

The sustainable management of marine and coastal sediment

Position statement

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What is this document about?

The aim of this document is to set out NRW's position on the sustainable management of sediment in the marine and coastal environment, including estuaries.

- Nothing in this position statement is intended to constitute legal advice.
- The terms of this position statement may be subject to periodical review and be changed or withdrawn in light of technological or scientific developments, regulatory or legislative changes, future government guidance or experience of its use. NRW reserves its discretion to depart from the position outlined.

Who is this document for?

The intended audience of the position statement is NRW staff and external customers involved in projects or activities involving the movement or management of marine and coastal sediment.

Contact for queries and feedback

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1. Introduction

Natural Resources Wales is a Welsh Government Sponsored Body. Our purpose is to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future.

The aim of this document is to set out NRW's position on the sustainable management of marine and coastal sediment. This position statement is intended to:

- Clarify NRW's application and interpretation of relevant policies and legislation in the provision of our advice
- Support and implement Sustainable Management of Natural Resources (SMNR)
- Provide a consistent approach to informing NRW advice in relation to activities, plans, projects and associated assessments
- Inform partners of our approach
- Influence best practice

The intended audience of the position statement is internal staff and external customers. NRW will have regard to this position statement in undertaking our own activities and providing advice to various planning and regulatory regimes.

2. Scope of the position statement

The position statement relates to all sediments present in the marine and coastal environment including estuaries (see section 7 for further information). Activities that involve the removal of sediment from one area of the seabed and the relocation (also referred to as 'deposit' in the context of marine licensing) of the excavated material elsewhere are in scope of this position statement. For example:

- Coastal protection works
- Maintenance dredging and disposal
- Infrastructure projects (e.g. renewable energy projects) and associated infrastructure (e.g. cabling)
- Marina, harbour and port developments

It should be noted that the above list is not exhaustive and other activities may need to be considered. The above activities differ from activities where the primary objective is to obtain sediment as an economic resource e.g. aggregates extraction, which is outside the scope of this position.

In advance of applying this position, NRW would expect to see evidence to demonstrate that the requirements to remove or relocate sediment have been avoided or minimised as far as possible. The position statement does not provide detailed advice on environmental assessments, but section 9 sets out where further information can be found on this matter.

3. NRW position on the sustainable management of marine and coastal sediment

When undertaking any activity in the marine and coastal environment that involves the removal and relocation of sediment, it is generally the preferred option to retain the sediment as close as possible from where it originated, within the same sediment system, if it is environmentally, technically, socially and economically feasible to do so.

If retention of sediment is not possible, NRW encourages consideration of beneficial use options that enhance ecosystem resilience of the marine and coastal environment. Project specific information and assessments would however need to be considered to determine the most sustainable and appropriate management option.

4. Priority of sediment management options in applying of the position statement

In applying NRW's position statement the following **steps** are encouraged to be considered:

1. The need for the activity has been demonstrated and Best Environmental Practice has been considered (see section 7 below).
2. Sediment characterisation information has been completed where necessary in accordance with the licences, permissions and/or consents that may be required to undertake the activity (see section 8 below). In addition, if contaminated sediments can be remediated then the options below may be considered.
3. Proposed management options have been evaluated against the **order of preference** outlined below, subject to environmental, technical, social and economic feasibility and project specific assessments. Section 7.7 provides advice on defining an appropriate sediment system.
 - **Preference 1:** Retaining the sediment within the same sediment system, and as close as possible from where it originated. This can include a range of options such as: those which support recovery from the disturbance/impact of the activity; habitat restoration; placement at a beneficial use disposal site; or potentially disposal at sea if the disposal site is within the same sediment system and is considered suitable in terms of supporting ecosystem resilience.
 - **Preference 2:** Use of options outside the sediment system (where the sediment originated from), that increase ecosystem resilience. This can include options such as habitat restoration or placement at a beneficial use disposal site.
 - **Preference 3:** Disposal at sea outside the sediment system (where the sediment originated from), to keep sediment in the marine environment.

Where the above preferences are not feasible, other management options can be considered.

5. The importance of marine and coastal sediments

Sediments are a fundamental component of the marine and coastal environment, which support the existence of a wide range of landforms, ecosystems and processes. Sediments provide the foundation for a range of subtidal and intertidal habitats which in turn support a diverse range of species, including the network of Marine Protected Areas (MPAs) that currently covers approximately 75% of our coastline and 69% of the [Welsh National Marine Plan \(WNMP\)](#) inshore area. Marine and coastal sediments are also a valuable natural resource which provide a range of ecosystem services upon which we have come to depend, which include (but are not restricted to):

- Providing a natural form of coastal defence against flooding and erosion
- Sustaining beaches which support coastal businesses, tourism and recreation
- Contributing to landscape/seascape character which supports maritime culture, enjoyment, health and well-being
- Carbon sequestration and storage
- Water quality improvement
- Habitat for fish nurseries and shellfish

Sediment budgets affect the condition, structure, function and processes of marine and coastal ecosystems, and the services which we derive from them. For example, saltmarshes need mobile fine sediment to enable them to accrete in response to sea level rise and in turn provide coastal protection, carbon sequestration, and habitats for fish, invertebrates and birds.

If sediment is permanently removed or lost from the environment (or outside the coastal cell, estuary or offshore sediment system) through human activities, it can present potential negative impacts and consequences, such as: coastal flooding and erosion; loss of habitats and species; degradation of beaches, landscape and seascape which can in turn affect tourism, recreation, well-being, industry and businesses. Climate change is likely to exacerbate these effects, and we will need more rather than less sediment to safeguard ecosystems and the services we derive from them. This is further compounded by the fact that whilst there are some contemporary sources of sediment, it is largely glacially derived and considered to be a finite resource.

It is more important than ever that we secure sustainable management of sediment as a natural resource, to safeguard the environment and to benefit society now and for future generations. Legislation, plans and policies have been put in place to help achieve this and NRW aims to clarify and communicate our position to help achieve this aim, and help our partners understand our approach.

As noted above, the resilience of habitats such as saltmarsh, mudflats and beaches is reliant on a healthy supply of sediment. In contrast, in rivers, there is often a need to reduce excess fine sediment input to improve freshwater environments. Fluvial sediment supply generally accounts for a small percentage of sediment inputs to marine and coastal systems compared with other sources, and therefore efforts to reduce fluvial sediment inputs are not considered to be in conflict with this position.

6. Strategic drivers for the sustainable management of marine and coastal sediment

A wide range of national and international legislation, regulations, plans, policies and guidance may be relevant for consideration in relation to the sustainable management of marine and coastal sediment (see section 9 for further information). The following sections provide a brief description of key drivers which support this position statement.

6.1. OSPAR Guidelines

The [OSPAR Guidelines](#) were adopted at the 2014 Meeting of the OSPAR Environmental Impact of Human Activities Committee and are in accordance with the London Convention and Protocol revised Specific Guidelines for Assessment of Dredged Material. It is explained that Contracting Parties should take the guidelines into consideration in their authorisation or regulation procedures for dredged material. A range of matters are considered within the guidelines which relate to the assessment of dredged material proposed for deposit at sea.

Upon considering dredged material management options, the OSPAR Guidelines recognise that generally it is preferable to keep the sediment in the aquatic, estuarine or marine system. However, the results of physical/chemical/biological characterisation will ultimately determine the management options that can be applied. For dredged material assessed to be uncontaminated (i.e., that meet national assessment criteria) the following possible management options are identified as examples (replicated from section 7 of the OSPAR Guidelines). Note that these examples are not given in any order of priority. NRW's order of preference is set out in sections 3 and 4 of this position statement.

Example management options:

- “.1 Sustainable Deposit by retaining sediment within the natural sediment system to support sediment-based habitats, shorelines, and infrastructure.*
- .2 Habitat Restoration and Development using direct deposit of dredged material for enhancement or restoration of natural habitat associated with wetlands, other near-shore habitats, coastal features, offshore reefs, fisheries enhancement, etc.*
- .3 Beach Nourishment using dredged material (primarily sandy material) to restore and maintain beaches.*
- .4 Shoreline Stabilization and Protection through the deposit of dredged material with the intent of maintaining or creating erosion protection, dike field maintenance, berm or levee construction, and erosion control.*
- .5 Sea deposit (see Chapter 8 of OSPAR Guidelines)*
- .6 Engineering uses (e.g. as capping material or for land reclamation)”.*

For material that is assessed to be contaminated, the OSPAR Guidelines explains that treatment or other management options should be considered. It states:

“Treatment, such as separation of contaminated fractions, may make the material suitable for a beneficial use and should be considered before opting for sea deposit. Deposit management techniques to reduce or control impacts may include e.g. deposit on or burial in the sea floor followed by clean sediment capping, or methods of containing dredged material in a stable manner.”

The pursuit of beneficial use of sediment is advocated to the maximum extent practicable, whilst minimising the release of contaminants to the environment.

6.2. Circular economy and waste hierarchy

The revised [Waste Framework Directive 2018](#), which following EU Exit has been directly applied into Welsh law, sets out the key definitions and principles for waste management in Wales. Integral to the Directive is the waste hierarchy in Article 4, transposed into law in Wales by [The Waste \(England and Wales\) Regulations 2011](#), which ranks waste prevention and management options, informed by what is best for the environment. The order of priority is as follows:

1. Prevention
2. Preparing for re-use
3. Recycling
4. Other recovery
5. Disposal

As stated in section 2 of this position statement, prevention (avoiding and minimising the need for sediment removal or relocation) remains the preferred option in line with the waste hierarchy. Once the need for the removal or relocation of sediment has been demonstrated, there are options for management which align with ‘preparing for re-use’.

[Welsh Governments Beyond Recycling Strategy](#) sets out how Wales will move towards a circular economy, reducing the resources and the waste we produce with a core theme of upscaling prevention and re-use.

The application of the waste hierarchy in relation to marine dredging and disposal activities is helpfully described in the [Restoring Estuarine and Coastal Habitats with Dredged Sediment: A Handbook](#) (referred to as ‘the handbook’ hereafter, more information below). The handbook notes that whilst sediment is regarded as an important natural resource, dredge material is classified as ‘waste’, which is defined in the Waste Framework Directive as “any substance or object which the holder discards, or intends, or is required to discard”. The impact of this classification on the perception and management of dredge material has been significant and has contributed to management activities which have led to the loss of sediment from sediment systems within the natural environment. Whilst this outcome is not in the spirit of the waste hierarchy there are several technical, regulatory, strategic and monetary barriers that have inhibited improvements in sediment management practices.

The handbook explains that beneficial use of sediment (which includes sediment retention) corresponds with the ‘preparing for re-use’ management option, which involves using dredge material to benefit society and the natural environment.

Where the sediment remains within the marine environment (below marine high-water spring tide), the sediment will be managed/regulated under the Marine and Coastal Access Act (2009). In the event that sediment needs to be brought onto land (e.g. for treatment due to contamination) then waste regulatory controls would apply (see section 9.1). As stated in section 8, if contaminated sediments can be treated and meet relevant standards, beneficial use options should be pursued where possible.

6.3. Restoring Estuarine and Coastal Habitats with Dredged Sediment: A Handbook

The [Restoring Estuarine and Coastal Habitats with Dredged Sediment: A Handbook](#) was jointly commissioned by the Department for Environment and Rural Affairs (Defra) and the Environment Agency (EA), as part of the cross-agency 'Restoring Meadow, Marsh and Reef (ReMeMaRe)' initiative, and NRW was involved in its development. The Handbook acknowledges that estuarine and coastal habitats have suffered extensive deterioration due to a range of factors, resulting in the loss of the valuable ecosystem services that they provide. It recognises that dredging plays an important socio-economic role, providing safe navigation in support of global shipping. However, the majority of dredged material is disposed of offshore, removing it from estuarine and coastal systems, and therefore contributing to deterioration of these environments.

As recognised in this position statement, the handbook points out that dredge material is an important sediment resource, the strategic and sustainable management of which is critical to our coasts and estuaries and forms an essential component of sedimentary processes and cycles. The handbook promotes and supports the beneficial use of dredged material, which is defined as using dredged material in a manner that will benefit the natural environment, which will in turn deliver societal benefits. From a habitat restoration perspective, the beneficial use of dredged material can be considered a nature-based solution, which supports the physical conditions that help the successful restoration of our estuarine and coastal habitats.

6.4. Welsh National Marine Plan

The [Welsh National Marine Plan](#) provides policies and supporting information for Dredging and Disposal activities. The plan encourages the beneficial use of dredged material in accordance with the Waste (England and Wales) Regulations 2011 and advocates that relevant authorities should apply the waste hierarchy.

The plan also states: *'When considering suitable management options, it is generally the preferred option to retain dredged material within the same sediment cell from where it originated, if it can be demonstrated that, in line with this Plan's General and Safeguarding Policies, it is environmentally, technically, socially and economically feasible to do so.'*

Whilst the plan discusses a range of potential beneficial uses, the [Welsh National Marine Plan Implementation Guidance](#) provides additional clarity: *'In preparing dredging and disposal related proposals, developers should apply the waste hierarchy to minimise any waste to be disposed. Under this hierarchy, the beneficial use of dredged material and/or the retention of dredged material within the same sediment cell from where it originated should be considered prior to offsite disposal.'*

The Welsh National Marine Plan also includes policies which aim to secure resilient marine ecosystems. These include:

- Policy **ENV_01 Resilient marine ecosystems** ‘...aims to ensure that biological and geological components of ecosystems are maintained, restored where needed and enhanced where possible, to increase the resilience of marine ecosystems and the benefits they provide. Under this policy, the sensitivities of marine ecosystems and ecosystem impacts should be taken into account when developing proposals and, where possible, proposals should also demonstrate how they will contribute to ecosystem protection, restoration and/or enhancement.’
- Policy **ENV_02: Marine Protected Areas** ‘ensures appropriate consideration of the potential impacts of proposals on MPAs in order to maintain the integrity of MPAs within the marine plan area and ensure the overall coherence of the MPA network.’

These policies are in line with the aspirations around the sustainable management of natural resources and ecosystem resilience set out under the Environment (Wales) Act 2016 and reflected in the overarching objective of the Welsh National Marine Plan. This position statement on the sustainable management of marine and coastal sediment aims to support delivery of these policies.

The Implementation Guidance for policy **ENV_01 Resilient marine ecosystems** further states that: ‘Developers should engage with NRW for advice on enhancement to ensure any proposed enhancement is suitable.’

In order to facilitate this, NRW have developed [Guidance Note 59 Principles supporting restoration and enhancement in marine or coastal development proposal](#), which provide the context for how NRW will approach discussions to help developers consider restoration and/or enhancement elements in their proposals.

Information on marine and coastal restoration opportunities which may be supported through sustainable management of sediment is available in NRW Evidence Report 554 *Restoring marine and coastal habitats in Wales: identifying spatial opportunities and benefits* [Natural Resources Wales / Marine and coastal evidence reports](#).

6.5. The Environment (Wales) Act 2016

[The Environment \(Wales\) Act 2016](#) recognises the value and importance of natural resources for the benefits and wide range of services that they provide. A fundamental driver of the Act is the need to adopt a new, more integrated approach to managing our natural resources in order to achieve long-term sustainability. The Sustainable Management of Natural Resources (SMNR) is an approach which ensures that the way in which we use our natural resources does not result in their long-term decline.

NRW’s general purpose is set out in Article 4 of the Act, and states that NRW must:

- (a) pursue sustainable management of natural resources in relation to Wales, and
- (b) apply the principles of sustainable management of natural resources, in the exercise of its functions, so far as consistent with their proper exercise.

Section 3 of the Act defines sustainable management of natural resources (SMNR), and Section 4 defines the 'Principles of sustainable management of natural resources.'

Section 6 of the Act creates the Biodiversity and Resilience of Ecosystems Duty '...to require all public authorities, when carrying out their functions in Wales, to seek to "maintain and enhance biodiversity" where it is within the proper exercise of their functions. In doing so, public authorities must also seek to "promote the resilience of ecosystems"'.

[Welsh Government's Factsheet on the Biodiversity and Resilience of Ecosystems Duty](#) includes examples of what public authorities could do to meet the biodiversity duty. They include: the need to reduce, re-use and recycle materials; raise awareness across an organisation about how staff can impact and influence biodiversity and consider measures to enhance biodiversity and ecosystems in all policies, plans and projects; identify opportunities to help encourage biodiversity; think about how enhancing biodiversity can help deliver across the organisation's activities.

The Environment (Wales) Act 2016, including the SMNR approach and the biodiversity duty, have been a catalyst for NRW's review of our advice on management sediment as a natural resource. This position statement looks to ensure that the guidance and advice provided in relation to sediment management in the marine and coastal environment embodies SMNR and the biodiversity duty and is compliant with governing legislation. We want to ensure that we apply this approach to our own plans and projects and in our advice to others to help secure operational delivery. The Environment (Wales) Act is therefore directly relevant to this position statement.

The Natural Resources Policy (2017)

[The Natural Resources Policy](#) sets the opportunities, challenges and priorities for the sustainable management of natural resources in Wales (in accordance with the Environment (Wales) Act 2016). Of particular relevance to the sustainable management of marine and coastal sediment are the following key elements:

- The Natural Resources Policy is focussed on improving the way we manage our natural resources including reducing pressures and taking action to build greater resilience into our ecosystems.
- Improving ecosystem resilience is identified as a key challenge within the Natural Resources Policy. In order to facilitate this we need to reduce and better manage the pressures and demands on ecosystems and natural resources. Increasing waste prevention and promoting re-use, recycling and recovery is identified as a way to reduce pressure on resources.
- Another key challenge identified is climate change and the declines in biological diversity. Careful management of ecosystems can help build our resilience to climate change impacts such as flooding.
- One of the national priorities identified is delivering nature-based solutions, with coastal zone management and adaptation recognised as areas that can deliver most in terms of ecosystem resilience and benefits across all the wellbeing goals.

The sustainable management of marine and coastal sediment could help to contribute towards increasing ecosystem resilience, combatting climate change impacts and the decline in biological diversity, and delivering nature-based solutions.

The State of Natural Resources Report

The State of Natural Resources Report (SoNaRR) is a product required under the Environment (Wales) Act 2016. In complying with the biodiversity duty in section 6 of the Act, a public authority (other than a Minister of the Crown or government department) must have regard to amongst other things SoNaRR published under section 8 of the Act and any area statement published under section 11 of the Act for a region that includes all or part of an area in relation to which the authority exercises functions.

NRW published the first SoNaRR in 2016, and the second report in 2020. [SoNaRR2020](#) builds on a number of Welsh, UK and global assessments of the status and trends of natural resources. It looks at the risks those trends pose to our ecosystems and to the long-term social, cultural and economic well-being of Wales, in terms defined by the Well-Being of Future Generations (Wales) Act 2015. A third SoNaRR report is due to be published in 2025.

The [Coastal Margins](#) chapter notes that *‘The coastal erosion rate in the UK is expected to increase in the future due to a combination of relative sea-level rise, reduced nearshore sediment supply, and impacts resulting from human activities and management’* and that this could impact on the resilience of this broad ecosystem. This therefore supports the need for sustainable management of marine and coastal sediment.

The Marine Area Statement

NRW has produced the [Marine Area Statement](#), which contributes to implementing the Natural Resources Policy in a local context, taking a place-based approach. The Marine Area Statement recognises the importance of Wales’ coastline and the need for careful sustainable management to continue to provide benefits now, and into the future. According to the Marine Area Statement, Wales’ coast is not currently environmentally, socially or economically resilient to pressures such as climate change and identifies *‘Nature based solutions and adaptation at the coast’* as a theme for delivery.

In the Marine Area Statement, the role of Shoreline Management Plans is explained. The Shoreline Management Plans set out where we should continue to defend the coast and where it would be more sustainable to adapt over time. Nature-based solutions are recognised as a means of providing coastal defence but unlike traditional solutions, can provide many other benefits. Hybrid approaches for coastal defence are also identified as bridging the gap between green and grey infrastructure, for instance installing structures on the sea-facing side of an existing defence to trap sediment to encourage saltmarsh growth.

These types of approaches to coastal management require the consideration of sediment retention and or beneficial uses to help enhance ecosystem resilience.

6.6. The Well-being of Future Generations (Wales) Act 2015

[The Well-being of Future Generations \(Wales\) Act 2015](#) aims to improve the social, economic, environmental and cultural well-being of Wales. The Act covers all of Wales, including the inshore marine planning region. More information on the Act, and what it

means for public bodies and the people of Wales is available on [Welsh Government's website](#).

Seven well-being goals are identified as part of the Act as follows:

- A prosperous Wales
- A resilient Wales
- A healthier Wales
- A more equal Wales
- A Wales of more cohesive communities
- A Wales of vibrant culture and thriving Welsh language
- A globally responsible Wales

Sustainable development is a core principle of the Act. Section 2 of the Act provides a definition of sustainable development: *“sustainable development” means the process of improving the economic, social, environmental and cultural well-being of Wales by taking action, in accordance with the sustainable development principle, aimed at achieving the well-being goals’*.

The sustainable development principle described in section 5 of the Act states that a public body doing something “in accordance with the sustainable development principle” means that the body must act in a manner which seeks to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs.

In doing so, the following five ways of working must be considered:

- Long term: the importance of balancing short-term needs with the need to safeguard the ability to also meet long-term needs.
- Prevention: How acting to prevent problems occurring or getting worse may help public bodies meet their objectives.
- Integration: Considering how the public body’s well-being objectives may impact upon each of the well-being goals, on their other objectives, or on the objectives of other public bodies.
- Collaboration: Acting in collaboration with any other person (or different parts of the body itself) that could help the body to meet its well-being objectives.
- Involvement: The importance of involving people with an interest in achieving the well-being goals and ensuring that those people reflect the diversity of the area which the body serves.

Each public body listed in the Act must work to improve the economic, social environmental and cultural well-being of Wales including working to achieve all of the well-being goals.

The well-being goals and sustainable development are relevant to the consideration of this position statement. For example, careful management of our sediment resource will contribute to a more resilient Wales by improving the resilience of the coast to climate change pressures, and a more prosperous and healthier Wales by supporting the retention of sediments on beaches important for the tourism sector as well as for wellbeing of coastal communities. In addition, by acting now to implement careful management of this natural resource, we aim to prevent future problems associated with sediment deficits.

6.7. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

[The Water Environment \(Water Framework Directive\) \(England and Wales\) Regulations 2017](#) (hereafter referred to as the WFD Regs) are a key driver for the sustainable management of marine and coastal sediment. Any activities with the potential to affect the aquatic environment, including sediment management, must be compliant with WFD Regs requirements to meet good ecological status (GES) in undesignated water bodies, or good ecological potential (GEP) in water bodies designated as heavily modified.

Meeting WFD Regs objectives also complies with the principles of Sustainable Management of Natural Resources as set out by the Environment (Wales) Act (2016). Achievement of good or better overall WFD Regs status is a national indicator of the Well-being of Future Generations (Wales) Act (2015).

The WFD Regs require surface waters to be managed to protect their hydrology and geomorphology ('hydromorphology') and ecology. Physical modification of transitional (estuarine) and coastal (TRaC) water bodies by managing sediment regimes can change natural flows, physical forms and processes (hydromorphology) that create and sustain habitat – and in turn, support and sustain ecology.

In Wales, physical modification is one of the main reasons why all surface waters, including TRaC, are failing to achieve WFD Regs objectives. To achieve GES/GEP, we need to avoid, reduce or mitigate all physical modification impacts including sediment management.

In Wales, 18 TRaC water bodies have been designated as 'heavily modified' for socio-economic uses of navigation, ports, and harbours; flood protection; and coastal protection. To achieve good ecological potential in heavily modified water bodies, a set of specific mitigation measures (actions to restore unmodified hydromorphology) that relate to the operational management of sediment need to be implemented.

The third River Basin Management Plan reports that in transitional and coastal waters the mitigation measures assessment is a primary element causing heavily modified water bodies to be at less than good potential. Therefore, we need to ensure that all required mitigation measures are "in place" by managing coastal sediment sustainably. In turn, this will contribute to achieving WFD Regs requirements of GEP in HMWBs.

6.8. The National Strategy for Flood and Coastal Erosion Risk Management in Wales

[The National Strategy for Flood and Coastal Erosion Risk Management in Wales](#) recognises, in line with the Natural Resources Policy, the role of nature-based solutions (also referred to as Natural Flood Management) in providing cost effective and efficient interventions to challenges such as flooding and the risks posed by climate change. The role of nature-based solutions in managing coastal flooding, erosion and adapting to climate change in line with the policies set out in Shoreline Management Plans is acknowledged and supported. It is noted that such approaches may offer alternative

opportunities in areas where defences will be realigned, or a step away from routine maintenance towards a more natural coastline.

The sustainable management of marine and coastal sediment will be important in supporting these aspirations. For example, where a beach forms an integral and critical part of the coastal defence infrastructure it is important that a holistic approach is applied, especially given the increasing pressures associated with climate change.

7. Assumptions and supporting information

7.1. Need for activity

Prior to considering this position statement evidence should be provided to justify the need for any activities that involve the removal and relocation of marine sediment, such that these activities are avoided or minimised as far as possible.

7.2. Best Environmental Practice

Best Environmental Practice helps to minimise the quantity of excavated material and may help to avoid or reduce potential impacts to the marine and coastal environment. Best Environmental Practice techniques should be considered in the development and application of a methodology to remove and relocate sediment. Provision of information on Best Environmental Practice is outside the scope of this position statement and existing guidance should be considered for the relevant activity. For example, for dredging and disposal activities, [The OSPAR Guidelines for the Management of Dredged Material at Sea](#), Technical Annex III: Best Environmental Practice should be considered.

7.3. Cross-border areas

NRW will use this position to inform our advice in cross-border areas. We will be mindful of policies in the relevant marine plans and will engage with the relevant Statutory Nature Conservation Body, and regulators as appropriate to discuss our advice in relation to the application of this position.

7.4. Sediment size

The position statement relates to all cohesive and non-cohesive sediments present in the marine and coastal environment including estuaries. Finer (cohesive) sediments (smaller than 0.062mm) are classified as clays, muds and silts. For non-cohesive sediments (larger than 0.062 mm), this position mainly applies to sand and gravel but in some circumstances may also include boulders.

7.5. Sediment transport

Sediment in the sea may be moved by currents (tidal, wind or wave driven) or by waves, or very commonly by both currents and waves acting together. Typically, in the marine environment, the predominant mode of transport is bedload for grains coarser than about 2mm, and suspended load for grains finer than about 0.2mm. However, under different

physical conditions, such as in estuaries, other modes of transport may be experienced. Deposition occurs when grains come to rest in bedload transport, or by settling out of suspension. The amount of sediment transported may be measured by mass ($\text{Kg m}^{-1}\text{s}^{-1}$) or by volume ($\text{m}^3 \text{m}^{-1}\text{s}^{-1}$). The sediment transport rate in the sea has a magnitude and a direction and both are important to inform understanding of sediment budgets and decisions about sediment management.

7.6. Sediment budget

Sediment budget analysis represents a quantification of the conceptual understanding of sediment movement in a system. The underlying principle of sediment budget analysis is simply a continuity condition (that is, the conservation of volume or mass for a defined system). This system may be an estuary, a coastal cell or a series of features covering a region of interest offshore (e.g. sand-wave field, offshore sand banks). Sediment budget analysis is typically used to provide a means of establishing the overall context for managing sediment volumes for a specific area within a coastal cell, estuary or feature. Once a sediment budget has been developed, values in the budget may be altered to explore possible erosional or accretionary aspects of a proposed engineering project or variations in assumed parameters and may be used for management and conservation purposes. The first step in a sediment budget analysis is to identify the relevant elements, namely sources, sinks, sediment types and transport mechanisms within the coastal cell, estuary or feature of interest.

More detailed information on sediment budgets is available in the [Sediment budget analysis: practitioner guide - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/sediment-budget-analysis-practitioner-guide)

7.7. Spatial extent of sediment systems

In providing advice on activities and developments in the marine and coastal environment, NRW advocates the retention of sediment within the same marine and coastal sediment system. System may be defined to be “the macro unit which contains all the functioning elements and sub-systems to explain the behaviour of an area of coast or offshore”. Principles relating to the definition of the spatial extent of a coastal, estuarine and offshore sediment system are described below.

Spatial extent – coast

The Welsh coastline can be divided up into sediment cells. Each sediment cell is generally considered to be a closed system which suggests that no sediment is transferred from one cell to another. The boundaries of sediment cells are determined by the topography and shape of the coastline. Large features like peninsulas and headlands act as natural barriers that prevent the transfer of sediment. In reality, however, it is unlikely that sediment cells are fully closed. With variations in wind direction and tidal currents, it is inevitable that some sediment is transferred between cells or offshore. There are also many sub-cells of a smaller scale existing within these (major) cells. For example, for sand and shingle beaches the boundaries between major (regional) cells are usually major headlands. Such headlands should be littoral drift divide points and ideally be bare of beach material (so that any onshore movement is forced either to one side or the other of

a headland and is not deflected in its path by any coast protection works in adjacent frontages.

Sediment sinks are points at which sediment transport paths meet so that beach material tends to accumulate. This happens naturally in sheltered areas, such as deeply indented bays (pocket beaches) or major estuary mouths. Provided the sediment transport is strongly one dimensional and towards the sink, then interference with beach processes on one side of a sink will not normally affect beach movement on the other.

Within major (regional) sediment cells there exists a variety of independent sub cells. Littoral drift divide makes a natural choice for a cell boundary. A series of groyne systems and harbour arms and jetties for example can also interrupt the natural longshore drift of sediment from boundary to boundary and act as major obstacles to drift, although not eliminating it entirely. These man-made structures act to divide the regional cell into a series of sub cells, coupled with pocket beaches and estuaries.

Defining Spatial extent of the Coastal Sediment Cell

Open coast:

- **Alongshore:** ~1km lengths, coastal sub-cells or survey units, linked to existing structures.
- **Cross-shore:** Cliffs and dunes – order of a few metres landwards from cliff edge, inclusion of fore/embryo dunes which are actively connected with the beach.
- **Beaches:** back of beach or Highest Astronomical Tide to Mean Low Water Springs (typically a few tens to a few hundred metres on low gradient beaches).

Subtidal: Mean Low Water Springs to depth of closure.

More detailed information on defining the spatial extent of a coastal cell is available in the [Sediment budget analysis: practitioner guide - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/sediment-budget-analysis-practitioner-guide)

Spatial extent – offshore

In the offshore environment, the concept of splitting the offshore marine area up into discrete sediment cells using landform features for sediment conservation and management purposes, breaks down. Consideration should be given to local and regional sediment transport pathways incorporating bedload sediment movement of sand wave fields and offshore sand banks.

Attention should also focus on potential far field effects arising from longer term morphological alterations of the seabed caused by sediment removal or continued disturbance to the regional sediment transport pathways. When considering sustainable sediment management, it will be important to identify relationships between the coastline and offshore features and sediment transport pathways.

When evaluating potential impacts arising from sediment disturbance associated with offshore structures, consideration should be given to the following indicative potential zones of influence:

- Spring tidal excursion ellipses to estimate the potential extent of direct changes to flows as well as the zone of greatest influence for sediment plumes;
- Numerical modelling and field evidence from analogous developments to understand the likely overall spatial extent of changes to wave conditions, whilst also taking account of the pattern of prevailing conditions and the likelihood of exposure of distant areas to the potential effect.

More detailed information on defining potential zones of influence is available in [Natural Resources Wales / Marine and coastal physical processes assessments](#).

Spatial extent – estuaries

Whilst sediment cells have been identified as a means of defining the “sediment system” on the open coast, for estuaries, it is more appropriate to take the whole estuary system into consideration. Activities described in Section 2 (e.g. coastal protection works, maintenance dredging and disposal, infrastructure projects, and marina, harbour and port developments) have the potential to alter estuarine form and/or processes, and affect all parts of the estuary to some degree. It will therefore be necessary to consider the impacts of a particular activity at all levels of the estuarine system.

The estuary is an area of transition from the tidal conditions seaward to the freshwater flows from landward. Not only does this involve a change from the reversing tidal flow to the uni-directional river flows upstream, but there is also a transition from saline to freshwater conditions. As saline and freshwater bodies meet, mixing takes place, and can give rise to a marked interface between the two bodies, with the occurrence of internal waves on the interface between the two. These salinity gradients can also set up density flows, which can be directed both along and across the estuary depending on the size of the estuary. These water movements are further complicated by the presence of surface waves. As well as waves formed within the estuary, waves can also be generated externally (i.e. offshore) and propagate into the estuary.

The complexity of water movements is reflected in the sediment transport pathways within the system. Sediments can be supplied from marine or freshwater sources. In some estuaries, sediment is brought down rivers when they are in flood, and in from the sea during periodic storms. There can be a high degree of sediment reworking within an estuary, and erosional and depositional shores can exist in close proximity. Although many intertidal mudflats and sand flats appear relatively stable at least in the medium term, such areas can be quite dynamic, with deposition and erosion taking place at comparable rates and leading to a form of dynamic equilibrium. Sediments can be cycled on a variety of timescales, for example, changes in the configuration of channels and bed forms can occur over periods as short as days, whilst also responding to longer-term effects such as changing sea levels. The movement of fine material (sand and mud) is therefore a crucial component of estuarine sediment pathways and this will often be superimposed on the movement of coarser sand fractions. Hence, the variety of environments and sediment sources, coupled with the linkage between erosion and accretion in different areas in the same estuary, highlight the need to consider the estuary system as a whole.

More detailed information can be found in [The Estuaries Guide](#).

8. Characterisation of sediment and contaminated sediments

All activities that remove and relocate or deposit sediment are likely to require sediment characterisation information to support relevant licences, permits and consents that may be required (see section 9.1). This may include describing the nature of the sediment in terms of type/mineralogy, size, and quantity of sediment to be removed and/or relocated. There may also be a need to undertake sediment sampling and analysis to determine if sediments are contaminated (with regard to national assessment criteria i.e., Cefas Action Levels). This will inform whether control measures or specific management options are needed. The level of information required is likely to be determined on a project specific basis and the requirements of the licence/permission/consents under consideration.

Before applying for a licence to dredge or dispose of material at sea, applicants are required to analyse the material for a range of physical and chemical properties in line with [OSPAR guidelines](#). More information is available here [Natural Resources Wales / Request a sampling plan for a dredge or disposal marine licence application](#).

If contaminated sediments can be treated and meet relevant standards, beneficial use options should be pursued where possible. Where contaminated sediments are brought onto land, they must be managed in line with waste regulatory controls as set out in Section 9 below.

9. Further information and guidance

9.1. Roles and responsibilities

NRW has a range of roles which are relevant to the implementation of this position including an advisory and delivery role under our purpose: *to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future*; our role as the Statutory Nature Conservation organisation in Wales; and our role as a regulator (see section 9.2).

In cross-border areas and offshore waters we work with other organisations which fulfil these roles including [Natural England](#), the [Joint Nature Conservation Committee \(JNCC\)](#), the [Environment Agency](#) and the [Marine Management Organisation \(MMO\)](#).

9.2. Licenses, permits, consents and assessments

Licenses, permits and assessments associated with activities that involve the removal and the relocation of excavated sediment will need to be determined on a project specific basis. Early engagement with NRW is therefore encouraged to establish exactly what permits and environmental assessments are required and what they need to cover.

Information on the marine licence application process and associated assessments that may be required is available on [NRW's Marine licensing web page](#).

Where sediments are brought onto land, waste regulatory controls will apply including but not limited to [The Environmental Permitting \(England and Wales\) Regulations 2016](#). There is more information on waste regulatory controls including [the legal definition of waste](#), and advice on duty of care for organisations in relation to waste available on NRW's website [Natural Resources Wales / Waste duty of care for organisations](#).

Other permits and permissions may also be required from NRW, further information can be found on NRW's [Permits and permissions web page](#).

Due consideration should also be given to other licences/permits and consents that may be required by other third parties. It is the responsibility of the applicant to satisfy themselves that they have obtained consents and authorisations that may be required.

9.3. Further information

The following links may be helpful to consider in relation to the sustainable management of marine and coastal sediment.

Plans and policies

- [Natural Resources Policy](#)
- [Welsh Governments Beyond Recycling Strategy](#)
- [Area Statements](#)
- [Shoreline Management Plans](#)
- [The Welsh National Marine Plan](#)
- [The National Strategy for Flood & Coastal Erosion Risk Management in Wales](#)

Guidance

- [The OSPAR Guidelines for the Management of Dredged Material at Sea](#)
- [The Welsh Government Guidance on Applying the Waste Hierarchy](#)
- [Defra Guidance on applying the Waste Hierarchy](#)
- [The Welsh National Marine Plan Implementation Guidance](#)
- [The Well-being of Future Generations | GOV.WALES](#)
- [Restoring Estuarine & Coastal Habitats with Dredged Sediment: A Handbook](#)
- [London Convention & London Protocol](#)
- [Legal definition of waste guidance - GOV.UK \(www.gov.uk\)](#)
- [Natural Resources Wales / Marine licensing](#)
- [Natural Resources Wales / Request a sampling plan for a dredge or disposal marine licence application](#)
- [Natural Resources Wales / Waste duty of care for organisations](#)
- [Natural Resources Wales / Permits and permissions](#)
- [Natural Resources Wales / Marine development](#)
- [Natural Resources Wales / Marine and coastal physical processes assessments](#)
- [Natural Resources Wales / Benthic habitat assessments for marine developments](#)
- [Natural Resources Wales / Scoping and preparing an Environmental Impact Assessment for marine development](#)

Technical information

- [Sediment Budget Analysis Practitioner Guide](#)
- [The Estuaries Guide](#)
- [Wales Coastal Monitoring Centre](#)
- [Natural Resources Wales / State of Natural Resources Report \(SoNaRR\) for Wales 2020](#)
- [Natural Resources Wales / Marine and coastal evidence reports](#)

Legislation

- [The Environment \(Wales\) Act 2016 & Factsheets](#)
- [The Well-being of Future Generations \(Wales\) Act 2015](#)
- [Marine and Coastal Access Act 2009](#)
- [The Water Environment \(Water Framework Directive\) \(England and Wales\) Regulations 2017](#)
- [Revised Waste Framework Directive](#)
- [The Waste \(England and Wales\) Regulations \(2011\)](#)
- [The Environmental Permitting \(England and Wales\) Regulations 2016](#)
- [The Legal Definition of Waste](#)
- [Oslo and Paris \(OSPAR\) Convention for the Protection of the Marine Environment of the North East-Atlantic](#)
- [Wildlife and Countryside Act 1981](#)
- [The Conservation of Habitats and Species Regulations 2017](#)
- [Ramsar Convention](#)