

Preventing plastic pollution in the Itchen estuary

Feasibility Study

Southampton City Council / Environment Agency

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EXECUTIVE SUMMARY

PLASTIC POLLUTION IN THE ITCHEN ESTUARY

The issue of plastic pollution in the Itchen estuary is now being studied and reported on in increasing frequency, with recent research emanating from the University of Southampton and media coverage including an excerpt on the BBC One Show. This has highlighted that there are greater concentrations of microplastic pollution in the Itchen estuary than elsewhere in the river and the wider Solent estuarine complex. A major hotspot of plastic pollution is present within Chessel Bay, a nature reserve located on the eastern bank of the estuary, from which approximately 4 tonnes of plastics were removed in early 2023, as part of a large-scale clean-up, coordinated by Southampton City Council, the University of Southampton and Nurdle.

ASSESSING THE FEASIBILITY OF A PARTNERSHIP PROJECT TO PREVENT PLASTIC POLLUTION

The Environment Agency, Southampton City Council, Natural England, Southampton University and the Wessex Rivers Trust recognise that the key to the long-term prevention of plastic pollution in the Itchen estuary is to establish a collaborative partnership committed to delivering measurable environmental improvements to the estuary through prevention, reduction and clean-up of plastic pollution. This report represents a feasibility study conducted to inform the development through a partnership to prevent plastic pollution in the Itchen estuary. To address this a situational analysis of plastic pollution and its governance in the Itchen estuary has been conducted, in addition a stakeholder engagement programme. This has led to the development of a set of next steps for the development of a future partnership.

PATHWAYS, SOURCES AND IMPACTS OF PLASTIC POLLUTION IN THE ITCHEN ESTUARY

An estimated 80% of marine plastic waste originating from land-based activities, with plastics reaching the Itchen estuary through direct discharge, fluvial inputs from upstream, marine inputs and from atmospheric and aeolian processes. Sources are multiple and diverse and include wastewater treatment plants, plastics manufacturers and converters, transport and logistics, marine and maritime industries and the local community. In terms of impacts, plastic pollution has the potential to harm the river's flora and fauna, which includes a range of protected species, in addition to negatively affecting maritime infrastructure, transport and logistics, in addition to recreational users and fisheries.

GOVERNANCE OF PLASTIC POLLUTION IN THE ITCHEN ESTUARY

Multiple challenges exist in relation to the management of plastic waste and pollution in the Itchen catchment, which are presented in Section 3 of this report. Plastic pollution is by definition a transdisciplinary and transboundary problem with policy and regulation fragmented and incomplete. For example, no regulatory requirement exists to monitor for plastics in riverine, estuarine or marine environments, whilst the Environment Agency does not have the resources to impose fines and compliance measures in all instances of plastics leakages.

STAKEHOLDER ENGAGEMENT WITH PLASTIC POLLUTION IN THE ITCHEN ESTUARY

A series of key informant interviews, informal telephone conversations and a workshop were held with stakeholders from across the plastics value chain. The key outcomes from this process included a varied understanding of plastic pollution in the Itchen estuary, with good practice in terms of plastics management occurring, but more action required. In addition to this, stakeholders involved in the workshop were in agreement that the viability of any future partnership was dependent on appropriate leadership and funding, in addition to cross-sectoral stakeholder representation from across the plastics value chain.

NEXT STEPS TOWARDS PARTNERSHIP DEVELOPMENT

This study has identified a clear willingness and enthusiasm among stakeholders to develop a partnership aimed at tackling the problem of plastic pollution. Although this requires a comprehensive set of solutions across the plastic value chain and waste management hierarchy, involving all key stakeholders, there is present an opportunity to develop an innovative approach to tackling a local and global issue. Section 6 of this report presents the next steps required to get such a collaborative partnership off the ground and these are summarised as follows:

1. Establish a steering group to guide the work of the partnership, with representation from a range of key stakeholders including the private sector

To deliver a fully collaborative cross-sectoral partnership, a steering group should be established and composed of a range of key stakeholders including those from private industries that handle plastics within the Itchen catchment, including the maritime, plastics and wastewater industries.

2. Define the scope of the partnership

The steering group must determine the scope and boundaries of the partnership. This is critical given the range of partnerships that operate within the Itchen catchment and will ensure the partnership has clear direction and an actionable brief.

3. Develop a roadmap for change

The steering group should take responsibility for developing an actionable, time-bound roadmap for change that reflects the nature of the funding landscape to ensure the partnership delivers a long-lasting legacy.

4. Explore funding options to facilitate the partnership

It is recommended that the steering group seeks funds from willing partners to provide initial facilitation. To maximise active participation, this could be followed by an approach whereby each partner commits either funds and/or resources towards the partnership's objectives.

5. Appoint an individual or organisation to facilitate or lead the partnership

A partnership requires appropriate leadership to ensure the delivery of its objective, with one option being to externally recruit a partnership manager/officer or utilise existing personnel from an organisation that is part of the steering group. Alternatively, an independent organisation or individual could be appointed to facilitate the partnership moving forward.

1.0 INTRODUCTION

1.1 CONTEXT

The River Itchen is a chalk stream that rises at Hinton Ampner, south of New Alresford (Southern Water, 2020), flowing south westerly for 28 miles, through Winchester and into the suburbs of Southampton, before coming tidal at Woodmill Bridge. Draining into Southampton Water, it is administratively considered part of a wider Test and Itchen catchment (Environment Agency, 2019), though is a separate hydrological catchment fed by 8 separate tributaries including the River Arle, Candover Brook, Cheriton Stream and Monks Brook and comprises an area of 415 km² (Hampshire County Council, 2021).

The river supports a rich diversity of flora and fauna recognised as being of national and international importance. It is designated a Site of Special Scientific Interest (SSSI) due to its classic chalk stream and river, fen meadow and flood pasture and swamp habitats. It is also a Special Area of Conservation (SAC), as it supports specific species of interest namely *Ranunculus fluitans* and *Callitriche-Batrachion* vegetation, as well as the populations of southern damselfly and bullhead. Downstream beyond where the River Itchen SAC terminates at Woodmill Lane, much of the tidal Itchen is designated as part of the Solent and Dorset Coast Special Protection Area (SPA), supporting habitat for three species of breeding tern. In addition, the tidal areas of the river are characterised by mudflats and saltmarshes that act as rich feeding grounds for a range of bird species, including the dark-bellied Brent Goose and various waders, in addition to a nursery for commercially important fish species such as bass. These areas form part of the Lee on Solent to Itchen Estuary SSSI and are also designated as part of the Solent & Southampton Water SPA and Ramsar site for breeding and wintering waterbirds and wetland habitats and invertebrates.

Commercially, water abstraction from the Itchen catchment supports both agriculture and aquaculture, with the majority of licensed abstraction being used by fish and watercress farms, and 23% of licensed abstraction contributing to the public water supply. The Itchen (and the Test) is also considered to be the world's top dry fly trout fishery, as well as supporting salmon fisheries within its lower reaches (Environment Agency, 2013). The tidal reaches of the Itchen are dominated by a range of waterside developments, such as boatyards, marinas and aggregate wharfs, with residential housing along both banks. The Monks Brook flows through a concrete channel within the Itchen Navigation Canal and joins the river upstream of Woodmill Bridge, after which the Itchen gradually becomes more natural in form.

Rivers are known for their role in transporting land-based plastic waste to the oceans, yet despite this, research into the impacts of plastic pollution on freshwater and estuarine environments has until recently been largely limited (van Emmerik and Schwarz, 2020). However, like many river systems in the UK and internationally, the Itchen is experiencing high levels of plastic pollution. A recent study of 13 rivers in the UK revealed that all contained microplastics, with the Mersey being the most polluted, with 875 pieces of plastic drawn from the river in the space of 30 minutes (Greenpeace, 2019). This research also included the Thames, further building on previous research by Horton *et al.* (2017) that found large microplastic particles in sediments of tributaries of the River Thames, with particularly high

levels found downstream of a storm drain outfall receiving urban runoff. Internationally, the Yangtze and the Ganges are known to be significant contributors to ocean plastic pollution, with the Ganges having an estimated input of 0.12 million tonnes per year (Duncan *et al.* 2020).

With respect to the Itchen, whilst there is only a limited evidence base, research does indicate that levels of microplastic pollution are higher in the Itchen estuary (both in the water column and surface level sediment) than in other parts of Southampton Water and the wider Solent estuarine complex (Gallagher *et al.*, 2016). In addition, recent studies (Rose and Hudson, 2023) of Chessel Bay on the eastern bank of the estuary have found levels of plastic pollution suppressing vegetation growth with more than 25% plastic debris coverage, in addition to significant quantities of microplastics covering surface sediment.

The build-up of plastic bottles and pellets has been reported by local news outlets (Southern Daily Echo, 2022), whilst Surfers Against Sewage (2020) have published investigations into microplastic pollution in Chessel Bay. This has led to community litter picks and the University of Southampton (2021) supporting a trial to clean-up the nature reserve in collaboration with Nurdle, a not-for-profit organisation resulting in the removal of approximately 4 tonnes of plastic waste from the shoreline.

The degree of plastic pollution in the Itchen estuary has the potential to have a negative impact on the ecology of the estuary and wider Solent, as well as river users and the local community. With much of it likely to have originated from local communities and businesses situated around the Itchen, the issue has led Southampton City Council, in partnership with the Environment Agency, to seek to establish a collaborative partnership committed to delivering measurable environmental improvements to the R. Itchen estuary through the prevention, reduction and clean-up of plastic pollution.

1.2 STUDY AIMS

This work will be used to inform the development of the partnership to prevent plastic pollution in the Itchen and has the following objectives:

- a) To deliver a feasibility study which outlines the evidence of plastic pollution, as well as identifying the drivers and tools that could be used to tackle it including the collation of all activities that are/could support this work. It will also identify funding options for a partnership development; an assessment of different approaches to progress work; and the recommended next steps to develop a partnership project to prevent plastic pollution in the R. Itchen estuary.

- B. To conduct stakeholder analysis to inform an engagement plan in support of the establishment of a partnership project to prevent plastic pollution in the R. Itchen estuary.

1.3 REPORT STRUCTURE

The report is organised into 6 sections, as follows:

- **Section 1** provides the introduction and context for the study.

- **Section 2** presents a situation analysis of plastic pollution in the R. Itchen estuary, including a review of the evidence, sources, pathways, receptors and impact.
- **Section 3** presents critical review of the governance of plastic waste and pollution in the Itchen catchment, including a gap analysis to highlight key weaknesses.
- **Section 4** presents the outcomes and results of the stakeholder engagement activities.
- **Section 5** presents a needs assessment based on the previous work to identify options for partnership development including a review of funding options and an assessment of feasibility.
- **Section 6** presents conclusions and recommendations.

NB: an overview of the methodology employed to deliver the feasibility study is contained in Appendix 6.

2.0 PLASTIC POLLUTION IN THE ITCHEN ESTUARY

2.1 INTRODUCTION

The issue of plastic pollution in the Itchen estuary was first highlighted in academic literature in 2016 and has been the subject of further study since (Gallagher *et al.*, 2016; Stead, 2021; Rose and Hudson, 2023). The results highlighted that there were greater concentrations of plastic pollution (microplastics) in the Itchen estuary than upstream of the tidal reaches and, in comparison to other areas within the wider Solent estuarine complex (Gallagher *et al.*, 2016; Stead, 2021). In addition to this, high levels of microplastics have been found in Chessel Bay, on the eastern bank of the Itchen estuary (Rose and Hudson, 2023). This was further demonstrated during a recent clean-up of Chessel Bay conducted by Nurdle (a not-for-profit organisation), in conjunction with Southampton City Council and the University of Southampton, which removed approximately 4 tonnes of plastics (including 234,000,000 pieces of microplastic) of from the site, over a four-month period at the beginning of 2023, a quarter of which was estimated to be nurdles.

The scale of nurdle pollution in Chessel Bay has also recently received significant media coverage (Daily Echo, 2021; Daily Telegraph, 2022; Southampton City Council, 2021), including being featured on the BBC One Show and Meridian News in 2023. The prominence of this issue has contributed to Southampton City Council holding a Scrutiny Inquiry Panel on protecting, preserving and promoting the use of the river Itchen (Southampton City Council 2023).

However, given the lack of a statutory requirement to monitor and report on plastic pollution, evidence of the full scale of the problem is still relatively limited. Nevertheless, this section will review the secondary data available to provide an account of the nature and extent of plastic pollution within the Itchen estuary, including reference to both published academic material and grey literature in the form of citizen science reports.

Whilst the evidence may be limited as to the scale of the problem, a broader understanding of the sources of plastic pollution, their pathways and impacts are well known, and these therefore will also be reviewed in relation to the Itchen.

2.2 PLASTIC POLLUTION IN THE RIVER ITCHEN ESTUARY AND SOLENT

Since the first peer reviewed study exploring levels of plastic pollution in the Itchen estuary (as part of a Solent wide study) was published in 2016, three subsequent pieces of academic research referencing this issue have been conducted. The results of these are summarised in Table 1.

The study of the Solent wide estuarine complex by Gallagher *et al.* (2016) found a total of 1155 microplastics in the water column during four trawls at separate sites in the Itchen, with the vast majority (937) found in one trawl within the estuary. More recently, Stead (2021), sampling from the surface mixed layer (SML) of sediment within the Itchen estuary at Southampton Water Activities centre, found an average abundance of 34.6 microplastics per litre, and an average of 8.6 microplastics per litre of water sampled.

Studies of Chessel Bay on the eastern bank of the estuary found average coverage of plastic debris in summer 2021 to be 25.5% and demonstrated that above 25% of plastic debris coverage plant life declined dramatically (Hudson and Robinson, unpublished). In addition to this, very high levels of microplastic contamination was found in shoreline sediments, with the highest concentrations (42.3%) contained in surface sediment (Rose and Hudson, 2023). Of the 7742 microplastic particles identified in the study, 77% were of secondary origin, whilst 23% were nurdles. This finding is also supported by a recent clean-up of Chessel Bay conducted by Nurdle, in association with Southampton City Council and the University of Southampton. By the end of March 2023, it was estimated that 11600 litres of material were removed from the site, of which 40% were plastics with a nurdle density of approximately 1 g/cm³. This equates to approximately 4 tonnes of plastics removed from the site and 1 tonne of nurdles (equivalent to roughly 50 million individual nurdles (Dekimpe *et al.*, 2023)).

Additional evidence for the recent publicity relating to plastic pollution of the Itchen estuary stems largely from an investigative report (Ayling, 2020) on nurdle pollution in Chessel Bay, published by Surfers Against Sewage; and publicised by the Friends of Chessel Bay who also raised it with the Environment Agency and Southampton City Council. The pollution levels were monitored weekly for a period of three months with the report highlighting the scale of the problem, with significant levels of nurdles (inches deep in places) found along the shore and in the reed beds of the bay. The study also investigated the areas surrounding the premises of three local plastic converters (ASK Plastics, SIVA Plastics and Polystar Plastics), reporting large quantities of nurdles found in gutters and drains and on nearby pavements and roads.

Table 1. Evidence of plastic pollution in the Itchen estuary

Source	Location	Type	Quantity
Rose and Hudson, 2023 (in review)	Chessel Bay	Micro	Very high but variable levels of microplastic contamination in the sediments of the shoreline. Highest concentrations of microplastics in surface sediment (up to 42.3% of sediment). Of 7742 microplastic particles enumerated in surface and subsurface samples, 77% were of secondary origin (fragment, foam, film, fibre/filament), whilst 23% were nurdles.
Hudson and Robinson (unpublished)	Chessel Bay	Micro and macro	Average coverage of plastic debris (summer 2021) was 25.5% (range 10-60%). Plastic debris suppresses vegetation coverage. Above 25% debris coverage, plant life declined dramatically, with no plant life present above 60% coverage.
Stead, 2021	Southampton Water - with one sampling point in the Itchen estuary	Micro	The surface mixed layer (SML) of sediment had an average abundance of 34.6 microplastics/L, and the bulk water samples had an average of 8.6 microplastics/L.

	at Southampton Water Activities Centre (SWAC)		Greater abundance of microplastics in the SML at SWAC compared to main channel of Southampton Water. Polymers identified in the SML include HDPE, polypropylene + vistalon and polyisoprene, in addition to vinyl chloride in bulk water samples.
Gallagher <i>et al.</i> 2016	Solent wide	Micro	Total of 1155 microplastics found across four trawls in the Itchen, with the highest number (937) found in the Itchen estuary. Of these 1155 microplastics, 959 were fibres.

In addition, citizen science reports of nurdles in and around the river Itchen estuary have been recorded on FIDRA’s ‘The Great Nurdle Map’ (FIDRA, 2023). Sightings of nurdles have been recorded from 2017 through to 2021, from as far upstream as Woodmill Bridge to downstream at Weston Point, as well as further east along the coastline of Southampton Water (e.g., Royal Victoria Park, Weston Point, Netley shore and Hook Lake at Warsash) (*ibid.*). A recent study has also highlighted that low energy intertidal areas represent significant sinks for microplastics, having the potential to be trapped within the substrate, and buried by sediment (Stead, 2021). This could also account for the vast quantities of nurdles found within Chessel Bay.

The wider study into the extent of microplastic pollution within the Solent estuarine complex also found more microplastics in the water column of the river Itchen, than other estuaries such as the Hamble and the Test draining into Southampton Water and the Solent (Gallagher *et al.* (2016). This study attributed the greater presence of microplastics to the influence of Southampton’s built-up area – both residential and industrial – including manufacturers of plastic products, through which the lower reaches of the Itchen flow. Despite the presence of the plastic industry however, this study found that the levels of raw feedstock (rounded pellets/nurdles) within the Itchen catchment were relatively low in the water column, as compared to fibres and microbeads (approximately 0.5mm in size) which were more common. Sewage and wastewater treatment plants were considered to be the most likely sources of these plastics, which in turn are likely to originate from a range of clothes, beauty and cleaning products.

In addition to this, it was suggested that the low number of irregular shapes recorded in the Itchen indicates that most plastics originate from local sources within the Itchen catchment and not from marine sources. The likelihood of this is increased given the ebb-dominated nature of the Solent estuarine complex, in which more sediment and water is carried out of the estuary than brought in. A citizen science pilot project conducted by the Wessex Rivers Trust (2021) also collected 9 fragments of secondary microplastic in one sample within Monks Brook (a tributary of the river Itchen and upstream of the tidal reaches). Although the study did not successfully collect microplastic particles or fibres, this also indicates that nurdles are not the sole form of plastic present in the river Itchen.

Evidence of both nurdles in sediments and microfibres and microbeads within the water column demonstrate the complexity of sources likely to cause plastic pollution within the estuary and therefore the need for any future partnership to take a holistic view of the problem (which includes upstream/downstream inputs and macroplastics), its causes and solutions.

2.3 PATHWAYS OF PLASTICS TO THE ESTUARINE ENVIRONMENT OF THE RIVER ITCHEN

Plastics can be released into the environment during production and usage, at end-of-life, and when in storage or transfer between these different stages (Verschoor *et al.*, 2014), with an estimated 80% of plastic waste in the oceans originating from land-based activities (Kapinga *et al.* 2020). More specifically, plastics can reach the estuarine environment of the river Itchen through direct discharge from riverine users such as local marinas, or indirectly through fluvial inputs or discharge from wastewater treatment plants. Figure 1 outlines the principal pathways for plastics entering the river Itchen estuary and these are described below.

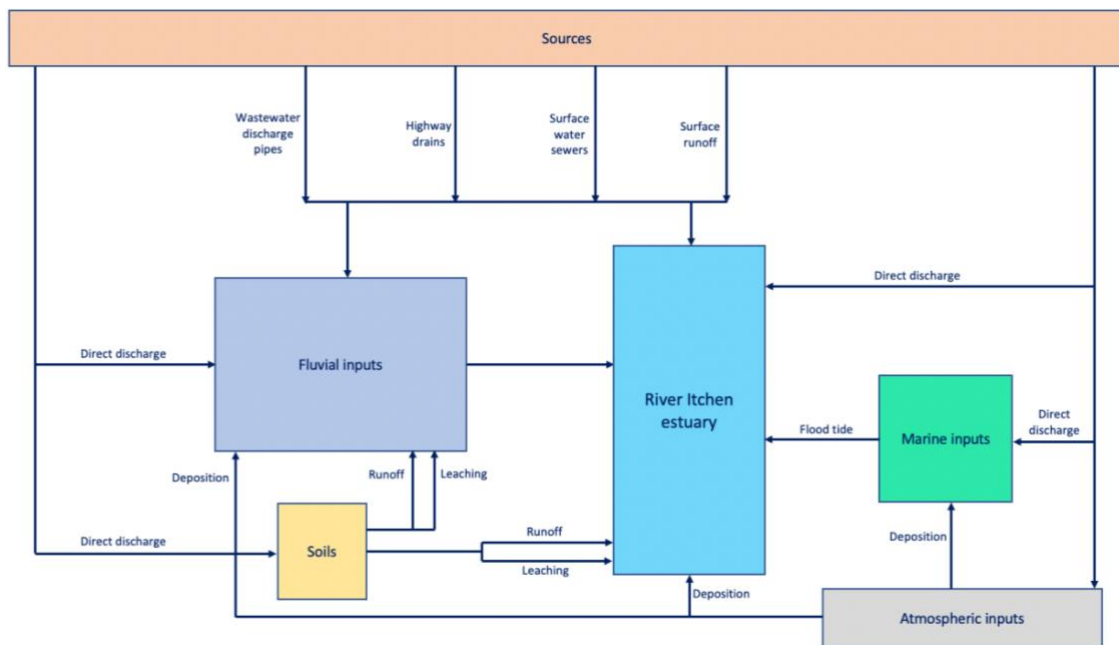


Figure 1. Pathways of plastics to the river Itchen estuary

2.3.1 Direct discharge and fluvial inputs

Plastics can be directly discharged into the river Itchen whether that is upstream of the estuary or into the estuary itself. For example, the Itchen is used by a range of stakeholders such as the marine industry (e.g., marinas such as MDL Marinas Group Ltd.), recreational users (e.g. sailing clubs such as St Denys Boat Club), in addition to fisheries and aquaculture (e.g. Lower Itchen Fishery). Plastics used by these stakeholders can enter the Itchen in a variety of ways. For example, from a polystyrene pontoon, an abandoned fibreglass boat, discarded plastic drums/waste, or through abandoned, lost or otherwise discarded fishing gear (ALDFG).

In the Itchen catchment, water companies (Southern Water) recycle wastewater from homes/businesses before returning it to rivers (like the Itchen) and the sea via wastewater discharge pipes. This water contains microplastics (Southern Water, 2023), such as clothing fibres, which as yet are not extracted from wastewater before it is released back into the

environment. In addition to this, during heavy rain, stormwater overflows release excess water from wastewater treatment works into rivers and the sea. Another pathway for plastics to enter the Itchen estuary is via surface water drains. These are used to transport rainwater that runs off impermeable surfaces (e.g., roofs or paved areas) into public drainage systems, which then empty out into a watercourse. As with wastewater, this surface water contains plastics which then end up in the Itchen estuary. This is one of the pathways that has been highlighted in the Itchen catchment (Ayling, 2020), with evidence of plastic nurdles found in and around surface water drains close to the premises of known plastics converters.

Similarly, highway drains also transport surface water from roads into the public drainage systems, which empty into the Itchen. This can lead to an increase in microplastics in the Itchen, particularly from the deterioration of tyres which is known to be a significant contributor to the flow of plastics into the environment (Kole *et al.*, 2017). In addition to this, surface runoff that flows directly into the river Itchen or its estuary is also a pathway for plastics to enter the watercourse. For example, runoff that occurs on impermeable surfaces (e.g., pavements or quaysides) adjoining the river will result in further plastic pollution, e.g., in the form of microplastics or even larger plastic objects such as bottles during flood events.

Soils can also be a pathway through which plastics enter the Itchen watercourse. For example, through the discharge of biosolids containing microplastics (Radford *et al.*, 2023) – a product of the wastewater system – onto agricultural soils in the upper course of the Itchen. These plastics would then have the potential to enter the river Itchen either through leaching or runoff.

2.3.2 Marine inputs

Another pathway for plastics into the river Itchen estuary is from the marine ecosystem – i.e., from Southampton Water and the wider Solent – with plastics having the potential to be brought into the estuary on a flood tide. The sources of ocean plastics are predominately land-based (approximately 80%); however, ocean-based plastic pollution originates primarily from the fishing or marine industries. In the context of the Itchen, possible sources include inshore fisheries within the Solent, the shipping and cruise industries that operate out of Southampton Port, in addition to other maritime users. For example, this could include loose pontoons, discarded vessels or abandoned, lost or otherwise discarded fishing gear (ALDFG).

2.3.3 Atmospheric inputs

Plastics can also enter the river Itchen estuary through atmospheric and aeolian processes (Zhang *et al.*, 2020). For example, once microplastics are present in the environment, they are easily degraded and this alters their characteristics including their environmental mobility, leading to them easily becoming airborne (Evangelidou *et al.*, 2022). Aeolian transportation leads to microplastics being blown over watercourses, where they enter the water column through the process of atmospheric deposition. For example, windblown plastic could enter the Itchen estuary from nearby recreational areas such as Weston Shore and Riverside Park.

2.4 SOURCES OF PLASTIC POLLUTION

A recent review by Galafassi *et al.*, (2019) attempted to set out all the possible sources of plastic pollution identified within scientific and grey literature. A typology of plastic sources has been developed for the Itchen catchment, based on that which is set out by Galafassi *et al.*, (2019). This is outlined in Table 2 with a number of catchment-specific sources detailed for source type. These are described in greater detail below.

Table 2. Potential sources of plastic pollution within the Itchen catchment (adapted from Galafassi *et al.*, 2019).

Sources		Catchment-specific sources
Land-based	Wastewater treatment plants	<ul style="list-style-type: none"> • Woolston Wastewater Treatment Works • Portswood Wastewater Treatment Works • Morestead Wastewater Treatment Works • Chickenhall Wastewater Treatment Works
	Roads / tyres	<ul style="list-style-type: none"> • M3 • M27 • A3025 • A3024 • A3035
	Municipal solid waste	<ul style="list-style-type: none"> • Netley Household Waste Recycling Centre • TJ Waste Materials Recovery Facility (Belvidere Road) • Eastleigh Household Waste Recycling Centre
	Plastics manufacturers and converters	<ul style="list-style-type: none"> • Martin's Rubber Company • Shorecast Solent Ltd • Polystar Plastics Ltd • Bridge Rubber & Plastics Ltd • SIVA Plastics Ltd • ASK Plastics Ltd • Specpol: Specialised Polymer Engineering Ltd • Custom Covers Ltd • Phase3 Plastics • Alda Plastics Ltd • Greentech Plastics Ltd • Everest Plastics • CNC Polystyrene • Polyclear Ltd (located within the Test catchment)
	Transport & logistics	<ul style="list-style-type: none"> • Associated British Ports (ABP) • DP World • Sevenstar Yacht Transport UK • Columbia Cruise Services UK Ltd • Denholm Port Services • Craftline Shipping Ltd • John H Whitaker (Tankers) Ltd • Williams Shipping • Clarkson Port Services • Hoegh Service Centre • Southampton Cargo Handling • Southampton Freight Services • Wallenius Wilhelmsen • Port Direct Logistics Southampton

		<ul style="list-style-type: none"> • Complete Marine Freight Ltd • BMW Shipping Agents Ltd • JC Shipping Services Ltd • AB Plant Shipping Ltd • NMT International Shipping UK Ltd • Wainwright Bros & Co Ltd • MJS Shipping Ltd • Anglo Freight • Maritime Transport Ltd • Pentalver • Supreme Freight Services Ltd • Seko Logistics Southampton UK • GAC Pindar • Crossborder Logistics • Network Rail
	Fisheries, aquaculture and agriculture	<ul style="list-style-type: none"> • Lower Itchen Fishery • Franklyns Fish Farm • Avington Trout Fishery • Fishers Pond Fishery • Inshore fisheries (Solent-wide)
	Local community	<ul style="list-style-type: none"> • Private homeowners with property (incl. jetties) on the banks of the Itchen (e.g., Bitterne Manor) • Recreational users of the Itchen • Local community members
	Others	<ul style="list-style-type: none"> • South Coast Building Supplies • JMS Construction • C J R Glass & Glazing • Itchen Glass and Glazing • Direct Windows and Doors Ltd • Network Rail (and associated contractors) • Marwell Zoo • St Mary's Stadium
Marine-based	Fisheries	<ul style="list-style-type: none"> • Inshore fisheries (Solent-wide)
	Marine and maritime industries (for shipping see transport & logistics companies)	<ul style="list-style-type: none"> • MDL Marinas Group Ltd – Ocean Village Marina • Itchen Marine Towage Ltd • Ocean Quay Marina • Shamrock Quay • Saxon Wharf • Kemps Quay • Quayside Marina • Bluffs Quay • Dyer Bros Marine Ltd • St Denys Boat Club • Merlin Boat Yard • Lauren Marine Services • Drivers Dry Berthing Ltd • Southampton Dry Stack • Smith's Quay Boat Yard

2.4.1 Land-based sources

There are a range of potential land-based sources of plastic pollution in the Itchen catchment, including: wastewater treatment plants, plastic manufacturers and converters, drainage,

community litter, and the marine industry. The following sections (2.4.1.1 – 2.4.1.8) of the report will set out these sources in more detail.

2.4.1.1 Wastewater treatment plants

There are a number of wastewater treatment plants operated by Southern Water in the Itchen catchment, the company which is also responsible for wastewater treatment in the area where water is supplied by Portsmouth Water. The four principal wastewater treatment works in the Itchen catchment are Woolston and Portswood which are both in the tidal reaches of the Itchen, and Chickenhall and Morestead in the middle and upper reaches respectively. The latter two plants recycle wastewater that contains microplastics from homes before returning it to the Itchen. Other large local sources are the wastewater treatment plants at Millbrook and Slowhill Copse, Marchwood, however, these are located outside of the Itchen catchment on Southampton Water. In addition to this, there are numerous storm/emergency overflows within the catchment.

2.4.1.2 Tyres and roadways

A network of roads lies either side of the Itchen in its lower course and in places cross the river, in the case of highways such as the A3025 and A3024, and further upstream, the M27 and M3. These are a source of plastics, for example from the break-down of tyres, with highway drains transporting these plastics in the surface water via public drainage systems, into the Itchen.

2.4.1.3 Municipal solid waste

There are a number of sites that deal with municipal solid waste in the Itchen catchment, through which plastics could be released into the environment. The closest of these to the Itchen is TJ Waste Materials Recovery Facility, which is located north of St Mary's Stadium on Belvidere Road on the west bank of the Itchen estuary.

2.4.1.4 Plastics manufacturers and converters

Multiple plastic manufacturers and converters are located within the Itchen catchment, with many sites in close proximity to the Itchen estuary. In the event of a spillage, these companies are potential sources of plastic pollution. Three companies were cited by Ayling (2020) - Polystar Plastics, SIVA Plastics and ASK Plastics - in the investigative report on nurdle pollution in Chessel Bay, however, as indicated by Table 2, there are many more companies in the lower catchment that utilise plastics.

2.4.1.5 Marine industries

Marinas and shipyards line the banks of the Itchen estuary, with each having the potential to be a source of plastic pollution. Plastics are used in the industry in a variety of forms, from polystyrene pontoons and fibreglass hulls to plastic ropes and propellers. The largest of the marines – Ocean Village – is run by MDL Marinas Ltd and is located on the east bank of the Itchen, at the mouth of the estuary.

2.4.1.6 Transport and logistics

Transport and logistics are a key industry within the Itchen estuary, as it is the home of Southampton port, which is operated by ABP and DP World. Multiple shipping and logistics companies are based in Southampton and ships are known to be carriers and potential dischargers of plastics in multiple forms (Osmundsen, 2022) such as via a cargo of plastic

nurdles. Plastic spills can occur both at sea and also in port, depending on the efficacy of plastic waste reception facilities. According to ABP’s Port Waste Management Plan (ABP, 2021), ship-generated waste is temporarily stored by ABP, before being removed by the port’s licensed waste contractors: Veolia, Biffa Waste Services and Cleansing Service Group (CSG).

2.4.1.7 Fisheries, aquaculture and agriculture

The fishing industry is a known contributor to plastic pollution through ALDFG in addition to other forms of waste such as packing containers and buoys. Marine ALDFG could enter the River Itchen on a flood tide, whilst freshwater fisheries and fish farms within the upper/freshwater/river Itchen catchment also have the potential to be a source of plastic pollution. Agriculture is also likely to be a source of plastic pollution within the Itchen catchment, with microplastics shown to be present in agricultural soils (Radford *et al.*, 2023). If agricultural land in the upper reaches of the Itchen contains microplastics, surface runoff and leaching can result in these finding their way into the waters of the Itchen.

2.4.1.8 Local community

The local community is also a source of plastic pollution to the Itchen estuary through the discarding of litter (e.g., plastic bottles and wrappers) and by recreational users of the Itchen. In addition to this, plastics also leak into the watercourse from a variety of other community-based sources. For example, private homeowners with properties that back directly onto the estuary often own plastic jetties that degrade over time causing plastics to leach into the river.

2.4.2 Marine-based sources

Sources of marine-based plastic pollution are largely considered to be limited to that produced by the fisheries and maritime industry (e.g., shipping) and these have been previously discussed in sections 2.4.1.6 and 2.4.1.7 of this report.

2.5 POTENTIAL IMPACTS OF PLASTIC POLLUTION IN THE ITCHEN

To better understand the potential implications of plastic pollution for the ecology, environment and users of the Itchen, the following discussion is organised around the potential impacts for a selection of key species of flora and fauna that are found in and around the Itchen, in addition to the socioeconomic impacts for the key users of the river. An indicative list of these species and users are set out in Table 3 and 4.

Table 3. An indicative list of key species of flora and fauna found in tidal and upper reaches of the Itchen (Environment Agency, 2013)

Flora	Fauna	
<ul style="list-style-type: none"> • River water-crowfoot (Ranuncion Fluitantis)* • Callitricho-Batrachion* • Ranunculus spp. 	Fish and crustaceans	<ul style="list-style-type: none"> • Bullhead* • Brook lamprey • Sea trout • Atlantic salmon • White-clawed crayfish
	Birds	<ul style="list-style-type: none"> • Dark-bellied brent goose**

		<ul style="list-style-type: none"> • Eurasian teal** • Ringed plover** • Black-tailed godwit** • Redshank • Snipe • Mediterranean gull** • Terns (e.g. Little tern)**
	Other	<ul style="list-style-type: none"> • Otter • Water vole • Southern damselfly* • Seal

*Denotes species supported by the Itchen that resulted in the river being designated a Special Area of Conservation (SAC).

** Denotes species that are a qualifying feature for the Solent and Southampton Water SPA/Ramsar

Table 4. Key users of the Itchen and wider Solent region

Key users of the Itchen
<ul style="list-style-type: none"> • Maritime infrastructure (ports, harbours and marinas) • Recreational users (e.g., watercraft, swimmers, walkers, beachgoers) • Transport and logistics industry (e.g., shipping industry) • Fisheries (e.g., Inshore fisheries within the Solent)

2.5.1 Environmental impacts

Plastic pollution, whether macro (>0.5cm) or micro (<0.5cm), has the potential to affect organisms across all levels of biological organisation (Bucci *et al.*, 2020). Plastic pollution as the ability to affect habitats by altering species distribution, inflict damage to organisms through entanglement and increase mortality rates when ingested (Welden, 2020). Currently, the impacts of plastic pollution have been most commonly studied in relation to the marine environment, as opposed to freshwater ecosystems, whilst the impacts of macroplastics are more clearly defined than the effects of microplastics (Bucci *et al.*, 2020). However, available studies indicate that issues such as ingestion of plastics by freshwater fauna is widespread (van Emmerik and Schwarz, 2020).

It is also important to highlight the links between plastic pollution and climate change, as although the production of plastics is not a major contributor to greenhouse gas emissions, plastics are largely derived from fossil fuels and emit greenhouse gases at all stages of their life cycle. Furthermore, extreme weather and floods associated with climate change will further increase levels of plastic pollution in the environment (Ford *et al.* 2021).

The following sections (3.4.1.1 – 3.4.1.5) of the report will set out the potential implications for the ecology of the Itchen.

2.5.1.1 Flora

The Itchen is a chalk river that supports a number of important species of vegetation, including *Ranunculus fluitans* and *Callitriche-Batrachion*, which are two of the four ecologically important species that led to the Itchen being classified as a Special Area of Conservation (SAC). However, as these vegetation communities float at the surface of the river, plastics can be trapped within the vegetation and over time a reservoir of plastics can form. This also means that these aquatic plants will then function as a carrier, as they, along with the plastics, are transported with the river flow (van Emmerik *et al.*, 2022).

2.5.1.2 Fish & crustaceans

The Itchen is home to rare freshwater species such as the bullhead and the white-clawed crayfish, in addition to highly protected and endangered marine species like the Atlantic salmon and sea trout. Research has shown that plastic ingestion is common within marine and freshwater fish and crustaceans (Azevedo-Santos *et al.*, 2021). For example, a recent study (O'Connor *et al.*, 2020) of trout in an Irish riverine system found microplastics in 72% of the fish sampled. As a consequence, plastics pollution in the Itchen undoubtedly has the potential to affect these species, as is indicated by the ecological impact studies undertaken by the recent Interreg Preventing Plastic Pollution Project (2023), which indicated that freshwater ecosystems are vulnerable to plastic pollution due to their proximity to key sources of microplastics such as wastewater treatment plants. It is though widely recognised that further studies are required to determine whether/how microplastic ingestion affects fish health and the factors which may influence this (Eerkes-Medrano *et al.*, 2015; Naidoo *et al.*, 2020).

2.5.1.3 Birds

The Itchen estuary is home to a number of species of breeding and overwintering birds, waders and small wetland passerines. For example, the brent goose and other wading birds are subject to conservation under the Solent Waders and Brent Goose Strategy (Whitfield, 2020), which seeks to protect these species in non-designated areas which support the Solent Special Protection Areas (SPA) and Ramsar wetlands. The brent goose, among others, has also been sighted in and around the Itchen estuary, e.g., at Weston Shore (Bird Aware Solent, 2022), which further puts these species at risk of exposure to plastic pollution in the Itchen. In a study of barnacle geese in a remote coastal habitat, 79% of faecal samples collected contained low quantities of microplastics (either fragments or fibres). This suggests that other species of non-marine water birds, such as the brent goose, can frequently ingest microplastics if exposed (Coughlan *et al.*, 2020). Wading birds also have a high potential to be exposed to and ingest plastics pollution (Flemming *et al.*, 2022), with plastic pollution present in 53% of 1106 samples taken from 26 shorebird species (including snipe and redshank). The study also showed that species that forage at sea, on mudflats or on beaches were more likely to have ingested plastics than species foraging in freshwater environments (Flemming *et al.*, 2022). In addition to this, entanglement with plastic debris is a significant cause of mortality among marine taxa, with research suggesting that seabirds collect plastic debris for nesting material, which may lead to entanglement (Votier *et al.*, 2011). This risk is also likely to exist for freshwater birds, with a swan's nest in Chessel Bay found to have been partially woven from plastic waste (Ayling, 2020).

2.5.1.4 Other

The River Itchen is home to a number of mammals including otters and water voles and the southern damselfly, which is one of the species supported by the Itchen that led to the river

being designated a Special Area of Conservation (SAC). Recent research (Azevedo-Santos *et al.*, 2021) demonstrates that plastic ingestion is an issue in freshwater mammals, including within otters (Santillán *et al.*, 2020; Smirolto *et al.*, 2019). In addition to this, the presence of larger plastic waste in the Itchen poses a risk of entanglement for riverine mammals (Azevedo-Santos *et al.*, 2021; Weldon, 2018). A recent study has also showed that microbial diversity was negatively affected in damselflies that ingested daphnids exposed to microplastics. This is the first piece of research that shows that organisms exposed to microplastics at lower trophic levels (daphnid) have an impact on the microbiome of organisms at higher trophic levels (damselflies). This demonstrates that microplastics have an indirect impact on organismal microbiomes as they are transferred through the food chain (Varg *et al.*, 2022).

2.5.2 Socioeconomic impacts

Research into the socioeconomic impacts of plastic pollution is currently in the early stages. However, the data available indicates the potential for widespread ramifications for the maritime sector, in addition to human health and wellbeing (Thompson, 2017; Windsor *et al.*, 2019). This was highlighted in a recent court case initiated by local residents and fisherman in Texas, in which a plastics corporation was found liable for violating the United States Clean Water Act, through the release of thousands of nurdles into a creek and bay on the Gulf Coast, which led to the company being fined \$122,000 (Berti Suman and Shade, 2021).

The socioeconomic ramifications of plastic pollution will be discussed in the following sections (3.4.2.1 – 3.4.2.5) of the report, in relation to the key users of the Itchen estuary.

2.5.2.1 Maritime infrastructure

Research undertaken in the UK has shown over 70% of harbours and marinas involved in the study had received reports from their users relating to problems caused by plastic waste. This includes entangled propellers, anchors and rudders, in addition to blocked intake pipes and valves. It was estimated that the cost of removing plastic waste from ports and harbours across the UK is over £2 million each year (Thompson, 2017). Furthermore, the effects of plastic pollution can be further exacerbated by flooding, with plastics observed to accumulate in estuarine harbours following a flood event (Chikodzi *et al.*, 2021).

2.5.2.2 Recreational users

The Itchen is used for a wide range of recreational activities and by a variety of different users. For example, it is popular for people keen to participate in water sports such as sailing and paddleboarding and by those who wish to experience local nature, for example by visiting the Chessel Bay reserve. However, plastic pollution is likely to influence where people visit (Thompson, 2017; Windsor *et al.*, 2019), as spending time in polluted areas can negatively impact people's mood and wellbeing (Beaumont *et al.*, 2019). Plastic pollution therefore has the potential to become a barrier for people wishing to use the Itchen estuary for recreational purposes.

Whilst local authorities often act to prevent plastic pollution becoming a barrier to visitors, clean-up operations are expensive (Windsor *et al.*, 2019) and required regularly to combat the problem. For example, in 2010, beach-cleans were conducted by 40% of local authorities in the UK, with total costs upward of £15 million (Mouat *et al.*, 2010). This is also unlikely to represent

the full costs, given that extensive beach-cleaning activities are carried out by volunteers (Thompson, 2017), which have also been undertaken in the Itchen and in Chessel Bay in particular.

2.5.2.3 Transport and logistics

Plastic waste can also directly impact physical health. For example, workers within the maritime sector may be exposed to sharp debris and unsanitary items (Beaumont *et al.*, 2019). In addition to this, lifeboats are frequently called out to deal with propellers and other parts of vessels that have become entangled in plastic waste, with rescue missions proving extremely costly (Abalansa *et al.*, 2020; Thompson, 2017; Welden, 2020). Moreover, research by McIlgorm *et al.*, (2011) estimated that the damage caused by plastic pollution to the shipping industry of the 21 economies of the Asia-Pacific rim was in excess of €200 million euros.

2.5.2.4 Fisheries

Plastic pollution can negatively impact fisheries by reducing and damaging catches, in addition to causing damage to fishing vessels, as previously discussed (Thompson, 2017), thereby influencing the productivity, viability, profitability and safety of the industry (Beaumont *et al.*, 2019). Within Southampton Water and the wider Solent region, inshore fishers operate and fish for a variety of species including Manila clam, cockles, cuttlefish, sole, plaice and whelk (Southern IFCA, 2023). As the Itchen estuary drains into Southampton Water, increased plastic pollution in the Itchen could have a knock-on effect on fisheries in the Solent region, in addition to fisheries upstream of the Itchen estuary, such as the Lower Itchen Fishery, a 4.5 km stretch of the Itchen under private ownership, which offers fishing for salmon, trout and grayling.

However, while humans are vulnerable to changes in the quality of fish that are used as a food source (Golden *et al.*, 2016), there is currently a lack of research undertaken to understand how the consumption of fish or shellfish that have ingested microplastics can pose a risk to human health (Landrigan *et al.*, 2022).

3.0 GOVERNANCE OF PLASTIC POLLUTION IN THE ITCHEN ESTUARY

This section will critically review the current system of governance for plastic waste and pollution in the Itchen catchment. It will address both the regulatory framework and the roles and responsibilities of relevant authorities and key stakeholders in order to inform a gap analysis of the situation prior to defining a needs assessment.

3.1 THE POLICY AND REGULATORY FRAMEWORK

The waste management hierarchy (Figure 2) is applied in the UK and sets out the options for the management of end-of-life plastics. The implementation of this hierarchy was one of the fundamental requirements of the EU Waste Framework Directive and adopted in England through *The Waste Regulations 2011* and the *Environmental Permitting Regulations 2016*.



Figure 2. Waste Management Hierarchy

There are also a number of other pieces of legislation that contribute to the management of plastic waste and the prevention of plastic pollution as follows:

Environmental Protection Act, 1990

The Environmental Protection Act prohibits the treatment, storing or deposition of controlled waste in a manner likely to pollute the environment or represent a hazard to human health, and makes it an offence to fail to take reasonable measures to prevent the escape of waste. As the regulator in England, the Environment Agency has the authority to set specific conditions that companies and individuals must adhere to. In addition to this, the Act makes it a criminal offence to leave litter, with local authorities having the authority to serve clearance or control notices to combat this. Local authorities are also charged with inspecting their area periodically, to detect anything that might be considered a statutory nuisance, e.g., discharges from industrial premises or accumulations/deposits. To address this, they can serve abatement notices where necessary.

Environment Act, 2021

The *Environment Act 2021* contains measures to allow the Government to amend extended producer responsibility scheme rules, which were primarily introduced under the *Environment Act 1995* to ensure that businesses over a certain size which make or use packaging had a legal obligation to ensure that proportion of the packaging that they sell is recovered and recycled. The *Environment Act 2021* now contains provision for those involved in the manufacture, processing, distribution or supply of packaging waste to be required to pay for the full net cost of collection, sorting, recycling and disposal (Parliament. House of Commons, 2022).

Resources and Waste Strategy, 2018

The *Resources and Waste Strategy 2018* set out the ambition for the UK Government to shift towards a more circular economy and work towards all plastic packaging placed on the market being recyclable, reusable or compostable by 2025. The strategy supports the Government's environmental plan, *A Green Future: Our 25 Year Plan*, which sets out a commitment to eliminating avoidable plastic waste by 2042, with avoidable waste defined as plastic that could have been used or recycled, substituted with an alternative reusable/recyclable material or composted or biodegraded (Parliament. House of Commons, 2022).

Water Environment (Water Framework Directive) Regulations, 2017

The *Water Environment (Water Framework Directive) Regulations 2017* provide a framework for managing the water environment in England and preventing the deterioration in status of water bodies. Under these regulations, river basin management plans have been developed, with the Itchen catchment included within the *Southeast River Basin District: River Basin Management Plan 2015*. The Environment Agency is responsible for producing and updating river basin management plans and has the authority to ensure compliance and prevent deterioration in status. Where plastic pollution occurs and the source can be identified, the Environment Agency will use its existing powers to take action (Environment Agency, 2021).

South Inshore and South Offshore Marine Plan, 2018

The *Marine and Coastal Access Act 2009* contained provision for the development and implementation of marine plans by the Marine Management Organisation. The tidal reaches of the Itchen fall within the *South Inshore South Offshore Marine Plan 2018* of which one of the objectives is to complement and contribute to the achievement or maintenance of Good Ecological Status or Potential under the Water Framework Directive and Good Environmental Status under the Marine Strategy Framework Directive with respect to marine litter. One of the targets identified within the plan to achieve this is an overall reduction in the number of visible litter items within specific categories on coastlines. Implementation measures involve the collection and removal of marine litter from coastal beaches, in addition to licensing requirements for marine related activities, where relevant, which can involve putting in place a waste management plan to reduce the risk of litter escaping into the marine environment. (Marine Management Organisation, 2022).

Other measures

The *Single Use Carrier Bags Charges (England) (Amendment) Order 2015* introduced a minimum 10p charge on all single use carrier bags in England for all English retailers. In 2020, plastic straws, stirrers and cotton buds were banned in England and from October 2023, there will be a ban on a range of single-use plastics, including plates, cutlery and certain types of polystyrene

cups (Defra, 2023). In addition to this, the sale and production of personal care products containing microbeads was prohibited in 2018.

3.2 STAKEHOLDERS INVOLVED IN PLASTIC WASTE MANAGEMENT AND ITS GOVERNANCE

There are many stakeholders involved in the collection, management and wider governance of plastic waste in the Itchen catchment. These can be categorised as Table 5.

Table 5. Stakeholders involved in plastic waste management and its governance in the river Itchen catchment

Type of actor	Actor	Role and responsibility
Non-departmental public bodies (NPDB)	Environment Agency	Responsible for: <ul style="list-style-type: none"> regulating major industry and waste treatment of contaminated land water quality and resources fisheries inland river, estuary and harbour navigations conservation and ecology
	Natural England	Responsible for enforcing regulations covering designated sites and protected species. In the Itchen – responsible for SSSIs (e.g. Chessel Bay – part of Lee on Solent to Itchen Estuary SSSI)
	JNCC	Responsible for advising the UK Government on the management of SPAs and SACs, including the River Itchen SAC and Solent and Southampton Water SPA
	Marine Management Organisation	Responsible for: <ul style="list-style-type: none"> planning and licensing for marine construction, deposits and dredging that may have an environmental, economic or social impact making marine nature conservation byelaws dealing with marine pollution emergencies producing marine plans to include all marine activities
Joint committees of local government	Southern IFCA	To balance the social and economic benefits of exploiting the sea fisheries resources of the district with the need to protect the marine environment from, or promote its recovery from, the effects of such exploitation. To ensure that the conservation objectives of any MCZ in the district are furthered.
	Southampton City Council	Waste Planning, Collection and Disposal Authority

Municipalities / local authorities	Eastleigh Borough Council	Waste Collection Authority
	Winchester City Council	Waste Planning, Collection and Disposal Authority
	Hampshire County Council	Waste Planning and Disposal Authority
Waste /wastewater management companies	Southern Water	Responsible for wastewater treatment
	Veolia Hampshire	Integrated waste management contractor. Part of Project Integra – responsible for the collection, management and disposal of Hampshire’s waste. Duty of care under EPA, 1990, to take all reasonable measures to ensure that waste is safely and legally disposed.
	Other private waste management companies (e.g. Biffa Eastleigh, TJ Waste & Recycling Ltd.)	Duty of care under EPA, 1990, to take all reasonable measures to ensure that waste is safely and legally disposed.
Private sector	Associated British Ports (ABP)	Duty of care under EPA, 1990, to take all reasonable measures to ensure that waste is safely and legally disposed. Merchant Shipping and Fishing Vessels (Port Waste Reception Facilities) Regulations, 2003, require harbour authorities and terminal operators (including marinas) to provide waste reception facilities to deal with waste from ships normally using the harbour/terminal.
	British Plastics Federation	Trade association representing over 80% of UK plastics industry. Lead Operation Clean Sweep (OCS) in the UK, an international initiative from the plastics industry to reduce plastic pellet loss, flake or powder into the environment. Companies voluntarily sign up to make a commitment to adhere to best practice and implement systems to prevent plastic pellet loss.
	Other plastic manufacturers/converters (e.g., SIVA Group, ASK Plastics, Polystar Plastics)	Duty of care under EPA, 1990, to take all reasonable measures to ensure that waste is safely and legally disposed.
	Marinas/shipyards	Duty of care under EPA, 1990, to take all reasonable measures to ensure that waste is safely and legally disposed.
	Crown Estate	Manage the foreshore in the tidal reaches of the Itchen.
	Private landowners - riverside	Cannot carry out activities that could lead to pollution of the water and therefore reduce the natural water quality within a watercourse.

Academic institutions	Southampton University	<p>Conducted work on marine plastics since 2004, analytical science and waste management.</p> <p>Has a team of researchers focusing on plastic pollution issues, including the effects on marine life, risks associated with seafood, plastics in wastewater treatment systems and land-based environments, and microplastic behaviour in aquatic and sedimentary systems.</p> <p>Supporting a trial to remove plastic pollution in Chessel Bay with the EA and Nurdle</p>
NGOs / CSOs	<p>Surfers Against Sewage</p> <p>The Final Straw Foundation</p> <p>Nurdle</p> <p>Friends of Chessel Bay</p>	Organise and undertake various clean-up efforts in the Itchen
Local community		Involved in local efforts to remove plastic from the Itchen – e.g., paddleboard clean-ups organized by British Marine/Planet Patrol

3.3 GAP ANALYSIS

Based on the outcomes of the review of policy and legislation, there are a number of challenges facing the management of plastic waste and pollution in the Itchen catchment. These are reflected in the problem tree, Figure 3. This identifies the root causes of the problem which involves the leakage of plastics into the environment, as well as highlighting the generic impacts.

Plastic pollution is by its nature a transdisciplinary and transboundary problem with policy and regulation often fragmented and incomplete. This is the case for the Itchen catchment and estuary as it is for other areas in the UK with no regulatory requirement for example to monitor for plastics in rivers, estuaries or the marine environment. Furthermore, enforcing existing policy is also an issue. For example, the Environment Agency (EA) has the regulatory authority to impose fines and compliance measures on individuals and companies that are responsible for plastic leakages. However, it does not have the resources to enforce this in every instance and instead has an enforcement and sanctions policy (Environment Agency, 2022) which states that its regulatory effort is principally directed towards:

- those whose activities cause or could cause the greatest risk of serious environmental damage.
- where the risks are least well controlled
- where a breach undermines a regulatory framework
- where deliberate or organised crime is suspected

As a consequence, lower-level leakages (e.g., the degradation of fibreglass hulls or polystyrene pontoons in a marina) are extremely unlikely to warrant investigation.

In addition to this, where more serious leakages do occur, for example, a major nurdle spill from the site of a plastic converter, the EA may require the company to put in place a range of measures to improve their management practices. However, this requires follow-up visits to monitor progress and ensure compliance and the EA may not have the resource capacity to deliver this. It can also be difficult to gather the evidence necessary to ascertain and prove the source of a leak, which makes the enforcement of existing regulations challenging.

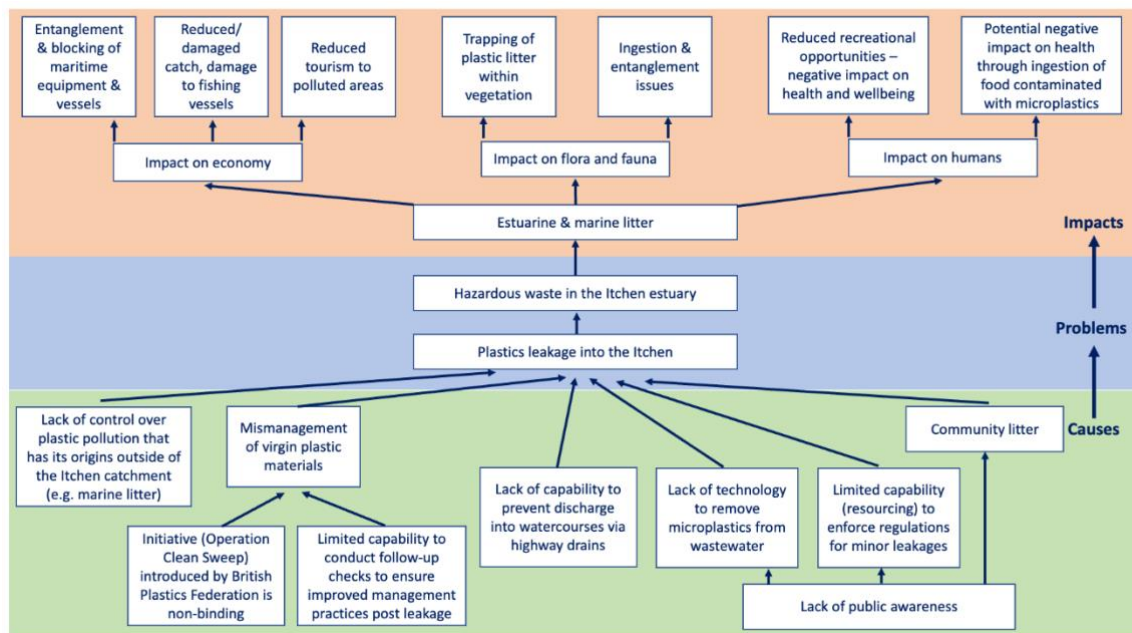


Figure 3. Problem tree description of the issues relating to the management of plastic waste and pollution in the Itchen catchment.

The British Plastics Federation (BPF) leads Operation Clean Sweep (OCS) in the UK – an international initiative from the plastics industry to reduce plastic pellet loss, flake or powder into the environment. Of the plastic industries in the Itchen catchment, only three (Polystar Plastics, SIVA Group and ASK Plastics) have signed up to this initiative and made a commitment to adhere to best practice and implement systems to prevent plastic pellet loss. Furthermore, as a voluntary commitment, this is not enforceable, meaning the level of success in preventing plastic pellet loss is currently unknown.

The water company responsible for wastewater treatment and discharge in the Itchen catchment is Southern Water; however, at present, it does not have the technical capabilities to filter microplastics. As a consequence, microplastics leak into the Itchen through wastewater /storm discharges. Similarly, highway drains feed directly into the Itchen at a number of points, transferring surface water containing microplastics into the watercourse.

Lack of public awareness of the issue and impact of plastic pollution also results in plastic pollution entering the Itchen watercourse. For example, any plastic litter produced by the local community (e.g., plastic wrappers and bottles) and dumped on the shoreline or on streets in close proximity to the Itchen can enter the watercourse, whether directly, windblown or via

atmospheric processes such as aeolian deposition. In addition to this, there are a number of properties which back on to the Itchen that have jetties and boats that contain plastics, which degrade over time, causing plastics to enter the water column.

Finally, marine waste that enters the Itchen estuary via a flood tide is also extremely challenging to prevent, with source identification difficult and even if identified, likely to be beyond the jurisdiction of those organisations with statutory responsibility for the management of plastics in the Itchen catchment.

4.0 RESULTS OF STAKEHOLDER ENGAGEMENT

4.1 INTRODUCTION

An initial consultation phase took place involving key informant interviews (KIIs) with key stakeholders within the Itchen catchment with the objective of generating support for a future partnership and encouraging participation in the workshop. KIIs were held with representatives of ABP, the RYA, SIVA Group, and MDL Marinas, with transcripts of these interviews detailed in Appendix 2. In addition to this, further telephone discussions were conducted by Jackaline Mellan of the Environment Agency and stakeholders including ASK Plastics, European Metal Recycling and Southern Water, with notes from these calls set out in Appendix 3. Outcomes from these discussions are presented in section 4.2.

A workshop on Preventing Plastic Pollution in the Itchen Estuary was held at the University of Southampton on the morning of Thursday 11 May 2023. The agenda, agreed with the project partners, is shown in Appendix 6. The workshop was attended by 28 delegates, representing 16 different stakeholders from a broad range of sectors. These included representatives from national bodies, public authorities, statutory nature conservation bodies, the private sector, academia, NGOs and community-based organisations. A full list of the delegates present is set out in Appendix 3, including details of apologies received from those stakeholders who were unable to attend. The outcomes of the workshop are presented in section 4.3.

4.2 OUTCOMES FROM KEY INFORMANT INTERVIEWS

The outcomes from the key informant interviews and other communication with key stakeholders demonstrated a varied understanding of plastic pollution in the Itchen estuary, with more research or publication of existing research necessary to enhance awareness of the situation.

Stakeholders were however aware of how their company (or in the case of membership organisations – their members) handled/used plastics. In addition to this, all companies that could be considered potential sources of plastic pollution emphasised their use of a range of Environmental Management Systems (EMS) as evidence of good practice and concern for the environment.

In addition to this, companies explained that these measures were consistently reviewed and upgraded when appropriate. However, whilst this is undoubtedly positive, it is also recognised that there is a need to go beyond these measures, for plastic pollution in the Itchen estuary is still a problem and there is a legacy issue.

In terms of support for a partnership going forwards, the majority consensus was an interest in being involved, however, the majority of stakeholders interviewed by ERC or involved with communication with the Environment Agency were not able to participate in the workshop. These stakeholders included ABP, MDL Marinas, Southern Water, SIVA Group, ASK Plastics, the RSBP, the MMO and Southern IFCA.

4.3 OUTCOMES FROM WORKSHOP

Within the workshop, the main sessions delivered were split into two interactive breakout themes. The questions asked were:

1. Existing management of plastic pollution in the Itchen estuary
 - What is currently being done to manage the issue of plastic pollution?
 - How effective is this considered to be?

2. Options for better management of plastic pollution in the Itchen estuary
 - How might management of plastic waste be improved?
 - What are the challenges in doing so?
 - What is their feasibility?

The attendees were split into groups to discuss the themes and discussions were noted by a facilitator designated to each group. The outcomes of these discussions are summarised in sections 5.2.1 and 5.2.2, whilst the notes made by each facilitator have been photographed and are included in Appendix 4.

In addition to this, a short plenary session was conducted in which Professor Anthony Gallagher of ERC led a discussion on the next steps for developing a partnership to prevent plastic pollution in the Itchen estuary. The outcomes of this are set out in section 5.2.3.

4.3.1 Existing management of plastic pollution in the Itchen estuary

Discussions around the efficacy of the existing management of plastic pollution in the Itchen estuary centred around the following key themes:

- Regulatory constraints
- Disconnected monitoring of plastic pollution
- Need for greater industry engagement

Regulatory constraints were identified as being one of the major challenges in managing plastic pollution effectively in the Itchen estuary. Issues raised by delegates included the fact that nurdles are not considered to be pollutants or hazardous in legislative terms and that the burden of proof lies with the regulator, in this case the Environment Agency (EA), to establish the source of any leak, which is very often a significant challenge. The view was also expressed that this leads the regulatory system to be viewed in a way that leads to behavioural issues that do not support a reduction in plastic pollution.

In addition to this, regulation within the plastics industry itself was considered weak, with Operation Clean Sweep, an international initiative (led by the British Plastics Federation in the UK) to reduce plastic pellet loss to the environment, reliant on voluntary participation.

Weaknesses in how plastic pollution in the Itchen estuary is monitored was another key theme raised by delegates. For although monitoring is conducted by a range of stakeholders (e.g., the

University of Southampton, Southampton City Council, Friends of Chessel Bay, Portsmouth Water etc.), no centralised monitoring system or database exists through which data can be collated, stored and shared among stakeholders. Further concerns were also raised about a possible lack of awareness among the public of the importance of reporting spillages to the Environment Agency and the mechanism for doing so.

Another key theme raised was that the current focus is largely on efforts to clean up plastic pollution in the Itchen estuary, and particularly within Chessel Bay, rather than stemming the flow of plastics into the environment. Discussions therefore centred on the need to engage industry further to better manage plastic waste in and around the Itchen estuary. This included a range of different stakeholders, from the plastics industry to water companies and marine industries. However, it was noted that there has recently been more evidence of engagement with the issue from the plastics industry, such as initial contact with the SIVA Group regarding engagement with clean-ups efforts in Chessel Bay and their willingness to participate in a key informant interview as part of this feasibility study.

4.3.2 Options for better management of plastic pollution in the Itchen estuary

Discussions around the options for improved management of plastic pollution in the Itchen estuary centred around the following key themes:

- Education and capacity building
- Regulatory change
- Fiscal measures

Education and capacity building was discussed by delegates as being vital tools in enabling individual and organisational change to better manage plastic pollution in the Itchen estuary. In terms of education, it was felt that there was great value to be attained from publicising more widely existing research into plastic pollution in the Itchen estuary, such as that conducted by the University of Southampton. In addition, it was felt that a greater focus should be put on the human health implications of plastic pollution as this is an issue that would obviously be of concern to the public. In terms of feasibility, it was felt that an educational campaign was more feasible to deliver in the present climate, given the prominence of social media and the number of environmentally focused NGOs working locally. However, it was mentioned that there are other eye-catching ways to raise awareness, such as by visibly highlighting pathways of plastic pollution to the Itchen, for example by painting an image of a fish on a drain cover.

Discussions were also focused on the need to ensure that key industrial stakeholders, including the plastics and maritime industries, were aware of the benefits that would be derived from playing a part in preventing plastics from leaking into the environment, in addition to the changes that this would necessitate. For example, it was felt that this could be achieved by demonstrating the benefits in terms of reputational change to an organisation, versus the cost of delivering that change. It was also noted that generating change would require a focus on building capacity among smaller businesses throughout the catchment, in addition to the more well-known, larger stakeholders, and focusing on nurdle users, in addition to the plastics producers and converters.

One of the key challenges identified to delivering change in this regard was the issue of greenwashing, whereby organisations convey the false message that they are run in an environmentally sustainable manner. In addition to this, it was felt that a lack of understanding of the issue of plastic pollution among the public may hold back widespread behavioural change. Finally, delegates also raised the challenges that a partnership would face in the funding and delivery of such a programme.

In terms of regulatory change, several issues were discussed; however, these were predominantly national issues that a local partnership would be limited in terms of its scope in affecting. For example, the need for nature conservation designations such as SSSIs to consider plastic pollution and the need for specific legislation to improve nurdle storage.

Finally, the discussions centred on the fiscal measures that would be necessary to generate change and more effective management of plastic pollution in the Itchen estuary. Similarly, many of these measures such as green levies or taxes, were national measures that a local partnership would not be able to implement of its own accord. For example, there was mention of current research into a boat scrapping scheme for the UK, to ease the financial burden of disposing of end-of-life boats. There were also additional discussions around the concept of extended producer responsibility and the benefits valorising end-of-life plastics through methods such as deposit return schemes.

4.3.3 Next steps – developing a partnership to prevent plastic pollution in the Itchen estuary

The workshop culminated with discussion around the next steps necessary to develop a partnership to prevent plastic pollution in the Itchen estuary. All the delegates present at the workshop expressed a willingness to participate in a future partnership and it was agreed that a follow-up email would be sent to all delegates to identify the role that each stakeholder would be prepared to have in the partnership, and the resources that they are able to contribute.

The importance of having effective leadership for any future partnership was discussed, and it was agreed that a steering group would be formed to guide the development of a partnership going forward. The make-up and role of the steering group were then considered by delegates, and three clear priorities emerged from this discussion. These are set out as follows:

- Acquire representation on the steering group from key private stakeholders e.g., plastics and marine industries.
- Define the scope of the partnership.
- Set out an actionable and time-bound roadmap for change.

4.4 SUMMARY OUTCOMES

The key outcomes from the stakeholder engagement process are summarised as follows.

- Varied understanding of plastic pollution in the Itchen estuary
- Good practice in terms of plastics management occurring, but more action required.

- A steering group must be formed to guide the partnership and have cross-sectoral stakeholder representation.
- The scope and boundaries of any partnership require clear definition, and an actionable, time-bound roadmap for change developed.
- Secure funding and appropriate leadership are required to make any partnership viable.

5.0 OPTIONS TO PREVENT PLASTIC POLLUTION

5.1 INTRODUCTION

Tackling plastic pollution in the Itchen estuary is complex. It requires a comprehensive set of solutions across the plastic value chain and waste management hierarchy that involves all key stakeholders.

Based on the evidence of plastic pollution in the Itchen, the policy and regulatory gap analysis and the outcomes of the stakeholder engagement activities, there are a number of apparent development needs that should be addressed in order to tackle the problem. This section lays out an assessment of those needs prior to identifying the options available for tackling plastic pollution in the Itchen going forward. This includes an overview of relevant best practices to provide a context for the assessment.

This section will also outline funding options and proposed next steps. Firstly however, a solutions tree is presented upon which a future strategy might be based. Developed from the problem tree in Section 4.3, this identifies specific options for potential interventions.

5.2 SOLUTION TREE

The solution tree presented in Figure 4 is a diagrammatic indicative representation of how the problem can be addressed and the beneficial outcomes that would result from doing so. However, it does not include all solutions, as these would need to be considered and developed more fully by any future partnership.

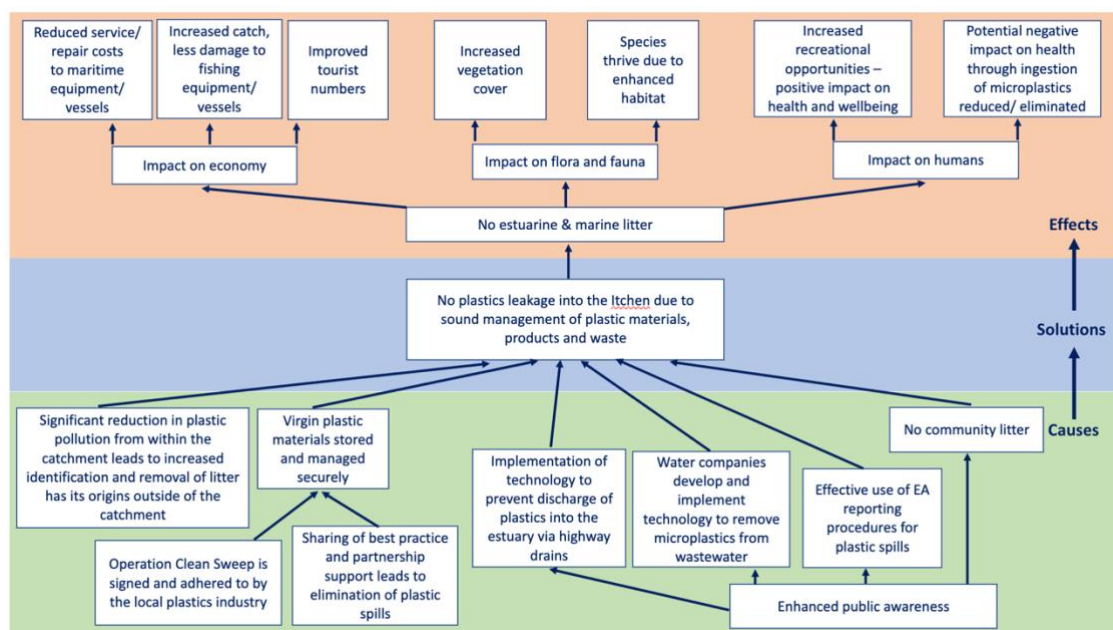


Figure 4. Solutions tree

5.3 NEEDS ASSESSMENT

5.3.1 An innovative partnership including active private sector engagement

It is clear there is an evident need to address the problem of plastic pollution in the Itchen and that an innovative collaboration drawing together all of the key stakeholders relevant to the problem is required.

There are many examples of partnerships working across river catchments in the UK and internationally to address a range of environmental issues. In the UK, Thames21 developed from a partnership programme supported by stakeholders including Keep Britain Tidy, the Port of London Authority, Thames Water, the Environment Agency and multiple local authorities to clean-up the river. Now a registered charity, the partnership continues to work to improve and maintain the Thames waterways. On a smaller scale, the River Mease Partnership includes stakeholders such as Natural England, Trent Rivers Trust, the Environment Agency, farmers and local authorities to protect and improve the river's SSSI and SAC by reducing levels of phosphate within the watercourse. Furthermore, the Wholescape Approach to Marine Management (WAMM) was established to address the key pressures that estuarine waters face both locally and from up-stream and to enable effective integration and collaboration between the Catchment based Approach Partnerships, Coastal Partnerships and the Coastal Partnerships Network. Morecambe Bay was selected as the pilot, with a focus on delivering a monitoring programme for plastics and other pollutants (CaBA 2023).

Given the complexity of sources of plastic pollution, as well as the gaps evident in the control, management and governance of plastics, best practice requires that all key stakeholders, including those from whom the pollution originates, be included within the partnership on an equal and value free basis. The challenge therefore is to enable private sector companies and industry representing all aspects of the value chain from importers to manufacturers, converters, users and end-of-life options to be actively engaged as part of the solution and working constructively with other stakeholders to address the problem. Whilst private sector involvement might not be a panacea, it would represent a significant step forward and provide a boost in efforts to further our understanding/research/evidence, reduce and clean up plastic pollution in the Itchen.

Commitment and actions from a selection of key stakeholders to go beyond their minimum requirements (and green washing) would encourage others and could deliver multiple benefits to meet sustainability goals including reducing costs, meeting supplier requirements, enhancing reputations and potentially attracting customers etc. Given that private sector entities (particularly plastic manufacturers and converters) are largely considered to be the principal polluters and have been the subject of investigations and regulatory action for plastics spillages in the Itchen catchment, conditions have to be enabled that will deliver the growth of this engagement and build a strong working partnership between key stakeholders.

As part of the 'Interreg: Preventing Plastic Pollution' project (Preventing Plastic Pollution, 2023), guidance has been released to support business engagement, which will inform the recommendations of this study.

5.3.2 Governance and the regulatory regime

The existing regulatory regime has been discussed in detail in Section 3 of this report, with its weaknesses further highlighted in the stakeholder workshop. Whilst it is beyond the scope of any proposed partnership to make alterations to the national regulatory framework, the development of a partnership involving both public and private sectors does offer the opportunity for innovation around the collaboration. The work also provides an opportunity to present case studies to government and showcase the benefits we can achieve through collaboration. On a global scale, the increasing focus on public-private sector partnerships to address significant environmental problems may present a model for the development of catchment pollution management both in terms of enabling change to take place and as a means of generating funds to further the work, in addition to the prominence of plastics, such as the development of the global plastic pollution treaty by 2024.

5.3.3 Training and support to build community capacity

Recent research suggests that relative public awareness of marine plastic pollution is high, yet current government policy, such as bans on single-use plastics, is not considered radical enough (McNicholas and Cotton, 2019). The recent clean-up operation in Chessel Bay and the media coverage that it has received is also likely to have contributed to greater public awareness within the local community. This provides a window of opportunity for change that a future partnership project has the opportunity to capitalise on by building capacity within the local community to prevent and reduce plastic pollution.

A review of approaches to reduce and remove the legacy of plastic pollution, in addition to those that enable change in behaviour has recently been conducted by the 'Interreg: Preventing Plastic Pollution' project (Preventing Plastic Pollution, 2023). These have the potential to inform the delivery of any future community-based outreach programmes and initiatives to remove existing plastic pollution, such as sustainable community-based clean-up operations.

5.3.4 Robust monitoring and an accessible data platform for reporting plastic pollution

Despite the efforts of community groups, academia, non-governmental organisations and other stakeholders conducting clean-ups of the shoreline of the estuary and online reporting platforms such as the Great Nurdle Hunt, there is no continuous monitoring of plastic pollution in the tidal reaches on the Itchen. This is particularly important if the sources of plastic leakages are to be identified and action taken to prevent future incidents. This represents a development need and may require training, in addition to the development of an online reporting system.

This is also supported by recent research that suggests that there is a need to ensure that data collected is scientifically meaningful, with standardised survey protocols and simplified data submission methods (Nelms *et al.*, 2022). As part of the recent 'Interreg: Preventing Plastic Pollution' project, a standardised methodology to identify, measure and evidence plastic pollution in the environment has been developed (Preventing Plastic Pollution, 2023) for use as part of a citizen science-based monitoring approach. Similar measures have also been

implemented by organisations such as Thames 21, through their Thames River Watch programme, as has been highlighted in a recent presentation to Southampton City Council's Scrutiny Inquiry Panel - Protecting, Preserving and Promoting the River Itchen. In addition to this, a prospective project by Portsmouth Water to monitor nano-pollution upstream of the tidal limit in the River Itchen will help to identify upstream inputs to the estuary.

Data is crucial and relevant to the management of plastic pollution, providing the basis by which to design and measure impactful preventative actions. A standardised methodology for collecting data, setting targets and measuring progress is recognised by the United Nations as the critical first step in the development of National Action Plans for waste management. It can provide a snapshot of the health of the system – in this case the Itchen catchment – and offer insights into the value of plastic material in the waste stream and their fates. The collection and monitoring of plastic flows in addition to levels of plastic pollution within the estuary is therefore crucial to ensure environmentally sound management practices.

There are many kinds of methodologies for monitoring plastic pollution, including those set out in the guidance issued as an output of a recent Interreg project (Preventing Plastic Pollution, 2023), which details a set of standardised approaches to identify, measure and evidence plastic pollution in the environment, in addition to the development of a database to collate data. However, it is also important that any methodology also incorporates data from organisations involved in the management of plastics and waste to gather information about current practices within the catchment. Whatever methodology is chosen, it should follow an internationally recognised approach.

5.3.5 Securing funding

Clearly funding represents a key challenge for the development of a partnership and a requirement to facilitate efforts to reduce plastic pollution in the Itchen.

Partnerships such as Thames 21 are funded by a range of sources, with approximately half of their funding coming from the private sector, a fifth from trust funds and a quarter from public funds (Thames21, 2017). The Severn Estuary Partnership, an independent, non-statutory initiative, is also funded by its members, who are offered the opportunity to become part of a management group, which provides advice and guidance, in addition to overseeing the work of the partnership. Current members/funders include local authorities and government agencies.

The “Financing UK Nature Recovery Coalition’s: Recommendations and Roadmap Report” recommended the launch of a voluntary Nature Positive Commitment backed by UK government in 2023. This would provide a market mechanism for private sector organisations that depend on nature to set and deliver their own targets for habitat creation and restoration (Young *et al.*, 2022). Whilst this doesn’t directly reflect the nature of a partnership focused on the reduction of pollution, nevertheless it is a model that has the potential for the delivery of its objectives.

Private sector engagement with the project can be more than token membership or even a commitment to the projects objectives. It could involve the provision of financial/resources

support which might also incentivise others within the plastic value chain to invest. It could also be developed further as a public-private sector partnership which will help fund the project over its duration. Globally, there are many examples of public private partnerships, with some more successful than others; however, a recent report (Interreg Europe, 2022) identified a series of recommendations to promote effective public-social-private collaboration for river restoration, which it stated can lead to increased public awareness of issues and remedial actions, better outcomes and management decisions and increased engagement in and support for outcomes that deliver sustainable change. One of the key tools identified to deliver this successfully was long-term core funding to cover staff costs and essential organisation requirements, with recommended fiscal options including the acquisition of funding from the private sector as part of their CSR activities.

5.4 FUNDING OPTIONS

As discussed, key development needs are for a new partnership with active and engaged private sector involvement, and secure funding, as a minimum for the initial facilitation of the partnership and for its on-going development and activities.

Asides from the need to secure contributions to the project from key stakeholders and partnership members, there are a huge variety of funders that could be accessed to enable the development of the partnership from those that offer large scale grants to smaller piece meal funds that might contribute to specific aspects of the work or specific activities. The following is non-exhaustive but provides an overview of the general funding landscape that might be apposite in supporting the partnership development.

5.4.1 Government and public sector agencies

The UK government provides a range of funding opportunities through its various departments, agencies and public bodies. The following is an indicative list of those governmental departments, agencies or bodies that have the potential to provide funds:

- Department for Environment, Food and Rural Affairs (Defra) – e.g., the Fisheries and Seafood Scheme (FaSS) provides financial assistance for projects that support the development of the catching, processing and aquaculture sectors, and for projects that enhance the marine environment.
- Environment Agency – e.g., the Catchment Restoration Fund, Water Environment Improvement Fund, Championing Coastal Coordination (3C's), River Itchen Flood Alleviation Scheme, the Natural Environment Investment Readiness Fund
- Natural England – e.g., the Water Environment Grant (WEG) scheme, Seed funding
- Centre for Environment, Fisheries and Aquaculture Science (Cefas)
- Marine Management Organisation (MMO) – Maritime and Fisheries Fund (MFF)
- Local Authorities
- Highways Agency – National Highways Designated Funds – Environment & Wellbeing Fund – focuses on biodiversity schemes, issues relating to noise, air and water quality around the road network, flooding resilience, protecting and enhancing sites of historic and cultural interest.
- UKRI / NERC – e.g. research grants through the circular economy funding theme

- Ofwat – ‘Innovation in the water sector’ fund
- Department for Housing, Community and Local Government - Community renewal fund. Aims to support people and communities most in need across the UK to pilot programmes and new approaches and will invest in skills, community and place.

5.4.2 Funding coalitions

There are a number of large funding collaboratives that draw together a range of private foundations and corporate entities with similar objectives which relate specifically to reducing marine plastic pollution. These include Oceans 5 and the Plastics Solution Fund. For example, Oceans 5 support projects involving multiple organisations working toward results-oriented conservation projects throughout the world and has a particular focus on projects which support marine protected areas. For example, a recent grant was awarded to a French NGO to further protect French Marine Protected Areas (MPAs) from high impact fishing activities.

The Interreg Preventing Plastic Pollution Project also outlines how collaborative partnerships between organisations and communities can be an effective way of delivering change across shared objectives (Preventing Plastic Pollution, 2023). For example, organisations including national and local authorities, infrastructure providers, businesses and environmental NGOs can offer funding, access to resources and in-house expertise to address the issue of plastic pollution.

5.4.3 Non-profits

There are numerous UK-based and international non-profit organisations and private trust funds that offer funding for marine plastics related initiatives. These include but are not limited to the Oak Foundation, Pew Charitable Trusts, the National Lottery Community Fund, John Ellerman Foundation, Swire Charitable Trust and the Esmée Fairbairn Foundation. For example, the National Lottery Community Fund, which offers funding (over £10,000) for organisations that work in partnership with a shared set of goals to help their community thrive, has previously awarded grants to organisations to raise awareness of the negative impact of plastic pollution and to tackle plastic waste. Another example is the Coastal Fountain Fund run by Sea-Changers to reduce the impact of single-use plastic water bottles on coastal habitats. Communities are provided with grants (up to £2000) to purchase drinking water fountains and install them for public use in busy or environmentally important areas.

One that might be particularly relevant to the nature of the partnership would be the Blue Marine Foundation, that is a charitable company limited by guarantee that funds a number of marine related projects both in the UK and overseas. Of particular relevance locally is that of its Solent Oyster Restoration project that is a 5-year programme to restore the native oyster fishery in the Solent. However, BMF are also leading on a new project entitled the Solent Seascape Project that will reconnect the Solent into a functioning seascape by improving the condition, extent, and connectivity of key marine and coastal habitats using protection and restoration initiatives.

5.4.4 Private enterprise

There are a range of businesses and their philanthropic arms that are active in funding marine plastics related initiatives. For example, the Biffa Award Partnership Grants Scheme awards grants of up to £1million to projects in the UK that restore and/or improve the environment and the natural systems or habitats that support it. In addition to this, local businesses may have funding opportunities available, such as the Southampton Airport Community Fund (administered by Eastleigh Borough Council), for which £100k of funding is available to support projects benefitting the local community.

6.0 CONCLUSION AND NEXT STEPS

6.1 CONCLUSION

Tackling plastic pollution in the Itchen estuary is complex. It requires a comprehensive set of solutions across the plastic value chain and waste management hierarchy, involving all key stakeholders.

This work funded by the Environment Agency has reviewed the situation regarding plastics in the Itchen estuary and conducted stakeholder engagement both through a series of key informant interviews and a workshop. It is clear there is a willingness and enthusiasm to take this forward and develop a partnership aimed at tackling the plastic pollution problem.

The development of such a collaborative partnership would be a positive step in the management of this issue, though it should not be seen as a short-term process, or a guarantee of success in the long-term. It would however provide an opportunity to develop an innovative approach to tackling a local and global issue. If successful it could offer a model to be shared more widely for the kind of collaborative and behavioural change required to go beyond the minimum requirements and thresholds that are currently in place, and which evidently do not work. Community clean-up operations by themselves do not solve the problem and a continuation of the status quo will only see an increase in the impacts of plastic pollution and a consequent reduction in ecosystem health.

6.2 NEXT STEPS

This report does not extend to making recommendations around particular interventions that might be actioned but instead highlights the key next steps required to get such a partnership off the ground. These are:

1: Establish a steering group to guide the work of the partnership, with representation from a range of key stakeholders including the private sector

In line with the outcomes of the workshop, the establishment of a steering group is necessary to guide the work of a partnership. It is strongly suggested that this should be composed of a range of key stakeholders including those from private industries that handle plastics within the Itchen catchment, including the maritime, plastics and wastewater industries. Securing the support of the private sector is seen as crucial in delivering a fully collaborative cross-sectoral partnership that can effectively address the issue of plastic pollution in the Itchen estuary.

To date, representatives from the Royal Yacht Association, National Oceanography Centre, University of Southampton, Friends of the Itchen, the Final Straw Foundation, Natural England, Wessex Rivers Trust, Southampton City Council and the Environment Agency have expressed a willingness to form part of a steering group. However, there is still a need for representatives from the aforementioned industries to join the steering group to ensure that it is fully representative of the different actors in the plastic value chain and waste management hierarchy.

2: Define the scope of the partnership

Once established, the steering group must determine the scope and boundaries of the partnership. This is critical given the range of partnerships that operate within the Itchen catchment and will ensure the partnership has clear direction and an actionable brief. For example, by having a clear focus on plastics, the partnership will be clearly differentiated from pre-existing partnerships such as the Test and Itchen River Association, the Test and Itchen Catchment Partnership and an Itchen River Forum, the formation of which is recommended by the report on Protecting, Preserving and Promoting the Itchen, which was produced following the Southampton City Council's Scrutiny Inquiry Panel of the same name.

3: Develop a roadmap for change

Once the steering group has formed and the scope of the partnership defined, the members of the steering group should take responsibility for developing a roadmap for change. This must be both actionable and time-bound and take into account the funding landscape to ensure that the partnership not only achieves its objectives in the short to medium term but also delivers a long-lasting legacy. The strategy to deliver change will largely depend on the scope and limitations of the partnership and the generation of buy-in from stakeholders across the plastic value chain. However, there are multiple benefits of developing such a strategy, which will act as a tool to inform members of the partnership's progress, provide accountability for those responsible for delivering specific actions and add context to the overall aims and objectives of the partnership.

4: Explore funding options to facilitate the partnership

The success of a partnership depends on the availability of sufficient funding and resources. There are a number of available options which will need to be considered by the steering group but as a starting point seeking funds from willing partners could represent the best option for providing the initial facilitation. Following that, an approach whereby each partner has a responsibility to commit either funds and/or resources to help in achieving the partnership's objectives would act as a way of maximising the active participation in the partnership.

5: Appoint an individual or organisation to facilitate or lead the partnership

One of the themes raised by delegates in the workshop was the need for a partnership to have appropriate leadership to ensure the delivery of its objective of preventing plastic pollution in the Itchen estuary. One option is to externally recruit and appoint a partnership manager or officer or alternatively to seek to utilise existing personnel from an organisation that forms part of the steering group. Another option is to appoint an independent organisation or individual to facilitate the partnership moving forward. These measures will effectively be determined by the funds available to the partnership, however, it is recommended that leadership for or facilitation of the partnership is sought, as the capacity of the steering group alone may be limited.

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APPENDICES

APPENDIX 1: KEY STAKEHOLDERS IN THE PLASTIC VALUE CHAIN WITHIN THE ITCHEN CATCHMENT

Type of actor	Key stakeholders
<p>Plastic industry representatives:</p> <p>Resin and pellet importers, converters and plastic product manufacturers, retail and supply chain representatives</p>	<p><u>Resin and pellet importers, converters and plastic product manufacturers</u></p> <ul style="list-style-type: none"> • British Plastics Federation • Martin’s Rubber Company • Shorecast Solent Ltd • Polystar Plastics Ltd • Bridge Rubber & Plastics Ltd • SIVA Plastics Ltd • ASK Plastics Ltd • Specpol: Specialised Polymer Engineering Ltd • Custom Covers Ltd • Phase3 Plastics • Alda Plastics Ltd • Greentech Plastics Ltd • Everest Plastics • CNC Polystyrene <hr/> <p><u>Retail and supply chain representatives</u></p> <ul style="list-style-type: none"> • GAP Southampton (previously Formerton Sheet Sales) • Di-Pak Packaging Services
<p>Key plastic users in the catchment</p>	<p><u>Maritime Industry</u></p> <ul style="list-style-type: none"> • Royal Yacht Association (RYA) • British Marine • Crown Estate • MDL Marinas Group Ltd – Ocean Village Marina • Itchen Marine Towage Ltd • Ocean Quay Marina • Shamrock Quay • Saxon Wharf • Kemps Quay • Quayside Marina • Bluffs Quay • Dyer Bros Marine Ltd • St Denys Boat Club • Merlin Boat Yard • Lauren Marine Services • Drivers Dry Berthing Ltd • Southampton Dry Stack • Smith’s Quay Boat Yard <hr/> <p><u>Fisheries and aquaculture</u></p> <ul style="list-style-type: none"> • Lower Itchen Fishery • Franklyns Fish Farm • Avington Trout Fishery • Fishers Pond Fishery <hr/> <p><u>Agriculture</u></p> <ul style="list-style-type: none"> • National Farmers’ Union – Southeast • The Hampshire Farmers’ Club • Country Landowners’ Association – Southeast • Farmers Clusters Group – Winchester Downs

	<u>Construction</u> South Coast Building Supplies
Transport & logistics companies	<u>Ports & Harbours</u> <ul style="list-style-type: none"> • Associated British Ports (ABP) • DP World
	<u>Shipping</u> <ul style="list-style-type: none"> • Sevenstar Yacht Transport UK • Columbia Cruise Services UK Ltd • Denholm Port Services • Craftline Shipping Ltd • John H Whitaker (Tankers) Ltd • Williams Shipping • Clarkson Port Services • Hoegh Service Centre • Southampton Cargo Handling
	<u>Freight</u> <ul style="list-style-type: none"> • Southampton Freight Services • Wallenius Wilhelmsen • Port Direct Logistics Southampton • Complete Marine Freight Ltd • BMW Shipping Agents Ltd • JC Shipping Services Ltd • AB Plant Shipping Ltd • NMT International Shipping UK Ltd • Wainwright Bros & Co Ltd • MJS Shipping Ltd • Anglo Freight • Maritime Transport Ltd • Pentalver • Supreme Freight Services Ltd • Seko Logistics Southampton UK • GAC Pindar • Crossborder Logistics
Waste management companies	<u>Wastewater treatment</u> <ul style="list-style-type: none"> • Southern Water • Portsmouth Water
	<u>Solid waste management and recycling</u> <ul style="list-style-type: none"> • Veolia* • Eastleigh Borough Council* • Southampton City Council* • Winchester City Council* • Hampshire County Council* • Biffa Eastleigh • SUEZ Recycling and Recovery UK • L&S Waste Management • TJ Waste & Recycling Ltd • The Waste Group • KPG Waste Services • Zero Waste Group • Eurocell Recycle
*Part of Project Integra – Hampshire Joint Municipal Waste Strategy	

Municipalities/ local authorities	<ul style="list-style-type: none"> • Eastleigh Borough Council • Southampton City Council • Winchester City Council • Hampshire County Council
Government agencies	<ul style="list-style-type: none"> • Environment Agency • Natural England • MMO • Cefas • IFCA • Defra
CSOs and NGOs	<ul style="list-style-type: none"> • Wessex Rivers Trust • The Final Straw Foundation • Nurdle • Surfers Against Sewage • Friends of Chessel Bay • Hampshire and Isle of Wight Wildlife Trust • Marine Conservation Society • The Green Blue • Hamble Estuary Partnership • Solent Forum • RSPB • Coastal Partners • Test and Itchen Catchment Partnership
Academic institutions	<ul style="list-style-type: none"> • Solent University • Southampton University • National Oceanography Centre (NOC) • University of Winchester

APPENDIX 2: KEY INFORMANT INTERVIEW TRANSCRIPTS

Interview with Sue Simmonite, ABP

1. The problem: plastic pollution in the Itchen – current understanding of nature and extent - What is your understanding of the extent of plastic pollution in the Itchen?
Types of plastics / sources
 - *Don't know how bad it is. Around the port is doesn't look bad but then they keep a tidy port. Recently visited Dibden Bay and that looked visually free of plastics.*
 - *Storm events are likely to bring plastics up the estuary towards the port.*
2. How are ABP involved with plastics? Imports / transfer / storage / waste disposal - Organisational role within the plastic value chain
 - *Imports, cargo*
 - *Transfer / storage*
 - *Waste disposal - ABP try to minimise waste but contract Biffa Waste for landside waste and collection. ABP segregate wastes. Ship waste collected by Veolia and goes to Marchwood .. Annex 5 waste / galley waste*
3. How does ABP manage plastic waste / prevent plastic spillages? Measures in place to prevent/reduce plastic pollution
 - *No specific monitoring of plastics though workplace inspections occur regularly as part of environmental management auditing – Port EMS*
 - *There is a central reporting system but EMS is not specific to plastics*
 - *Have you had plastic spillages? Not especially*
4. In what ways could these management strategies be improved? How could these measures be improved?
 - *Always looking to improve but not looking particularly at plastics.*
 - *New strategy development for waste. Big waste audit planned in 2020 which didn't happen so overdue, and this will inform strategy development. Aim top refresh the initiative.*
 - *Head of Compliance is responsible for waste.*
5. Would ABP be interested in being part of a wider partnership project with other key stakeholders to prevent plastic pollution in the Itchen?
 - *Yes, attend and participate.*

Interview with Phil Horton, RYA

1. What is your understanding of the extent of plastic pollution in the Itchen? Types of plastics / sources
 - *Polystyrene from marina floats*
 - *End of life yachts, boats*
 - *Is there any evidence?*

2. How do RYA members engage with plastics / the issue of plastic pollution?
 - *Through the Green Blue*
3. Does the RYA advise its members on managing plastic waste / preventing plastic leakages?
 - *Provide guidance on maintenance of boats .. rig cleaning, wiring etc.*
 - *Clean Marine Programme / Yacht Harbour Association – Boat folk*
 - *Accreditation for standard and behaviour – to promote behavioural change*
 - *Online accreditation – bronze, silver, gold*
4. In what ways could these management strategies be improved?
 - *EPR – apply levy on new boats (%) of cost to pay for end of life yacht / boat clean up and management*
 - *Marlow ropes 100% recycled*
5. Would the RYA be interested in being part of a wider partnership project with other key stakeholders to prevent plastic pollution in the Itchen? In what capacity?
 - *Yes*
 - *Should invite John White RHA Tie Hard*

Interview with Abhishek Naik, SIVA Group

Profile: HSE manager

1. The problem: plastic pollution in the Itchen – current understanding of nature and extent - What is your understanding of the extent of plastic pollution in the Itchen? Types of plastics / sources

Blue polymer pellets / Styrofoam

2. How are Siva involved with plastics? Imports / transfer / storage / waste disposal - Organisational role within the plastic value chain

Use: Clear / grey / white plastics

Imports: virgin plastics arrive from different parts of world in containers; 20kg bags

Now: using 85% recycled materials (PCR/PCW) post customer waste; some recycled onsite

Some other companies take non-recyclable waste and sell it back ...

Transfer / storage / Waste disposal

3. How does Siva manage plastic waste / prevent plastic spillages? Measures in place to prevent/reduce plastic pollution

Strict management regime – EMS

Env Agency Monitoring / Reporting

Spillages: polymer plastics – recorded;

Use drain types; job responsibility

Site management -

4. In what ways could these management strategies be improved? How could these measures be improved?

Get EMS 14001

5. Would Siva be interested in being part of a wider partnership project with other key stakeholders to prevent plastic pollution in the Itchen? In what capacity?

Interview with Steve Russell, MDL Marinas

1. What is your understanding of the extent of plastic pollution in the Itchen? Types of plastics / sources

Regular plastic in the marinas

Berth holders with some behavioural issues – throwing waste over side

2. How are MDL involved with plastics? Imports / transfer / storage / waste disposal - Organisational role within the value chain

Polymers / Resins / Floats / pontoons

Reusing materials where possible

3. How does MDL manage plastic waste / prevent plastic spillages? Measures in place to prevent/reduce plastic pollution

14001 / Green boat show

Greener Marinas / Vision + to be most sustainable in UK

BREEAM = sustainable MDL estates / energy saving / open space / waste management

Reusing materials where possible

Procurement

4. In what ways could these management strategies be improved? How could these measures be improved?

Tenants control through contract

Work in boat yards

Filter buns – lifting boats out of water / water sieved before going back in

Waste associated with boat yards

Dredging – maintenance dredging lichen / disposal

Floats / pontoons - how many might be lost?

Pontoons – inspected annually – pontoon supplier collects and removes

5. Would MDL be interested in being part of a wider partnership project with other key stakeholders to prevent plastic pollution in the Itchen? In what capacity?

APPENDIX 3: NOTES FROM COMMUNICATION WITH KEY STAKEHOLDERS

Southern Water (SW)

Sean Ashworth leads on Plastic related work and would be happy to support this work going forward. Unfortunately, he is unable to attend the workshop due to other commitments but will try and find someone to attend.

SW have a Reducing Plastic Plan across their business – they commissioned a not-for-profit organisation to undertake this work = ‘Responsible Plastic Management’, that will audit how plastic flows through their business and will identify where they can do better, and where there are data gaps. For example, laboratories, facilities, operational processes, etc.

They use clay beads at their WWTW’s on the Itchen, not bio-beads (these help with different aeration systems). They have worked with Southampton Uni to understand the scale and type of issues, and where to target intervention measures.

WWTW’s – the screens remove plastic items at the beginning of the treatment process. Large items such as wet wipes, sanitary products, etc are removed and disposed of. The micro-plastics are removed via the sludge process – however 99% of sludge is reused on land. Water UK Innovation & Research are looking at the sludge/micro plastic issues – they will report back to industry, although some of this information may be released via scientific papers.

CSO’s are used during heavy or prolonged rainfall when the network becomes overwhelmed. When this occurs, excess water is released into rivers and the sea, therefore untreated sewage discharged through storm outfalls will not be subject to the same treatment process. The Clean Rivers & Seas Task Force has been set up to significantly reduce storm overflows by 2030 – see <https://www.southernwater.co.uk/our-performance/storm-overflows> .

SW also advise Government by responding to consultations such as single use plastics and wet wipes, and propose what needs to happen and why, therefore, have an influential role in policy and legislation development.

A lot of micro-plastics could potentially be removed before they arrive at the WWTW’s – change to clothing fibres, washing machine filters, etc.

Depending on the type of pollution e.g. nurdles, it may be useful to bring into the discussions, the clients and suppliers e.g. supermarkets, to encourage higher standards, more auditing and control measures.

DP World

Gary Malson (*Environment & Audit Officer*)

The company have introduced a lot of measures to reduce plastic on site e.g. cleaning products, facilities and equipment, PPE, providing alternatives to operatives. Interest in a potential partnership project.

EMR Group – Metal (and plastic) recycling

Herman Kok – Safety, Environment, Quality Director, Nick White SHE Tech Manager, Matt Bumpus South East SHE (Env lead).

Very interested in sustainability, environmental good practice, and maintaining their ISO accreditations. They have limited plastic come onto the metal recycling site in Northam, and have to clean any contamination before the metal is moved on – cleaning is completed under storage, cables are consolidated and taken off site for shipping to be stripped. The metal has to have less than 2% contamination to meet the stringent standards associated with permitting. They have a car plastic recycling facility in the NE.

Southern IFCA

Dr Sarah Birchenough

Thank you for your email regarding the Itchen Estuary Preventing Plastic Pollution workshop. We recognise the importance of the issue of plastic pollution in the marine environment and are supportive of work being carried out to understand this issue better. Regarding the invite to attend the workshop, unfortunately Southern IFCA will not be able to attend. We appreciate being provided the information on how to get involved and would be happy going forward to receive updates on the project and details of outputs from workshops/meetings such as the final report you mention but we won't be able to be involved directly.

The Crown Estate

Jack Price (Marine Sustainability Advisor)

We've started to do some work on our potential role in helping to manage/reduce source to sea pressures and litter is a key focus. Been involved on some internal work here at TCE on how we better manage marine litter on our foreshore so look forward to sharing our findings on impact management and community engagement on the topic.

ASK Plastics

Vicky Sohal

Currently on maternity leave but trying to organise for someone from admin to come to workshop. If not would still like to be involved and call you to discuss how we can make this happen. It sounds like a great initiative.

ABP

Sue Simmonite - Sustainable Development Manager, Mandy Boulding (Environment Officer)

Do keep me informed though because I am still keen that we keep working as a community improve our natural environment.

RSPB

Wez Smith - Senior Project Manager – LIFE on the Edge

I will pass it on to the conservation officers within the RSPB to see if they can help.

MMO

Zia Fikardos

I have attempted to find someone who would be able to attend the workshop (I am unfortunately away on a long-planned trip) but unfortunately I have not been successful. Moving forward I would like to be kept in the loop with the project and am happy to provide advice from a marine planning perspective. However, I am unsure on the level involvement the MMO would be able to have and it is something I am chasing with senior managers.

In terms of signposting to information, I would suggest the [South Marine Plan](#), [Technical Annex](#) and [Explore Marine Plans](#) would be relevant. We have marine litter and water quality policies that would be relevant to the project. If this isn't what you meant then please let me know. I may send you another email tomorrow once some of my other colleagues have responded to me and there might be some more information I can get for you.

Apologies, I have only just been forwarded the below email on the preventing plastic pollution workshop as my colleague has been on leave. I am now the lead on Marine Litter Policy for the MMO, so if you could please email me directly going forward it would be much appreciated – thank you.

Can I just check what time the workshop is today? Unfortunately I don't have a lot of capacity to attend an further meetings today. If there is any of the similar workshops going forward then please do let me know and I will try my best to join.

Kind regards,

Stephanie Hague (her/she)

Marine Planner (Evidence) | Marine Management Organisation
+ Nobel House | London | N1 8DW

APPENDIX 4: WORKSHOP DELEGATE LIST

Stakeholder	Delegates
Crown Estate	Jack Price - Jack.Price@thecrownestate.co.uk
DP World	Gary Malson - GMalson@dpworldsouthampton.com
Environment Agency	Alison Matthews - alison.matthews1@environment-agency.gov.uk Dawn Theaker - dawn.theaker@environment-agency.gov.uk Jackie Mellan - jackie.mellan@environment-agency.gov.uk Sophie Goodall-Smith - Sophie.Goodall-Smith@environment-agency.gov.uk
European Metal Recycling	Matt Bumpus – Matt.Bumpus@emrgroup.com Nick White - Nick.White@emrgroup.com
Final Straw Foundation	Lissie Pollard - hello@finalstrawfoundation.org
Friends of Chessel Bay	Rose Nicole - renicole@googlemail.com
Hampshire & Isle of Wight Wildlife Trust	Emily Stroud - emily.stroud@hiwwt.org.uk
National Oceanography Centre	Alice Kloker - alice.kloker@noc.ac.uk Dr Alice Horton - alice.horton@noc.ac.uk
Natural England	David Andrews - david.andrews2@naturalengland.org.uk Dr Aldous Rees - aldous.rees@naturalengland.org.uk
Nurdle	Joshua Beech - josh@nurdle.org.uk
Portsmouth Water	Simon Deacon - simon.deacon@portsmouthwater.co.uk James Bucknall - james.bucknall@portsmouthwater.co.uk Sophie Emms – sophie.emms@portsmouthwater.co.uk Ellie Moore – ellie.moore@portsmouthwater.co.uk Jenna Dewhurst – jenna.dewhurst@portsmouthwater.co.uk
Royal Yacht Association	Phil Horton - Phil.Horton@rya.org.uk
Solent Forum	Karen McHugh - solentforum@hants.gov.uk
Southampton City Council	Lindsay McCulloch - lindsay.mcculloch@southampton.gov.uk Sara Tschersich - sara.tschersich@southampton.gov.uk
Southampton University	Dr Malcolm Hudson - mdh@soton.ac.uk Dr Pete Shaw - p.j.shaw@soton.ac.uk
Wessex Rivers Trust	Dr Dave Rumble - dave@wessexrt.org.uk

Apologies received from: MDL Marinas, ABP, ASK Plastics, SIVA Group, Southern IFCA, MMO

Existing Management

EMR - quarterly SHE audits EMS system
End of waste process
~~closed system strip metal from plastic~~

Sewage treatment works - Mesh lets
in less than 6mm
Can audit for pellet loss

Plastics from ^{Littering} waste, blown onto sites

Management = correct waste bins

Downstream sources?
Near water closed bins - No matter what source LA waste mgt important
Portsmouth water will analyse above
Woodmill

Colour of plastics important clue to source

DP World - ABP is their landlord

Container port

Viola waste mgt

Environment Audit, Oilspill Response,
ISO accreditations

Risk = oil & hydraulics

Interceptors throughout site

Plastics free in covering

will be smaller organisations?

Josh → it is the breakage of the sacks

with nurdles in improvements needed → Screens to stop
& nurdle storage entry to water.

Need better evidence of nurdles found through
EA reporting

WHAT IS BEING CURRENTLY DONE?
Monitoring?

- Friends of Chesel Bay
 - Uni of Southampton.
 - Southern Water? DWMP
 - Portsmouth Water.
 - EMR — Trade Waste Sampling
— Not plastic monitoring
 - E.A. — compliance monitoring
- Catchment ^{to advice} Partnership → WRT
- No central database.
No consistent funding stream.
- IS Sludge to Land?
- Fidra
- Green Blue RYA
- Uni of Portsmouth — Food Chain

→ ABP - removal of material
knowledge of waste
quantity
- one off?

→ Marina's?
Association?

→ Fishing clubs?

→ IFCA?

→ Businesses discharging
to environment
Plastics on permit?
Suspended Solids

→ GAP ANALYSIS

EXISTING MG:

Jack Price - (Bio-infrastructure?)

- Green Gates - how to engage local councils to build good practice + policy - would like to include in contract
- need to track where hotspots are + progress being made

Dr Martin - (then seems unusual in % of needles in plastic deposit is very high)

Nat Oceanography Centre - challenge to engage with industry correctly

- current emphasis is on cleanup rather than prevention (Frocks & animal by)

- Manufacturers using needles we know but difficult to identify individual sources via regulation - big constraint

↳ Polystar have put in planning app for more secure storage → promising - what was driver?

↳ may have been influenced by UK Plastics pact?

↳ roadmap to 2025 (not specific to needles)

- Seva interested in cleanup being done at Chesel Bay and are starting to respond - slowly!

Existing Management

- Legislation that doesn't recognise plastic as pollution
- management systems are voluntary
- Public education - Littering is pollution
- Maintenance; boats; liability
 - Blue/green - increase in waste services for boat user
- Bins don't always solve the problem.
- in waste containing plastic to land.
- General lack of understanding in industry e.g. plastic degradation.
 - Storage of plastic
- Storm water overflows
 - lack of infrastructure
 - lack of public knowledge / awareness of harm

Better Management

* Education - All

- feasibility - Easy
- Challenges - Understanding / green washing / who ^{leads} ~~leads~~
- Opps/bars - Wide scale / large reach / social media / traditional media / existing env. groups e.g. ^{it} ~~subject~~ _{scope}.

* Product substitution - e.g. pontoon floats.

- ~~feas~~ - ?? Are there alternatives?
- Chall - manufacturer / user uptake / ownership / cost
- Opps/bars - easy transport / change of pollutants.
- Better tracking of products / licencing
- Recycled plastics?

~~Biodegradable~~ - Biodegradable plastics, not generally not the solution. Breakdown is quick = more plastics.

* Co-ordinating of efforts.

- Who leads this?

↳ Harbour Master / ABP

Consumer responsibility
i.e. and user env. credentials
e.g. Red-kite Certificate

↳ Resourcing issues?

* Containment improvements by responsible users.

Why regulate
resources

- Binding / management practices / clean up
- Improved regulation like oil storage?

Options Better Mgt. - GP4

- Nano plastics - 1mm or less
Micro " 1-5
- Need more monitoring. Source - pathway
 - Public Awareness raising -
Need to manage at Source
(+ smaller business awareness)
 - Small companies need help as a
big % of their turnover
 - EMS / Regulation needs to recognise
that plastics pollution could be toxic / dangerous
and require better management.
i.e. Polystyrene
 - Sludge of water company waste washing back
into rivers. Invest in significant infrastructure.
 - Awareness raising needs to be
well funded and national.
Itchen only one of many areas
although Itchen is one of worst in England
(FIDRA website)
 - Tackle future sources as well as existing background
pollution.
 - Itchen monitoring ^{at least 5 years data} post mudflats clean-up is so important
as a case study - can start to test changes in
the system
 - ~~Incentives~~ Incentives to local industry to work with them
to change
 - Replacement of polystyrene pontoons - need to make
ports / marina / harbours responsible for their assets
 - End of life boats. Need a fund on all new
boats built (France) for clean-up

Better Management

- Waste - Reduce
Refuse
Alternatives
* Biodegradable
Mis-information
"Green Washing"

Transparency of recycling
→ Where does it go?
Energy from waste.
True recycling.

- Levy / Green tax WRS
~~WRAP~~
2018
- "Revolution"

"Behavioral change"

- Infrastructure for recycling → Better
Reuse → Better

- Needs to be:
- Easy, accessible, cheap
 - Research - health effects
 - Public / Private
 - Legislation / Education
 - ISO 14001
 - Social Media → influencing Behavioral Change.
- Affordable
- Resource Support for Small Companies.
 - Focus more on Nurdle manufacture and users
 - Don't blame - work together. culture.
 - Reputation
 - Cost Benefit Assessment
 - Banning products - Alternatives.

Uni of Southampton
research needs to have
a bigger publicity drive

OPTIONS FOR BETTER MANAGEMENT.

- ∅ Improve regulation/legislation/resource. / MORE
/ LINKED UP.
- ∅ Education of MoP + Business.
- ∅ Marking of drains. with fish.
- ∅ Voluntary programs
- ∅ Environment needs to be important
- ∅ Stop the input of plastics
- ∅ Reputational Damage as a tool of change / CONSUMER
/ INDUSTRY.
- ∅ Opportunities → opens up for other environmental conversations.

APPENDIX 6: METHODOLOGY

INTRODUCTION

There are four distinct aims to this study and in order to generate an evidence base and meet each objective, different methods will be employed, as shown in Table A.

Table A: Approach taken to address the project objectives.

Key aspects of the study	Objectives	Approach		
		Desk research	Stakeholder engagement	Data analysis / formulation of findings and recommendations
1. Understanding plastic pollution from source to sea	a. Develop an understanding of the current nature and extent of plastic pollution in the River Itchen	✓		
	b. Develop an understanding of the implications of plastic pollution for the ecology and users of the River Itchen	✓		
2. Enabling transformational change	a. Identify potential activities and sources of plastics pollutants, including the routes by which they enter the water.	✓		
	b. Identify potential funding opportunities to support this work.	✓		
3. Communication	a. Consult key partners to gather information and gain support.		✓	
	b. Hold a key stakeholder meeting/workshop to gather further information and galvanize support to develop a collaborative project aimed at delivering an improvement programme for the River Itchen estuary.		✓	
	c. Identify options for future engagement and communication.		✓	✓
4. Reducing and removing the legacy of plastic pollution	a. Consult key partners to collate actions happening/planned to stop, reduce, and remove plastics.		✓	
	b. Identify current and/or new measures required, or measures that have	✓		

	been employed in similar environments nationally or internationally.			
	c. Identify different approaches and options the project could take to make a measurable difference to the natural environment and people.	✓		✓

This section provides a brief outline of the methods selected for data collection and analysis, as presented in Figure A.

DESK RESEARCH

Secondary research was undertaken to address a number of the key objectives of the project, with a rapid evidence review of published peer-reviewed studies and grey literature conducted using databases such as Google Scholar, JSTOR, ScienceDirect and PubMed *inter alia*, in addition to an online search engine (Google).

Review the current nature and extent of plastic pollution in the Itchen estuary

Literature related to plastic pollution in the River Itchen was sourced using a combination of pre-defined search terms and using a snowballing technique, with the following search string used. Given limited research into the extent of the problem has been conducted, the search terms were widened to include the Solent and Southampton Water, into which the Itchen flows and, in addition to this, widened to include synonyms for plastic pollution.

- TITLE-ABS-KEY ("Itchen") OR ("Southampton Water") OR ("Solent") AND ("plastic debris")
- TITLE-ABS-KEY ("Itchen") OR ("Southampton Water") OR ("Solent") AND ("plastic pollution")
- TITLE-ABS-KEY ("Itchen") OR ("Southampton Water") OR ("Solent") AND ("microplastic")
- TITLE-ABS-KEY ("Itchen") OR ("Southampton Water") OR ("Solent") AND ("marine debris")
- TITLE-ABS-KEY ("Itchen") OR ("Southampton Water") OR ("Solent") AND ("marine litter")
- TITLE-ABS-KEY ("Itchen") OR ("Southampton Water") OR ("Solent") AND ("plastic waste")

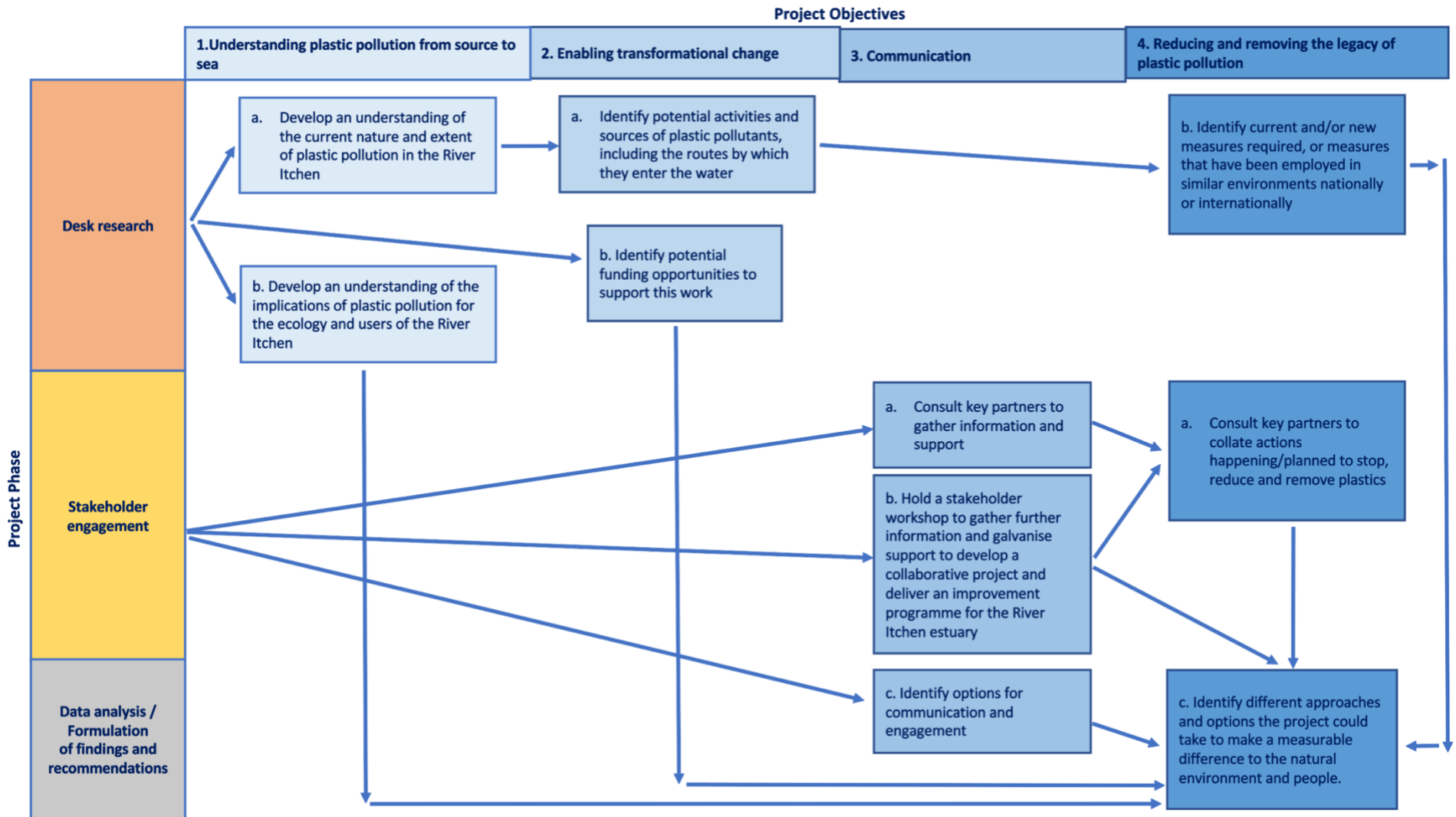


Figure A: Project framework

Identify potential sources and pathways for plastic pollution in the Itchen catchment

To identify the potential sources and pathways of plastics entering the Itchen estuary, existing literature around plastics within hydrological catchments was sourced, such as Windsor *et al.* (2019), in addition to land-based sources of plastics, such as OSPAR's (2017) assessment of land-based inputs of microplastics in the marine environment. Through this, a method of categorising the sources and fluxes of plastics within the Itchen's catchment was developed.

Existing secondary data on the extent of plastic pollution in the Itchen was reviewed to identify sources and fluxes of plastics within the Itchen catchment, including reports by local media and campaign groups such as Surfers Against Sewage and the Friends of Chessel Bay, and contributions from the Project Group. In addition to this, a review of potential sources of plastics within the catchment was conducted using Google Maps, with the pre-determined categories of sources and fluxes used to generate appropriate search terms to identify potential sources.

Review the impact of plastic pollution on the ecology and users of the Itchen estuary

To understand the implications of plastic pollution for the ecology and users of the Itchen estuary, it was necessary to develop an understanding of both the ecology of the Itchen and those that use it. A range of indicative sources included the following:

- Test and Itchen River Restoration Strategy Technical Report
- Test and Itchen River Restoration Strategy Management Report
- Test and Itchen Catchment Flood Management Plan
- Drainage and Wastewater Management Plan – Test and Itchen Catchment
- River Basin Management Plan – Southeast River Basin District – Plastic section
- Site Improvement Plan – River Itchen (IPENS - NE)
- Scrutiny Inquiry Panel – Protecting, Preserving and Promoting the River Itchen in Southampton - Meeting documentation (and final report)
- Websites relating to river usage – e.g., water sports clubs, tourist sites, community groups etc.

An evidence review was then conducted to develop an understanding of the impacts of plastic pollution, with the following search string used:

- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“impact”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“environmental effect”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“environmental impact”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“ecological effect”)

- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“ecological impact”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“social effect”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“social impact”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“human effect”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“human impact”)

Identify current and/or new measures required, or measures that have been employed in similar environments nationally or internationally.

To address this objective, a rapid evidence review was conducted to source literature that discusses measures that have been deployed to prevent plastic pollution. The search was focused on riverine and marine environments and this review was undertaken using a combination of pre-defined search terms, with the following search string used.

- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“prevent”) AND (“river”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“prevention”) AND (“river”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“preventing”) AND (“river”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“reduce”) AND (“river”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“reduction”) AND (“river”)
- TITLE-ABS-KEY (“plastic debris”) OR (“plastic pollution”) OR (“microplastic”) OR (“marine debris”) OR (“marine litter”) OR (“plastic waste”) AND (“reducing”) AND (“river”)

An indicative list of other sources reviewed includes:

- Outputs of the Interreg Preventing Plastic Pollution Project
- Southampton City Council’s Scrutiny Inquiry Report on the Itchen
- Thames 21
- Nurdle clean up – as recently reported on the BBC’s The One Show.

Identify potential funding opportunities to support this work.

Potential funding opportunities to support a partnership project to prevent plastic pollution in the Itchen were sourced through a rapid evidence review of opportunities available through donor organisations known to ERC and via an additional online search. This includes opportunities from a range of organisations, both public and private, UK based and international.

STAKEHOLDER ENGAGEMENT

Stakeholder engagement is vital to the successful development of effective measures aimed at plastic pollution reduction and fits into the project framework, as shown in Figure A. The process of engaging with stakeholders was therefore imperative and included the following activities:

- Stakeholder mapping to identify key actors relevant to plastic pollution and management in the catchment.
- Key informant interviews (KIIs) with representative stakeholders
- Stakeholder workshop to facilitate on-going engagement and network development.

Stakeholder mapping

Tackling plastic pollution requires an understanding of the drivers, causes and pathways of pollution, and it may require interventions at all stages of its lifecycle. As shown in Figure B, the plastic value chain encompasses all life cycle stages of plastics from the importation or manufacture of virgin plastics to waste generation, recovery and disposal.

Key stages of the value chain are therefore characterised as follows:

- Virgin plastics production from raw materials
- Plastic products manufacturing
- Trade (import and export) of virgin plastic, plastic products and plastic waste
- Consumption and use of plastics products
- Waste generation and management
- Disposal and recovery

Plastic waste monitoring from the point of waste generation, through the subsequent stages of waste management, will help identify the types and quantities of mismanaged plastics likely to cause pollution. However, analysing upstream stages of the plastic value chain can highlight key industry sectors and product types that contribute to the overall plastic stock in the catchment and their potential to cause pollution. Their use phase i.e., whether they are short- or long-lifetime plastics, is also a useful measure of how soon they enter the waste management system. This in turn can be used to inform interventions and solutions applicable at specific points in the value chain to prevent, minimise and manage plastic waste in an environmentally sound manner.

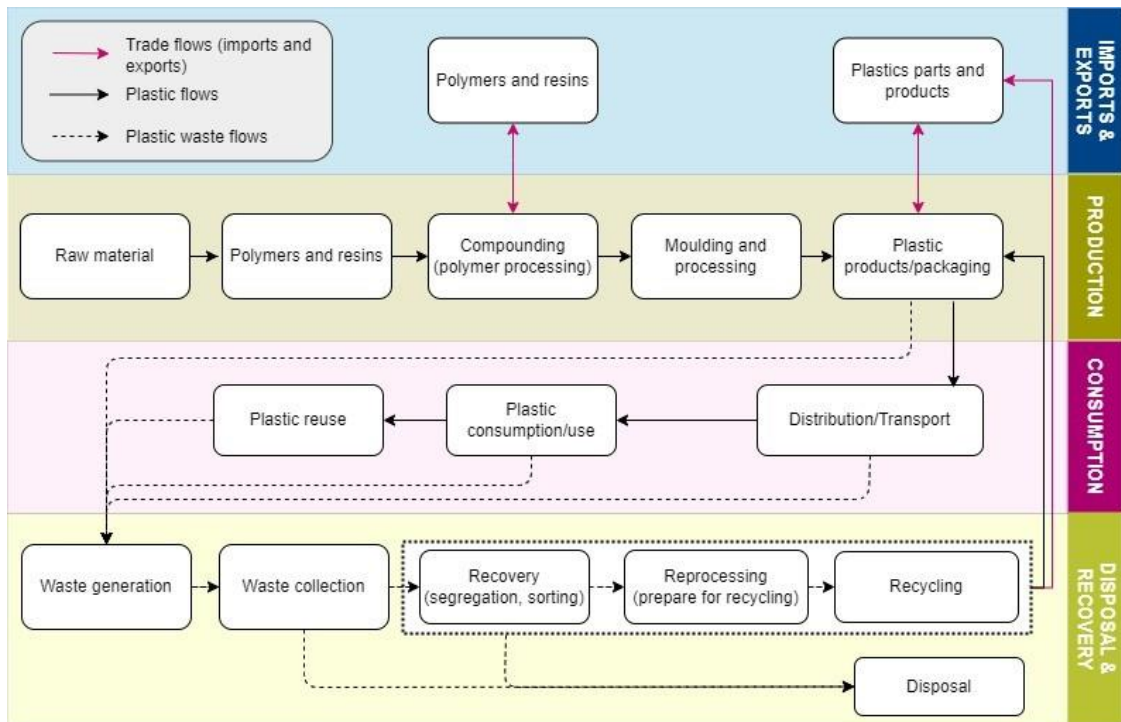


Figure B. Typical plastic value chain

The key actors in the plastics value chain include the following groupings:

- Plastic industry representatives: resin and pellet importers; retailers and supply chain representatives; converters and plastic product manufacturers
- Key plastic users in the catchment: maritime industry; marinas; ship building and boatyards.
- Transport & logistics companies: ports and harbours; shipping; freight
- Waste management companies: wastewater treatment; solid waste management and recycling
- Municipalities / local authorities
- Government agencies
- CSO (Civil Society Organizations) and NGOs
- Academic institutions

A stakeholder mapping exercise has therefore been conducted to identify key stakeholders within the Itchen catchment and categorise them in accordance with their role and responsibilities within the plastic value chain. The results of this exercise are set out in Appendix 1.

Stakeholder mapping can also be used to cross-reference the stakeholders against both their impact on a problem situation and their influence in enabling change. This is reflected in the “rainbow diagram” (Chevalier and Buckles, 2008) shown in Figure C which classifies stakeholders according to the degree they can have an influence on the problem as well as the degree to which they are affected by it.

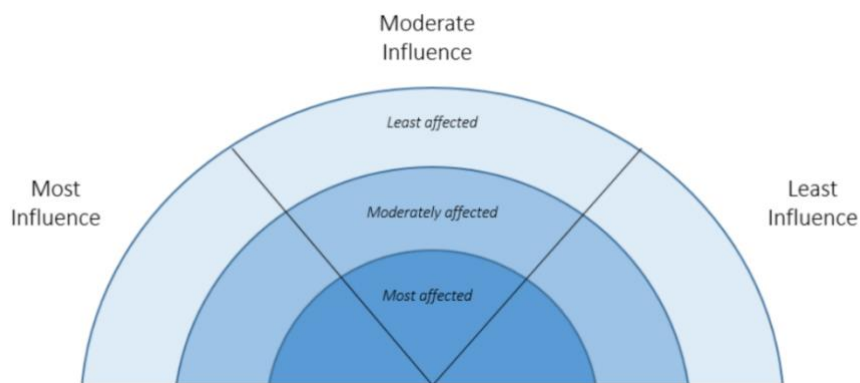


Figure C: Rainbow diagram for classifying stakeholders (Chevalier and Buckles, 2008)

A further categorisation of stakeholders can be identified based on the criteria of power, influence, interest and vulnerability as defined in the World Bank Stakeholder Analysis Guidelines (2016). ‘Power’ is the higher-level influence that has the ability to initiate and sustain a change within a situation; whereas ‘influence’ is ability to change the direction of the project; ‘interest’ is the relationship to the issue; and ‘vulnerability’ is the potential for an impact as a result of the situation over which the stakeholder in question has no control. Table B highlights these criteria with respect to the stakeholder groupings in the Itchen and proposes a classification based on whether they are considered to have high, medium or low value against each of the criteria. Governance stakeholders for example, are likely to have a relatively high degree of power to change the situation, as well as a low degree of vulnerability for the consequences of that change. Clearly debatable, but it provides a starting point when considering the planning and outcomes of the stakeholder engagement process.

Table B: Typology of stakeholder power, influence, relationships and vulnerability relating to plastic pollution (adapted from World Bank, 2016)

Category	Power	Influence	Interest	Vulnerability
Governance	High	High	Medium	Low
Plastics industry	Medium	Medium	Medium	Low
Port	Medium	Medium	Medium	Low
Marinas, boat yards	Medium	Medium	High	Medium
Waste management	High	Medium	Medium	Low
NGOs	Low	Medium	High	Low
Academia and research	Low	Medium	High	Low

Key Informant Interviews (KIIs)

On the basis of the stakeholder mapping, an initial consultation phase took place which involved key informant interviews (KIIs) with relevant stakeholders that were identified and agreed in consultation with the project steering group.

The overall aim of these KIIs directly is to support the current feasibility study into reducing plastic pollution in the Itchen, generate buy-in for the project and encourage participation in the upcoming stakeholder workshop. Specific objectives are as follows:

- I. To better understand the relationship between different stakeholder groups and the plastic value chain
- II. To better understand stakeholder awareness of plastic pollution in the Itchen estuary
- III. To better understand the range of actions currently in place (or planned) to stop, reduce, and remove plastics in the Itchen
- IV. To consider future opportunities for change by the stakeholder and/or as part of a developing partnership

The key informants were selected to represent the four stages of the plastic value chain, with target groups as specified in Table C.

Table C: Key stakeholders within the plastic value chain

Plastic Value Chain Stage	Key stakeholder
Imports and exports (trade and transport)	ABP
Production	British Plastics Federation / Industry representative
Consumption / usage	The Green Blue / British Marine / RYA / Crown Estate
Disposal and recovery	Southern Water

The key stakeholders available for interview were as follows:

- Sue Simmonite, Environment Manager, ABP
- Phil Horton, Planning and Sustainability Manager, RYA
- SIVA Group – Abhishek Naik
- MDL Marinas – Steve Russell

These key informants were contacted to arrange a suitable date and time with interviews held via MS Teams or telephone, depending on participant preference. The interviews were semi-structured with the transcripts to date shown in Appendix 2. These were approximately 20 - 30 minutes in duration.

In addition to this, a number of telephone conversations with other key stakeholders were conducted by Jackaline Mellan of the Environment Agency, including Sean Ashworth, Southern Water.

Stakeholder workshop

Following the key informant interviews, an in-person stakeholder workshop was facilitated with a representative range of key stakeholders invited to participate. The overarching aim of this meeting/workshop was to galvanise support to develop a collaborative project and deliver

an improvement programme for the Itchen estuary. In this regard, the specific objectives of this workshop were as follows.

1. To disseminate information on the nature and impacts of plastic pollution in the catchment
2. To review existing actions in place to manage plastic pollution
3. To identify options and opportunities for change
4. To review the challenges and feasibility of delivering specific options
5. To develop an action plan for delivering change

Participation

Based on discussions with the project steering group and consultation with key informants, a group of key stakeholders were invited to the workshop, as set out in Table D.

Table D: Stakeholders invited to the workshop

Stakeholder grouping	Stakeholder
Plastic industry representatives	British Plastics Federation
	Polystar Plastics
	SIVA Group
	ASK Plastics
	Greentech Plastics Ltd
Key plastics users in the catchment	Crown Estate
	MDL Marinas Group Ltd
	Kemps Quay (Kemps Shipyard Ltd)
	Quayside Marina (Ocean Compass Group)
	Test & Itchen Association
Transport & logistics companies	ABP
Waste Management Companies	Southern Water
	Portsmouth Water
	European Metal Recycling
	Southampton City Council (Waste)
	Nurdle
Municipalities/ Local authorities	Southampton City Council
	Eastleigh Borough Council
	Hampshire County Council
Government agencies	Environment Agency
	Natural England
	Southern IFCA
	MMO
CSOs / NGOs	Surfers against Sewage
	Marine Conservation Society
	Wessex Rivers Trust
	Final Straw Foundation
	Friends of Chessel Bay / Itchen Estuary
	The Green Blue / RYA
	RSPB

	Hampshire & Isle of Wight Wildlife Trust
	Solent Forum
Academic institutions	Southampton University
	National Oceanography Centre

Agenda

The workshop was held at the University of Southampton on the morning of Thursday 11 May 2023. The agenda, agreed with the project partners, is shown in Table E.

Table E: Workshop agenda

Agenda item	Descriptor	Approach / who?	Timing
1	Introduction: purpose; aim and objectives; structure; and logistics	Professor Anthony Gallagher, ERC	1000 - 1010
2	The plastics problem: nature (sources, pathways) and extent of issue in the Itchen	Dr Malcolm Hudson, University of Southampton	1010 - 1035
3a	Existing management – <i>what is currently being done to manage the issue and how effective is it considered to be?</i>	Group work – facilitator	1035 - 1105
3b	Feedback and discussion	Group rapporteurs and facilitator	1105 - 1125
4	Break	Teas, coffees	1125 - 1140
5a	Options for better management – <i>how might we improve management; what are the challenges and what is their feasibility?</i>	Group work – facilitator	1140 - 1210
5b	Feedback and discussion	Group rapporteurs and facilitator	1210 - 1230
6	Next steps – <i>who would like to participate and what are the next steps?</i>	Plenary	1230 - 1250
7	Summary and conclusions	Wrap up	1250 - 1300

ANALYSIS

The data gathered through the desk study were collated and analysed to inform the feasibility study. For example, studies identified to develop an understanding of the impacts of plastic pollution on the Itchen's ecology and users, were categorised according to the nature of the impact and the key outcomes summarised.

The data acquired through the stakeholder engagement exercise (including key informant interviews and a stakeholder workshop) was collated and provides a rich data source, enabling

the identification of key communication and engagement options, in addition to assessing the support for a wider collaborative project to prevent plastic pollution in the R. Itchen estuary. Textual analysis of the transcripts will be used and where relevant anonymous quotes used to support emerging findings.

In accordance with Figure A, the analysis of the data collected during the desk research and stakeholder engagement exercise has led to the development of a series of findings and recommendations that:

- Identify future options for engagement and communication.
- Identify different approaches and options the project could take to make a measurable difference to the natural environment and people.

These have been developed by the ERC team and then put forward to the project steering group for comment, with revisions incorporated into the final report.