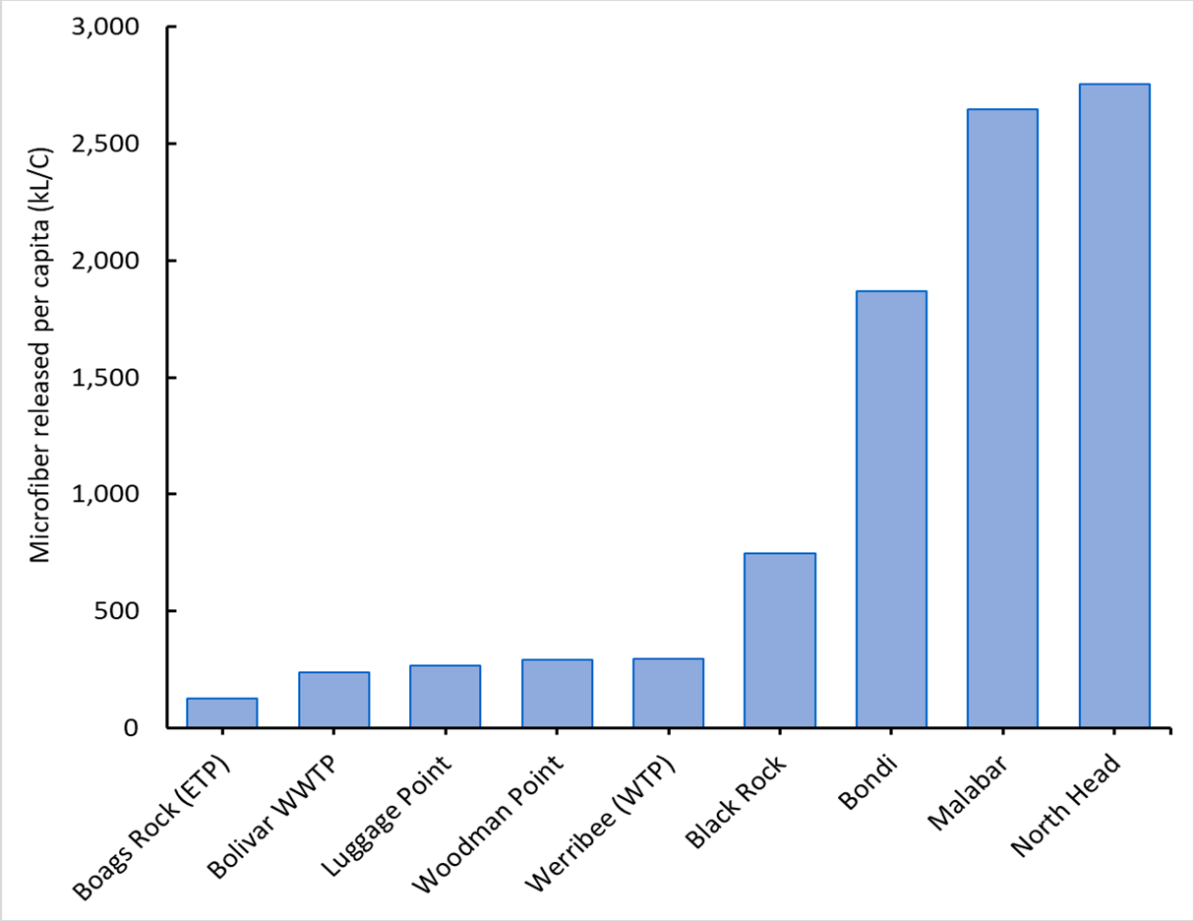


Table 2 Top Emitters Microfibres per capita 2018/2019 – Clean Ocean Foundation

What happens to microplastic emitted from Australia's WWTPs?

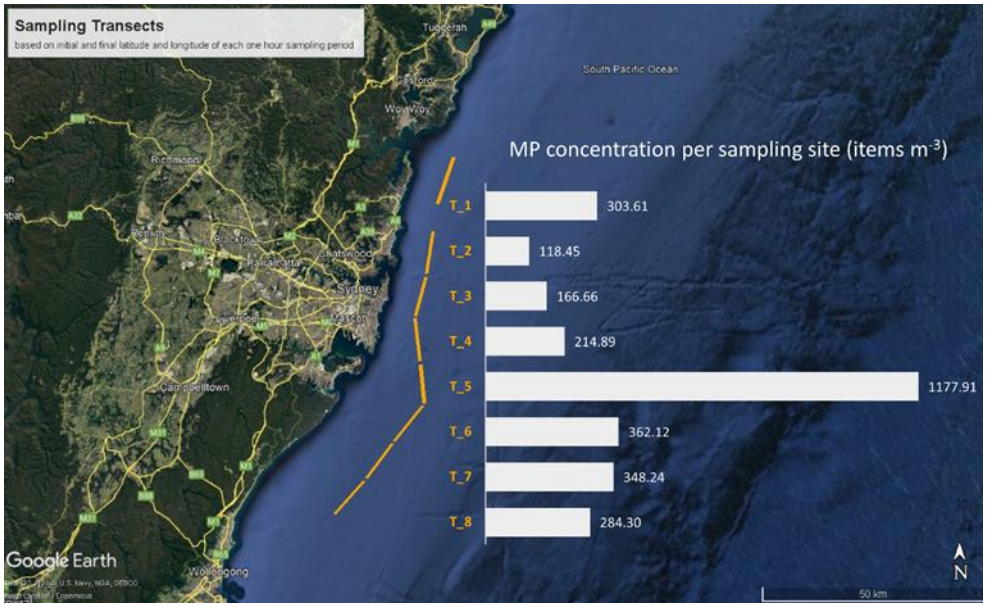
Little is known about the ultimate destination and impact microplastic discharge from individual WWTPs.

Institute Marine Observing System (IMOS) and Australian Institute of Marine Science (AIMS) are currently developing and operationalising a general microplastics monitoring program to assess microplastic contamination in Australian marine waters. A map of sampling sites is available on the Australian Ocean Data Network portal (aodn.org.au), where curated microplastics data is publicly available.

Clean Ocean Foundation and round the world sailor Lisa Blair in collaboration IMOS and AIMS have recently conducted a study of microplastics off the NSW urban coastline especially adjacent.

Clean Ocean Foundation initiated this research of urban waters as a demonstration of how example citizen science research can contribute to an understanding of ocean pollution from urban environments. We chose NSW because with three large primary outfalls it was the most likely of all to have detectable levels of microplastic fibres.

Although only an initial "proof of concept" for citizen science based opportunistic sampling of subsurface waters the research found, "polyethylene and polyester fibres were the most prevalent polymer types detected and the highest numbers were recorded adjacent to urban outfalls"[xiii]. We will be seeking further funding to continue this research.



Average microplastics concentration across NSW transects T_1 to 8 (units are microplastics per cubic metre per sampling transect.

How much microplastic is that?

We calculate that based on findings from these results, from the Malabar outfall alone, over one year there is enough microfibre to form a thread that could reach the moon and back 4 times.[xiv]

What national action has been taken to reduce microplastic emissions from WWTPs?

In 2021 action was a taken at National level to reduce microplastic pollution. As part of the National Plastics Plan - "The government said it would work with industry to have microfibre filters fitted to all washing machines sold in Australia by 2030." This action is in line with France (by 2025) and under consideration by the EU and California[xv].

Is this enough?

No. Although a useful step, especially in to reduce microplastic contamination of biosolids, it will not stop microplastics entering aquatic environments from WWTPs.

There are significant limitations in relation to:

- Efficiency of individual filter design and maintenance.
- Legacy issues related to the uptake of new washing machines.
- Population pressures increasing overall pollution.
- The level of treatment provided at the WWTP.

What further action is needed?

The principle behind this initial policy, taking precautionary action at a national level, to reduce microplastic pollution, needs to be embraced as we move forward. Implicit in this approach is the

fact that responsibility for ocean and river pollution cannot be left to either individuals or waste water treatment authorities.

Pollutants such as microplastics are not natural and do not breakdown and once discharged by an individual WWTP may travel and effect biota half an ocean away.

Simply put: one dirty outfall that discharges billions of microplastics is not one community, one water treatment authority, one state or territory's problem – it is everyone's problem.

Are upgrades to WWTPs a viable way of reducing Australia's microplastic pollution?

Upgrades to treatment plants have the potential to significantly reduce the amount of microplastic pollution and can also provide the opportunity significant benefits in terms of water recycling.

Our independent research led us in 2020 to release our National Outfall Upgrade Strategy (NOUS)[xvi] based on our research estimating the net benefit of upgrading all non-tertiary WWTPs to produce Class A+ recycled water. This approach is based on the discharge from Melbourne's Eastern Treatment Plant where half of its waste water is treated to Class A+.

This research found a net benefit of $20-30 Billion from taking a national approach to these upgrades[xvii]. Almost two-thirds of benefits were to be gained in NSW where Sydney's three big outfalls discharge primary treated waste water from North Head, Bondi and Malabar.

As a result of emerging concerns related to microplastics, forever chemicals and other contaminants contained in aquatic discharges from WWTPs, we have revised our position to advocate for major waste water plants to upgraded to produce fully recycled to potable level (purified recycled water) wherever possible.

This would substantially reduce the amount microplastics, and other pollutants, discharged to aquatic environments. It also would be economically competitive with the cost of water manufactured through the process of desalination but produces better environmental outcomes including using less energy. Net benefits would be higher than estimated in our initial research.

COF also notes that there are significant advances in new technologies[xviii] that may be suitable for use in all non-primary WWTPs to further remove microplastics.

What are the obstacles to upgrading WWTPs that could stop microplastic pollution?

Cross jurisdictional barriers. Perraton, SC 2015[xix] "A range of barriers to wastewater recycling have been identified including an inability to account for the external impacts of water management." Some considerations include:

- Investment decisions are biased by urban wastewater governance, economic policies for pricing and profits, application of principles of competition in absence of competition, and the level of past investment.

- Feasibility of wastewater reuse technologies changes with the conditions in which the feasibility of reuse is framed.

- The comparative level of formality or transparency in the assessment processes.

- The inability of environmental regulations to account for external impacts of wastewater disposal.
- Resistance to potable recycling using purified recycled water.
- Lack of data related to WWTPs and microplastics.
- Poor water literacy in general community.

Recommendations

A more exhaustive study of the net benefits of upgrading the nations WWTPs to Purified Recycled Water, that builds on previous work be undertaken.

The proposed new national EPA sets guidelines for the collection of data on routine basis for Water Treatment Authorities related to key emerging pollutants, including microplastics and water recycling. This data must be made publicly accessible.

National Outfall Database be expanded to include all inland river discharges.

Formal development and adoption for standards for the public reporting of influent and effluent reporting and water recycling should be adopted in relation to all waste water treatment plants in Australia. Data should include monthly average discharges, as is done for other parameters for the National Outfall Database on an annual basis.

Any water infrastructure proposals seeking federal support should be assessed based on their commitment to reducing pollutants released to the environment and circularity of the overall project.

A sensitivity analysis of critical variables related washing machine filters and any other actions to be taken at a household level, be undertaken to better understand the impact of all waste water treatment plants systems on microplastic pollution.

A national cap on the discharge from all waste water treatment plants of all pollutants of concern, and of emerging concern, be with the states and territories.

A national education program in water literacy, that emphasises the benefits of a circular economy for the whole water sector, including WWTP, to be introduced. This would help underline that fact that waste water treatment plants no longer hold a social license to pollute the ocean or river environment when alternatives exist and discuss the issues associated with the use of purified recycled water for potable use.

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