The background image shows a wide, flat mudflat area in the foreground, partially covered with green algae or seaweed. In the middle ground, there is a body of water with several sailboats docked at a marina. The background features a line of trees and a clear blue sky.

Occurrence and Distribution of Microplastics in the Mudflat Sediments of the Medina Estuary, Isle of Wight

Presented by: Liberty Turrell

November 20th, 2024

The Global Plastic Problem



Washing clothes



Abrasion of vehicle tyres



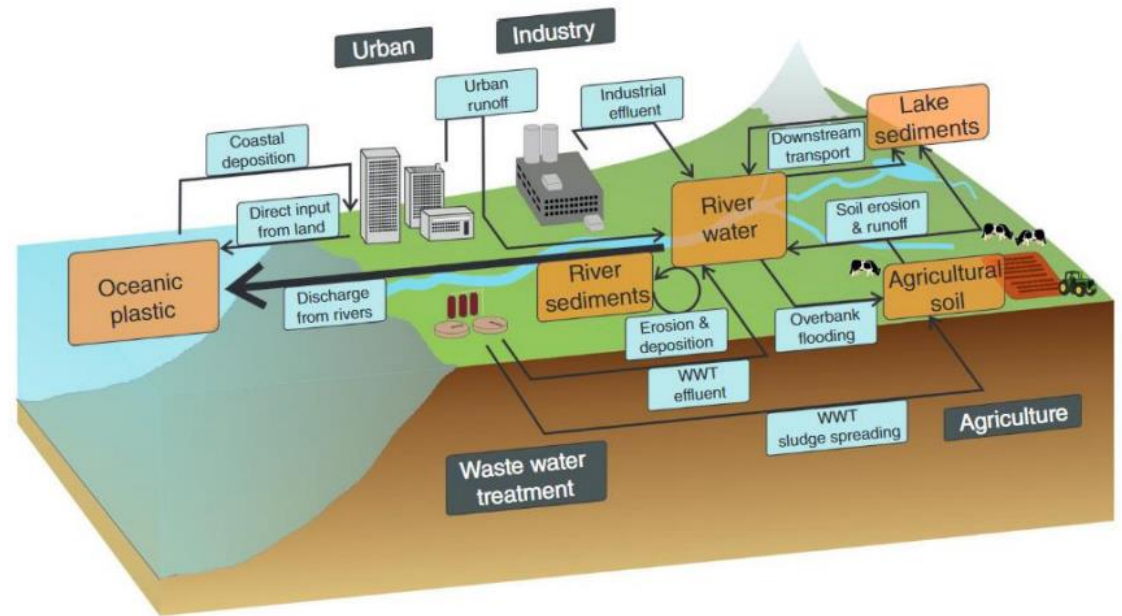
Road markings



City dust



Marine protective coatings

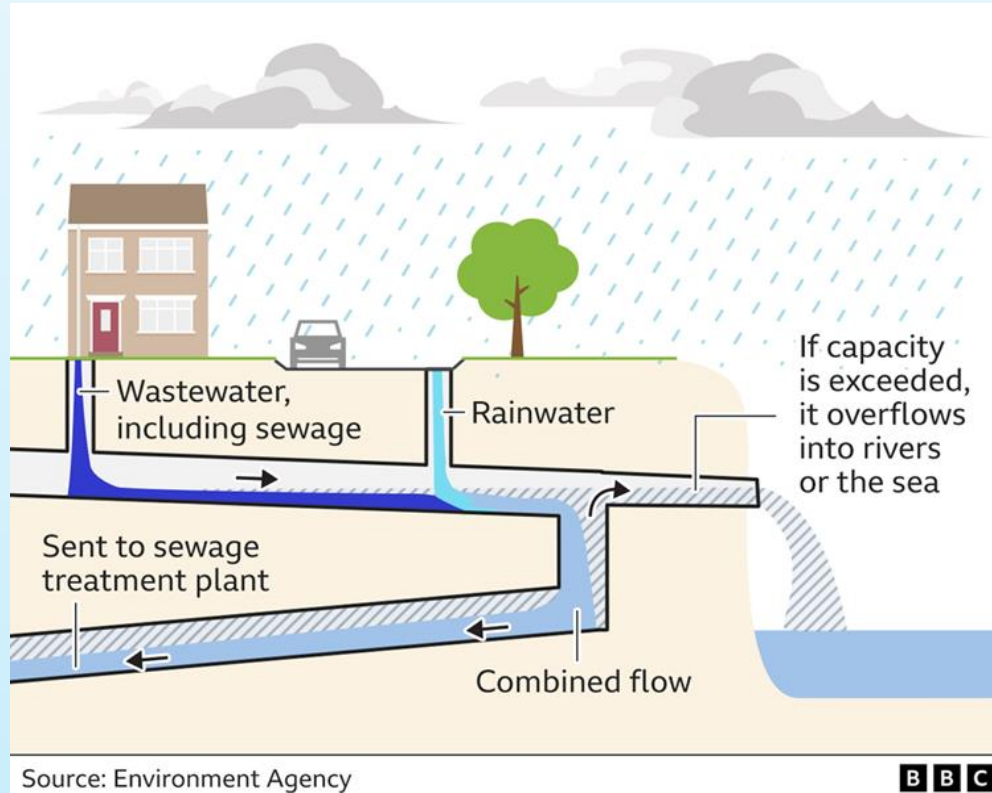


Sources of Microplastics (Boucher and Friot, 2017)

Source: Horton and Dixon (2017)

Sewer Overflows as a Source of Microplastics

“Combined sewer overflows are a necessary part of the existing sewerage system, developed as overflow valves to reduce the risk of sewage backing up during heavy rainfall” (Environment Agency, 2024).



There were **464,056** monitored ‘spill’ events into waterways by water companies in England during 2023, which is a **54%** increase from 2022 (Environment Agency, 2024).

Consequences of Microplastic Pollution

Potential health effects:

- Impacting reproductive capability (Li et al., 2021)
- Induced oxidative stress causing cell damage (Barboza et al., 2019)
- Reduced feeding activity affecting growth (Wright et al., 2013)



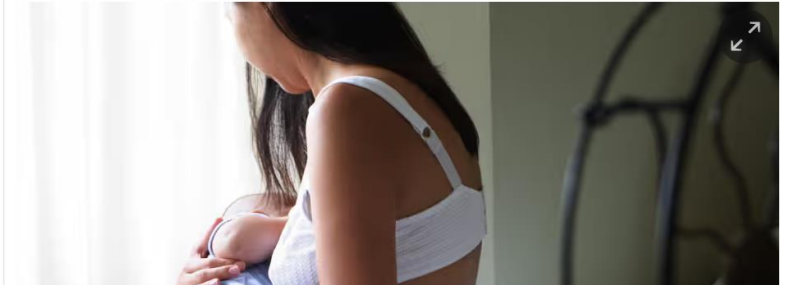
[Home](#) > [Animal Facts](#) > [Marine Animals](#) > [Scientists Just Collected 11 Petri Dishes Of Dolphin Breath – And f](#)

Scientists just collected 11 petri dishes of dolphin breath – and found something very worrying

The exhaled air – collected from wild bottlenose dolphins in Florida and Louisiana – contained harmful microplastics, say the researchers.

Microplastics found in human breast milk for the first time

Exclusive: Researchers concerned over potential health impacts of chemical contaminants on babies



Article | [Open access](#) | Published: 31 January 2019

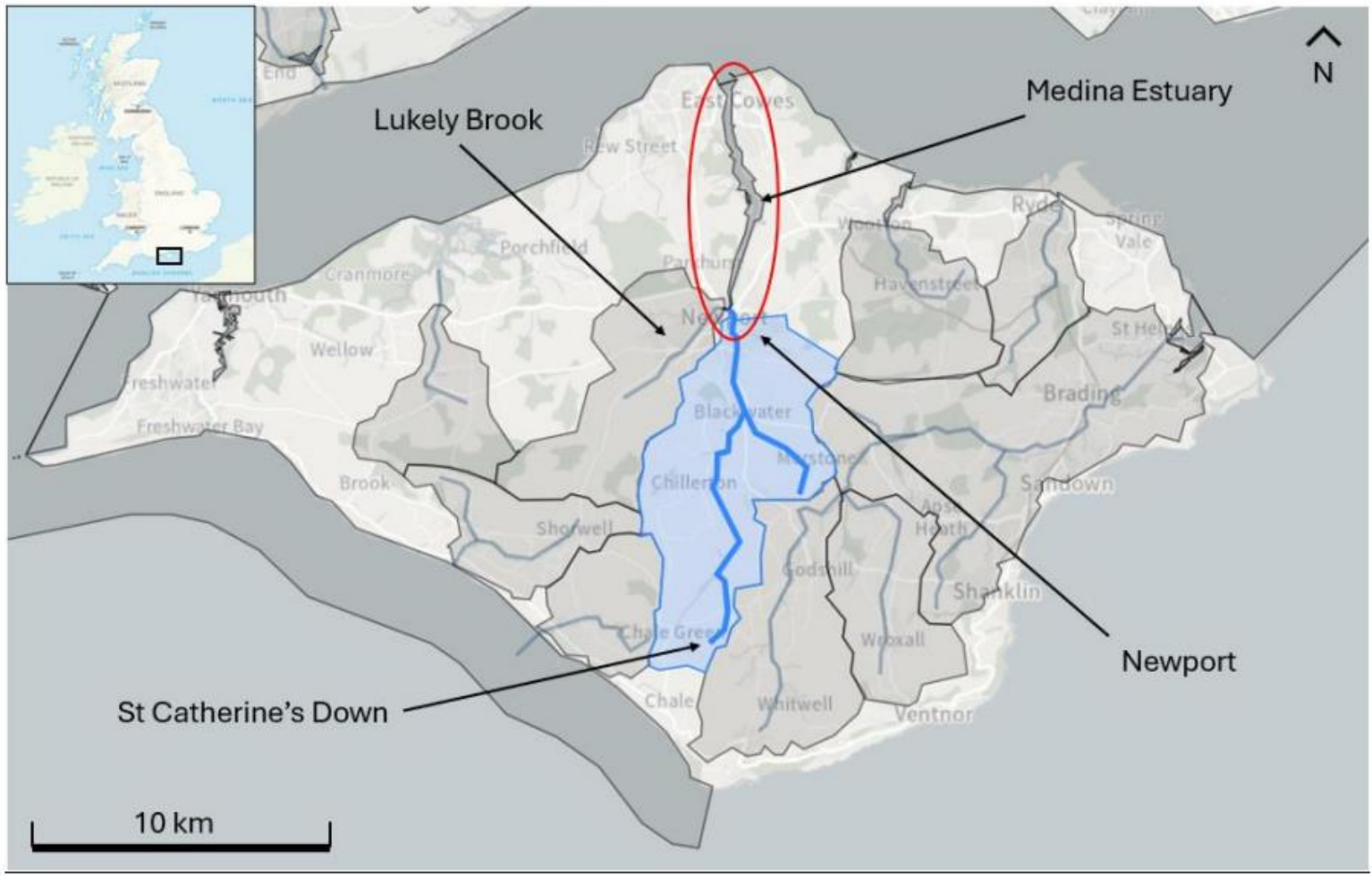
Microplastics in marine mammals stranded around the British coast: ubiquitous but transitory?

[S. E. Nelms](#) , [J. Barnett](#), [A. Brownlow](#), [N. J. Davison](#), [R. Deaville](#), [T. S. Galloway](#), [P. K. Lindeque](#), [D. Santillo](#) & [B. J. Godley](#) 

[Scientific Reports](#) **9**, Article number: 1075 (2019) | [Cite this article](#)

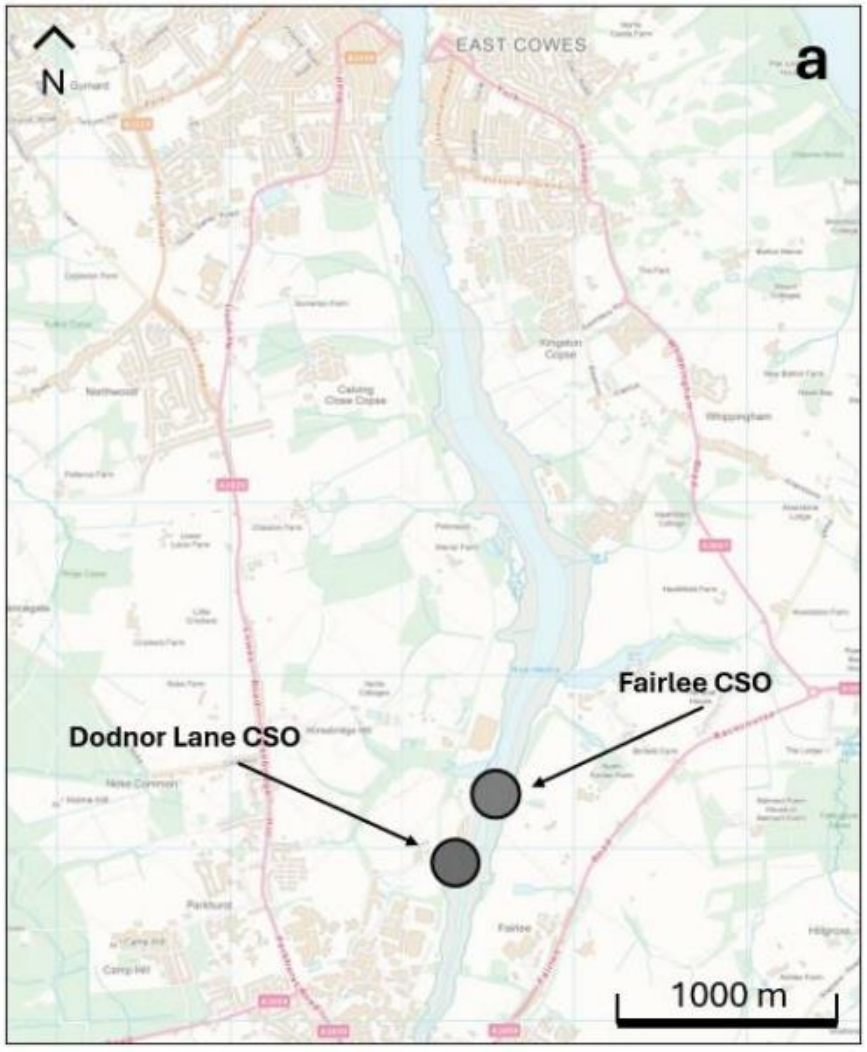
38k Accesses | **260** Citations | **1254** Altmetric | [Metrics](#)

The Medina Estuary



River Medina Catchment (Source: Digimap, 2023; Environment Agency, 2023)

Water quality of the Medina Estuary



Source: The Author

	Dodnor Lane Pumping Station CSO & EO			Fairlee CSO		
	2021	2022	2023	2021	2022	2023
Total duration (hrs) all spills	483.06	535.22	998.59	957.81	757.32	1,933.72
Counted spills	77	75	108	73	63	117

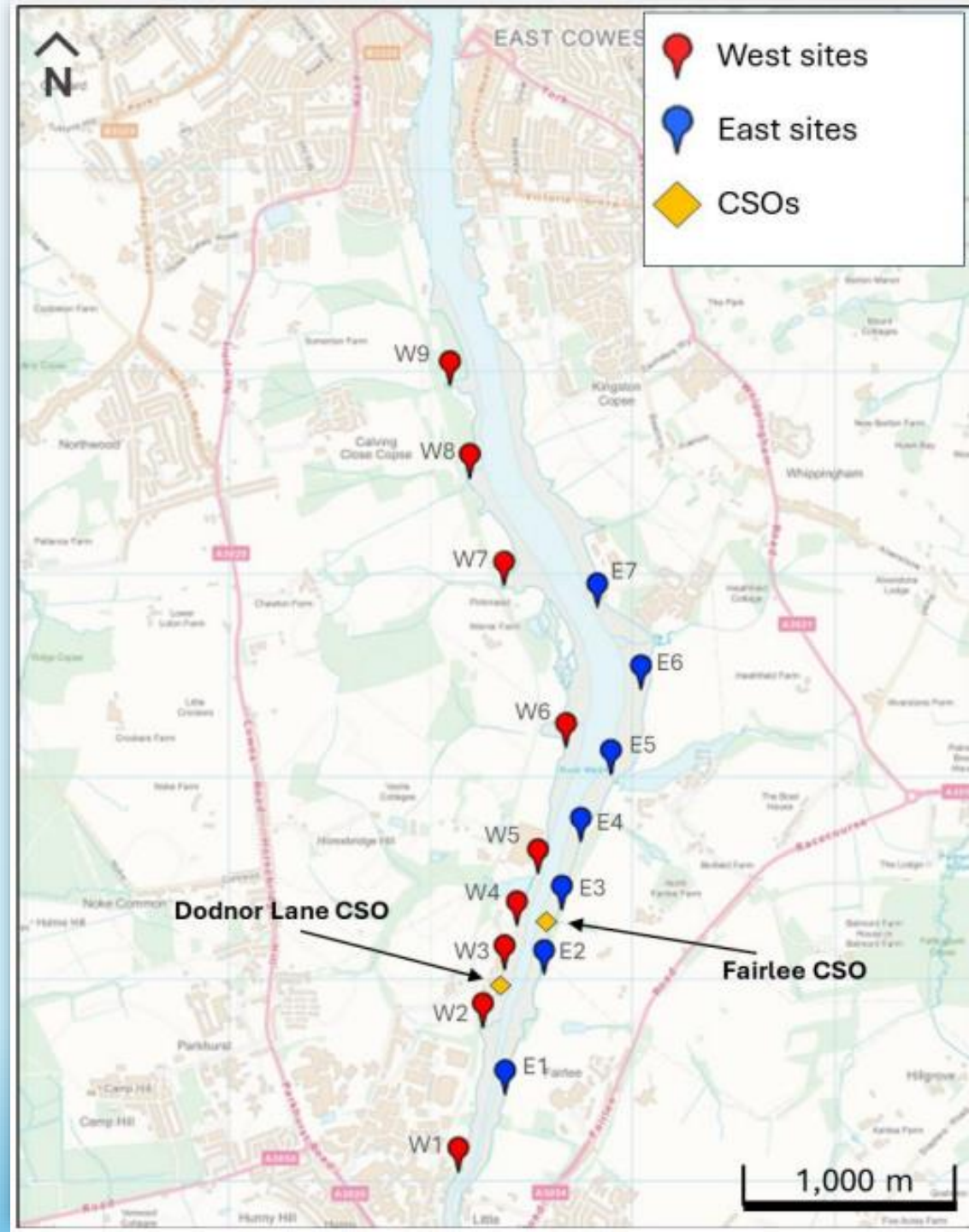
Source: Environment Agency (2024)

In 2022, the overall ecological status of the Medina catchment was assessed as ‘**moderate**’ by the Environment Agency, which ranks mid in the 5 possible classes (Environment Agency, 2023)

Methods

Field Sampling Strategy

- 16 sites
- 500m intervals (systematic)
- Eastern and western mudflats
- Increased sampling upstream and downstream of CSOs
- Samples taken from high tide mark
- Representative sample captured
- Top 2cm of sediment was sampled



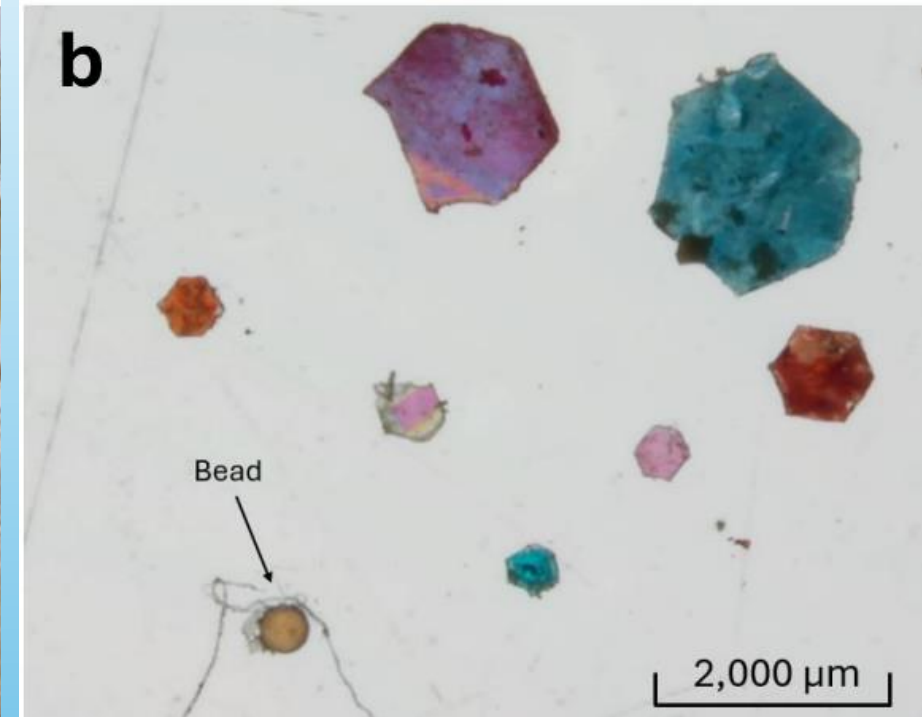
Methods

Lab analysis procedure

1. Removal of organic matter
2. Wet sieving
3. Density separation
4. Filtration
5. Microplastic extraction and identification
6. Hot needle test
7. Microplastic quantification



Results: Microplastic Assemblage



Microplastic assemblage at site W7

a) The immense quantity of microfibres estimated at **$\sim 130,000$ items** kg^{-1} d.w. mudflat sediment.

b) Microfragments and microbead.

Discussion: Microplastic Pollution of Estuarine Sediments



Estuary	Location	Microplastics kg ⁻¹ d.w. sediment	Dominant microplastic shape	Citation
<u>Kayamkulam Estuary</u>	India	433	Fibre	(Radhakrishnan et al., 2021)
<u>Fuhe River Estuary</u>	China	558 ± 233	Fragment, fibre	(Zhou et al., 2021)
Changjiang Estuary	China	121± 9	Fibre	(Peng et al., 2017)
<u>Haihe Estuary</u>	China	216 ± 92	Fibre	(Wu et al., 2019)
Pearl River Estuary	China	851 ± 177	Fibre	(Zuo et al., 2020)
Carrick Roads Estuary	Falmouth, UK	827 ± 162	Fragment, fibre	(Nel et al., 2020)
Ebro Estuary	Spain	2,052 ± 746	Fibre	(Simon-Sánchez et al., 2019)
Guanabara Bay Estuary	Brazil	528 ±30	Fibre	(Alves and Figueiredo, 2019)
Tampa Bay Estuary	USA	280 ±290	Fibre	(McEachern et al., 2019)
17 estuaries in Caspian Sea	Iran	351 ± 233	Fibre	(<u>Ghaye b zadeh et al., 2021</u>)
Jagir Estuary	Indonesia	217	Fibre	(Firdaus et al., 2020)
Medina Estuary	Isle of Wight, UK	2,147	Fibre	Present study

Discussion: Wastewater as a Source of Microplastics



Conclusions

- Estuaries have been largely overlooked in research concerning the fate of microplastics in the aquatic environment.
- The prevalence and abundance of microplastics found in the intertidal mudflat sediments has highlighted a severe contamination issue of the Medina Estuary
- Primary microplastics, especially microfibres, dominate the microplastic assemblage which is indicative of the wastewater system as responsible for the release of these pollutants
- Whilst the spatial pattern of microplastic concentrations observed is partly influenced by the CSOs, these particles exhibit great distributional heterogeneity throughout the estuary
- Intertidal mudflats serve as temporary sinks for microplastics prior to their expulsion from the estuary.