Welsh Government

# Marine Disposal Site Strategic Review



GoBe Ref: P00019472
Date 12th February 2026
COMMERCIAL IN CONFIDENCE

GoBe
APEM Group

Copyright © 2026 GoBe Consultants Ltd

All pre-existing rights reserved.

This document is supplied on and subject to the terms and conditions of the Contractual Agreement relating to this work, under which this document has been supplied.

Confidentiality

This document is confidential.

All information contained within this document is proprietary to GoBe Consultants Ltd and is disclosed in confidence to the specified parties. Information herein may not be reproduced in whole or in part without the express permission from GoBe Consultants Ltd.

www.gobeconsultants.com

| Revision | Date | Status | Author: | Checked by: | Approved by: |
|---|---|---|---|---|---|
| 1.0 | 12/02/2026 | Issued to Client | Georges Demmer | Claire Hinton | Kathy Wood |
| 2.0 | 23/02/2026 | Draft including modelling results | Georges Demmer | Claire Hinton | Kathy Wood |
| 2.1 | 12/03/2026 | Second Draft | Georges Demmer | Claire Hinton | Kathy Wood |
| 2.2 | 17/03/2026 | Third Draft | Georges Demmer | Claire Hinton | Kathy Wood |
| 2.3 | 18/03/2026 | Final Version | Georges Demmer | Claire Hinton | Kathy Wood |

# Executive Summary

Within English, Welsh and Northern Irish waters, the disposal of dredged material at sea is regulated by the Marine and Coastal Access Act 2009. As detailed in Part 4 of the Marine and Coastal Access Act 2009, the deposit of any substance or object at sea is subject to a Marine Licence which is issued by the appropriate Licensing Authority. In Wales, Marine Licences for disposal at sea are issued by Natural Resources Wales, acting on behalf of the Welsh Ministers, as the Licensing Authority under Part 4 of the Marine and Coastal Access Act 2009. Marine Licences for disposal may also be issued by Planning and Environmental Decisions Wales as part of wider planning applications, for example port and harbour developments.

There are currently 32 open sites designated for the disposal of material at sea within Welsh waters (as of end 2025). The amount of dredged material being disposed to sea within Welsh waters varies on an annual basis, with an average of 3,117,042.8 tonnes per annum deposited between 2005 and 2024. Of note, the disposal of material is not evenly distributed across all sites. Open sites serve different purposes, which lead to different volumes of material disposed. For example, some open sites are only used for beach nourishment, an activity which does not occur annually, whereas other open sites are used for multiple, more regular purposes such as maintenance and capital dredging. All open sites are of different sizes, allowing larger sites to receive more disposed material than the smaller ones.

This document provides an update to the previously published review (Cefas, 2020) which presented a review of the 32 open disposal sites in Welsh waters, at the time of publication. For each of the 32 open sites included within this current review, information regarding the usage history, environmental characteristics and potential dispersion pathways is presented.

Llywodraeth Cymru
Welsh Government

GoBe
APEM Group

# Contents


1 Introduction ..... 13
1.1 Regulatory obligations regarding disposal of waste at sea ..... 13
1.2 Welsh Disposal Sites ..... 14
1.3 Potential Impacts of disposal of dredge material ..... 17
1.4 Disposal site management ..... 20
2 Aims and objectives ..... 23
2.1 Project aims ..... 23
2.2 Objectives ..... 23
3 Methods ..... 24
3.1 Objective 1: Identification of disposal sites ..... 24
3.2 Objective 2: Collection of sensitive receptor data ..... 24
3.3 Objective 3: Modelling ..... 25
4 Results ..... 28
4.1 Identification of disposal sites ..... 28
Summary of sites that were excluded from this review ..... 29
4.2 Disposal sites without modelled sediment dispersal ..... 29
Tanybwlch beach (IS012) and Aberystwyth South Beach (IS013) ..... 31
Site characterisation ..... 31
Potentially sensitive receptors ..... 34
Spending Harbour (IS016) and New South Beach (IS021) ..... 36
Site characterisation ..... 36
Potentially sensitive receptors ..... 39
Shell Lagoon, Llanbedr (IS018) ..... 41
Site characterisation ..... 41
Potentially sensitive receptors ..... 43
Traeth Crugan 1 (IS023) and Traeth Crugan 2 (IS024) ..... 45
Site characterisation ..... 45
Potentially sensitive receptors ..... 49
Dolau Beach (IS014), Cei Bach Beach A (IS019) and Cei Bach Beach B (IS022) ..... 51
Site characterisation ..... 51

Potentially sensitive receptors ..... 54
4.3 Disposal sites with modelled sediment dispersal ..... 56
New Quay Track (IS015) ..... 56
Site characterisation ..... 56
Potentially sensitive receptors ..... 59
Modelling results ..... 59
Deganwy Beneficial Use (IS035) ..... 62
Site characterisation ..... 62
Potentially sensitive receptors ..... 65
Modelling results ..... 65
Conwy Beneficial Use (IS065 and IS066) ..... 68
Site characterisation ..... 68
Potentially sensitive receptors ..... 71
Modelling results ..... 71
Holyhead North (IS043) ..... 76
Site characterisation ..... 76
Potentially sensitive receptors ..... 79
Modelling results ..... 79
Broughton (IS099) ..... 81
Site characterisation ..... 81
Potentially sensitive receptors ..... 83
Modelling results ..... 83
Mostyn Deep (IS102) ..... 86
Site characterisation ..... 86
Potentially sensitive receptors ..... 89
Modelling results ..... 89
Mostyn Breakwater (IS103) ..... 92
Site characterisation ..... 92
Potentially sensitive receptors ..... 95
Modelling results ..... 95
Cardiff Grounds (LU110) ..... 97
Site characterisation ..... 97

Potentially sensitive receptors ..... 102
Modelling results ..... 102
Merkur Buoy (LU115) ..... 104
Site characterisation ..... 104
Potentially sensitive receptors ..... 107
Modelling results ..... 107
Swansea Bay (Outer) (LU130) ..... 109
Site characterisation ..... 109
Potentially sensitive receptors ..... 112
Modelling results ..... 112
Newport (LU140) ..... 114
Site characterisation ..... 114
Potentially sensitive receptors ..... 117
Modelling results ..... 117
Milford Haven Two (LU168) ..... 120
Site characterisation ..... 120
Potentially sensitive receptors ..... 123
Modelling results ..... 123
Milford Haven Three (LU169) ..... 125
Site characterisation ..... 125
Potentially sensitive receptors ..... 129
Modelling results ..... 129
Neyland (Off Milford Haven) (LU190) ..... 131
Site characterisation ..... 131
Potentially sensitive receptors ..... 135
Modelling results ..... 136
5 Discussion ..... 138
5.1 Summary of findings ..... 138
5.2 Concluding remarks ..... **Error! Bookmark not defined.**
6 References ..... 145

# Appendices

A Contribution of disposal sites to the total disposed material between 2005 and 2024 ..... 149
B Annual disposal volume for disposal sites included in this review ..... 151
C Disposal site selection ..... 157
D Sensitivity sites and receptors ..... 160
E Modelling report ..... 192

# Figures

Figure 1-1: Open disposal sites within Welsh waters. ..... 15
Figure 1-2: Total quantity of dredged material disposed at licensed Welsh disposal sites from 2005 to 2024. ..... 16
Figure 1-3: Transport of dredged material to a disposal site (a). At the disposal site, the material is released for convective descent (1), and the dynamic collapse starts upon impact on the ground (2). During the convective descent, material can be stripped (i) and during dynamic collapse settle (ii) while spreading on the ground. (From Gundlach *et al.*, 2024). ..... 18
Figure 3-1: Description of parameters on numerical modelling figures. ..... 27
Figure 4-1: Tanybwlch beach (IS012) and Aberystwyth South Beach (IS013) locations. ..... 33
Figure 4-2: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Tanybwlch beach (IS012) and Aberystwyth South Beach (IS013) (MetOceanWorks, 2025). ..... 34
Figure 4-3: Disposal sites located at Aberaeron (in red) with the direction of long-shore sediment transport (orange arrow) and position of sediment accretion (orange circle) (Base image taken from Ceredigion County Council website, 2025). ..... 38
Figure 4-4: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) at New South Beach (IS021) and wind speed and direction (Panel C) at both New South Beach (IS021) and Spending Harbour (IS016) (MetOceanWorks, 2025) ..... 39
Figure 4-5: Shell Lagoon, Llanbedr (IS018) location. ..... 42
Figure 4-6: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Shell Lagoon, Llanbedr (IS018) (MetOceanWorks, 2025) ..... 43
Figure 4-7: Traeth Crugan 1 (IS023) and Traeth Crugan 2 (IS024) locations. ..... 47
Figure 4-8: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Traeth Crugan 1 (IS023) and Traeth Crugan 2 (IS024) (MetOceanWorks, 2025). ..... 48
Figure 4-9: Net sediment transport along the south coast of the Llyn Peninsula with the disposal sites location (blue dot) (From Royal Haskoning, 2011d). ..... 49
Figure 4-10: The location of Dolau Beach (IS014), Cei Bach Beach A (IS019) and Cei Bach Beach B (IS022). ..... 53

Figure 4-11: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Dolau Beach (IS014), Cei Bach Beach A (IS019) and Cei Bach Beach B (IS022) (MetOceanWorks, 2025). ..... 54
Figure 4-12: New Quay Track (IS015) location. ..... 57
Figure 4-13: Annual disposal quantities (tonnes) at New Quay Track (IS015) between 2013 and 2017. ..... 58
Figure 4-14: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at New Quay Track (IS015) (MetOceanWorks, 2025). ..... 59
Figure 4-15: Maximum SSC simulated at New Quay Track (IS015) when disposed dredged material is released in summer (top panel) and winter (bottom panel). ..... 61
Figure 4-16: Deganwy Beneficial Use (IS035) location. ..... 63
Figure 4-17: Annual disposal quantities (tonnes) at Deganwy Beneficial Use (IS035) between 2009 and 2024. ..... 64
Figure 4-18: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Deganwy Beneficial Use (IS035) (MetOceanWorks, 2025). ..... 65
Figure 4-19: Maximum SSC simulated at Deganwy Beneficial Use (IS035) when disposed dredged material is released in summer (top panel) and winter (bottom panel). ..... 67
Figure 4-20: Conwy Beneficial Use (IS065 and IS066) locations. ..... 69
Figure 4-21: Annual disposal quantities (tonnes) at Conwy Beneficial Use (IS065) between 2009 and 2024. ..... 70
Figure 4-22: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Conwy Beneficial Use (IS065 and IS066) (MetOceanWorks, 2025). ..... 71
Figure 4-23: Maximum SSC simulated at Conwy Beneficial Use (IS066) when disposed dredged material are released in summer (top panel) and winter (bottom panel). ..... 74
Figure 4-24: Maximum SSC simulated at Conwy Beneficial Use (IS065) when disposed dredged material are released in summer (top panel) and winter (bottom panel). ..... 75
Figure 4-25: Holyhead North (IS043) location. ..... 77
Figure 4-26: Annual disposal quantities (tonnes) at Holyhead North (IS043) between 2009 and 2024. ..... 78
Figure 4-27: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Holyhead North (IS043) (MetOceanWorks, 2025). ..... 78
Figure 4-28: Maximum SSC simulated at Holyhead North (IS043) when disposed dredged material are released in summer (top panel) and winter (bottom panel). ..... 80
Figure 4-29: Broughton (IS099) location. ..... 82
Figure 4-30: Annual disposal quantities (tonnes) at Broughton (IS099) between 2010 and 2024. ..... 83
Figure 4-31: Maximum SSC simulated at Broughton (IS099) when disposed dredged material are released in summer (top panel) and winter (bottom panel). ..... 85
Figure 4-32: Mostyn Deep (IS102) location. ..... 87

Figure 4-33: Annual disposal quantities (tonnes) at Mostyn Deep (IS102) between 2005 and 2024. . 88
Figure 4-34: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Mostyn Deep (IS102) (MetOceanWorks, 2025). . 89
Figure 4-35: Maximum SSC simulated at Mostyn Deep Maintenance (IS102) when disposed dredged material are released in summer (top panel) and winter (bottom panel). . 91
Figure 4-36: Mostyn Breakwater (IS103) location. . 93
Figure 4-37: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Mostyn Breakwater (IS103) (MetOceanWorks, 2025). . 94
Figure 4-38: Maximum SSC simulated at Mostyn Breakwater (IS103) when disposed dredged material are released in summer (top panel) and winter (bottom panel). . 96
Figure 4-39: Cardiff Grounds (LU110) location. . 99
Figure 4-40: Annual disposal quantities (tonnes) at Cardiff Grounds (LU110) between 1988 and 2024. . 100
Figure 4-41: Tidal current speed and direction recorded within Cardiff Grounds (LU110) from the 12th of February 2024 to the 9th of March 2024. . 100
Figure 4-42: Hindcast model data showing wave height and direction (Panel A) and wind speed and direction (Panel B) at Cardiff Grounds (LU110) (MetOceanWorks, 2025). . 101
Figure 4-43: Maximum SSC simulated at Cardiff Grounds (LU110) when disposed dredged material are released in summer (top panel) and winter (bottom panel). . 103
Figure 4-44: Merkur Buoy (LU115) location. . 105
Figure 4-45: Annual disposal quantities (tonnes) at Merkur Buoy (LU115) between 1993 and 2024. . 106
Figure 4-46: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Merkur Buoy (LU115) (MetOceanWorks, 2025). . 106
Figure 4-47: Maximum SSC simulated at Merkur Buoy (LU115) when disposed dredged material are released in summer (top panel) and winter (bottom panel). . 108
Figure 4-48: Swansea Bay (Outer) (LU130) location. . 110
Figure 4-49: Annual disposal quantities (tonnes) at Swansea Bay (Outer) (LU130) between 1985 and 2024. . 111
Figure 4-50: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Swansea Bay (Outer) (LU130) (MetOceanWorks, 2025). . 111
Figure 4-51: Maximum SSC simulated at Swansea Bay (Outer) (LU130) when disposed dredged material are released in summer (top panel) and winter (bottom panel). . 113
Figure 4-52: Newport (LU140) location. . 115
Figure 4-53: Annual disposal quantities (tonnes) at Newport (LU140) between 1990 and 2024. . 116
Figure 4-54: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Newport (LU140) (MetOceanWorks, 2025). . 116

Figure 4-55: Maximum SSC simulated at Newport (LU140) when disposed dredged material are released in summer (top panel) and winter (bottom panel). ..... 119
Figure 4-56: Milford Haven Two (LU168) location. ..... 121
Figure 4-57: Annual disposal quantities (tonnes) at Milford Haven Two (LU168) between 1997 and 2024. ..... 122
Figure 4-58: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Milford Haven Two (LU168) (MetOceanWorks, 2025). ..... 123
Figure 4-59: Maximum SSC simulated at Milford Haven Two (LU168) when disposed dredged material are released in summer (top panel) and winter (bottom panel). ..... 125
Figure 4-60: Milford Haven Three (LU169) location. ..... 127
Figure 4-61: Annual disposal quantities (tonnes) at Milford Haven Three (LU169) between 2002 and 2024. ..... 128
Figure 4-62: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Milford Haven Three (LU169) (MetOceanWorks, 2025). ..... 129
Figure 4-63: Maximum SSC simulated at Milford Haven Three (LU169) when disposed dredged material are released in summer (top panel) and winter (bottom panel). ..... 131
Figure 4-64: Neyland (Off Milford Haven) (LU190) location. ..... 133
Figure 4-65: Annual disposal quantities (tonnes) at Neyland (Off Milford Haven) (LU190) between 2001 and 2024. ..... 134
Figure 4-66: Hindcast model data showing the tidal current speed and direction (Panel A), and wind speed and direction (Panel B) at Neyland (Off Milford Haven) (LU190) (MetOceanWorks, 2025). ..... 135
Figure 4-67: Maximum SSC simulated at Neyland (Off Milford Haven) (LU169) when disposed dredged material are released in summer (top panel) and winter (bottom panel). ..... 137

## Tables

Table 4-1: Differences between maintenance and capital dredging. ..... 29
Table 4-2: Key sources of online data sources related to oceanographic processes. ..... 29
Table 4-3: Direction and distance of the sediment plume at Holyhead North (IS043) for both summer and winter simulations. ..... 79
Table 4-4: Summarise of Marine Licences granted at LU110. ..... 97
Table 4-5: Direction and distance of sediment plume extension at Milford Haven Three (LU169) for both summer and winter simulations. ..... 130
Table 5-1: Summary table showing the key results for each disposal site review alongside the confidence in the assessment and any evidence gaps / suggestions for further investigation. ..... 139

# Acronyms

| Term | Definition |
|---|---|
| ADCP | Acoustic Doppler Current Profiler |
| Cefas | Centre for Environment, Fisheries and Aquaculture Science |
| EEZ | Exclusive Economic Zone |
| EIAR | Environmental Impact Assessment Report |
| Hs | Significant Wave Height |
| INNS | Invasive Non-Native Species |
| JNCC | Joint Nature Conservation Committee |
| MCAA | Marine and Coastal Access Act 2009 |
| MCZ | Marine Conservation Zone |
| MHWS | Mean High Water Springs |
| MPA | Marine Protected Area |
| MSL | Mean Sea Level |
| NNR | National Nature Reserves |
| NRW | Natural Resources Wales |
| OWF | Offshore Wind Farm |
| PEDW | Planning and Environmental Decisions Wales |
| SPM | Suspended Particulate Matter |
| SSC | Suspended Sediment Concentration |
| SSSI | Sites of Special Scientific Interest |
| SAC | Special Area of Conservation |
| SPA | Special Protected Area |
| SWPA | Shellfish Waters Protected Area |
| WNMP | Welsh National Marine Plan |

## Units

| Term | Definition |
|---|---|
| % | Percent |
| animal/km$^2$ | Animal per kilometre squared |
| birds/km$^2$ | Birds per kilometre squared |
| km | Kilometre |
| km$^2$ | Kilometre squared |
| m | Metre |
| mm | Millimetre |
| m/s | Metre per second |
| m$^3$/s | Metre cube per second |
| mg/L | Milligrams per litre |
| N/km$^2$ | Individual per kilometre squared |
| µm | Micrometre |

# 1 Introduction

## 1.1 Regulatory obligations regarding disposal of waste at sea

1.1.1 Within UK waters, the disposal of dredged material at sea is regulated through the Marine and Coastal Access Act 2009 (MCAA) for both the inshore region (0 to 12 nautical miles) and offshore waters (12 to 200 nautical miles). As detailed in the Part 4 of the MCAA, the deposit of any substance or object within the UK marine area is subject to a Marine Licence.

1.1.2 For the purposes of MCAA, the UK marine area is defined as the area of sea, including the seabed and subsoil of the sea, within the seaward limits of the territorial sea adjacent to the UK and within the UK Exclusive Economic Zone (EEZ). This includes any area submerged at Mean High Water Springs, and the waters of any estuary, river, or channel, so far as the tide flows at MHWS.

1.1.3 A Marine Licence is issued by the appropriate licensing authority following consideration of the licence application alongside the need to protect the environment, the need to protect human health, and the need to prevent interference with legitimate uses of the sea. In Wales, marine licences for disposal at sea are issued by Natural Resources Wales (NRW), acting on behalf of the Welsh Ministers, as the licensing authority under Part 4 of the MCAA. Marine Licences for disposal may also be issued by Planning and Environmental Decisions Wales (PEDW) as part of wider planning applications, for example port and harbour developments.

1.1.4 The MCAA also ensures that the UK, and consequently Wales, complies with international obligations as they relate to the disposal of waste at sea, such as those under the OSPAR Convention and the London Convention and London Protocol, to which the UK are a Contracting Party. Under these international conventions only specific types of waste are permitted for disposal at sea. In Wales only the disposal of dredged material is permitted in accordance with a marine licence. However, it is important to mention that some low-risk disposal activities are exempt from requiring a marine licence[1].Whilst other types of waste exist, such as inorganic geological, organic material of natural origin, and vessels and platforms to other man-made structure at sea, these are currently not licensed for disposal in Wales.

1.1.5 Furthermore, section 71(6) of the MCAA states that licencing authorities must abide by international obligations when issuing marine licences. Since the late 1990s, the only type of material to be routinely licenced for disposal at sea within Welsh waters are dredge arisings (e.g., for navigational access to ports and harbours) and a small amount (an average of 609 tonnes per annum) of fish waste (in the form of shellfish shells). Although it is worth noting that the fish waste disposal was terminated at the end of 2017, and this is no longer deposited in Welsh waters.

[1] The list of activities that may be exempt from requiring a marine licence are provided here: https://naturalresources.wales/permits-and-permissions/marine-licensing/marine-licence-exempted-activity/?lang=en.

## 1.2 Welsh Disposal Sites

1.2.1 Areas of Welsh waters designated for the purpose of receiving dredged marine sediment are known as disposal sites and can be classified into three categories. A disposal site is generally classified as 'open' if a site is currently available for use. 'Disused' sites are those that have not been used for a period of five years. A site is considered 'closed' following an inactive period of 10 years.

1.2.2 There are currently 32 open sites designated for the disposal of material at sea within Welsh waters (as end of 2025) (Figure 1-1). The amount of dredged material being disposed of to sea within Welsh waters showed yearly variation, with an average of 3,117,042.8 tonnes per annum between 2005 and 2024[2][3] (Figure 1-2). The maximum and minimum disposal of material were recorded in 2005 (4,099,635 tonnes) and 2024 (2,045,891 tonnes) respectively (Figure 1-2).

1.2.3 The disposal of material is not evenly distributed across all sites (Appendix A). Between 2005 and 2024, data[4] show that the majority of material was disposed at LU130[5] (63% of the total of all sites equivalent to 39,283,474 tonnes) followed by LU110 (22.1% of the total of all sites equivalent to 13,749,384.9 tonnes) and both IS102 and LU140 (5.5% ± 0.1% of the total of all sites equivalent to 3,466,600 tonnes ± 57,000 tonnes at each site) (Appendix A). Several reasons explain this difference:

- All open sites were not commissioned in the same year. For example, IS103 received its first disposal return in 2024, whereas LU110 and LU130 were commissioned before 2005 (Appendix B);
- Open sites serve different purposes, which lead to different volumes of material disposed. For example, some open sites are only used for beach nourishment (e.g., IS014, IS023 and IS024), an activity which does not occur annually, whereas other open sites are used for multiple, more regular purposes (maintenance and capital dredge deposits); and
- All open sites are of different sizes, allowing larger sites to receive more disposed material than smaller ones. For example, LU130 covers an area of 6.1 $km^2$ and received 63% of the total disposed material in 2020, whereas LU115, with an area of 0.02 $km^2$, received 1.7% of the total disposed material in 2020 (Appendix B and Appendix C).

[2] Only disposal returns up to 2024 have been used to inform this review. Returns during 2025 were not available at the time of writing.
[3] Disposal of dredge material started before 2005 for certain disposal sites and the associated disposal volumes are presented in detail in Appendix B.
[4] The percentage and tonnes of disposed material between 2005 and 2024 were calculated for 25 open sites and excludes those open disposal sites related to Offshore Wind Farm (OWF) developments.
[5] The report refers to the disposal site code for clarity. The name of the disposal site and their respective code is provided in Appendix B.

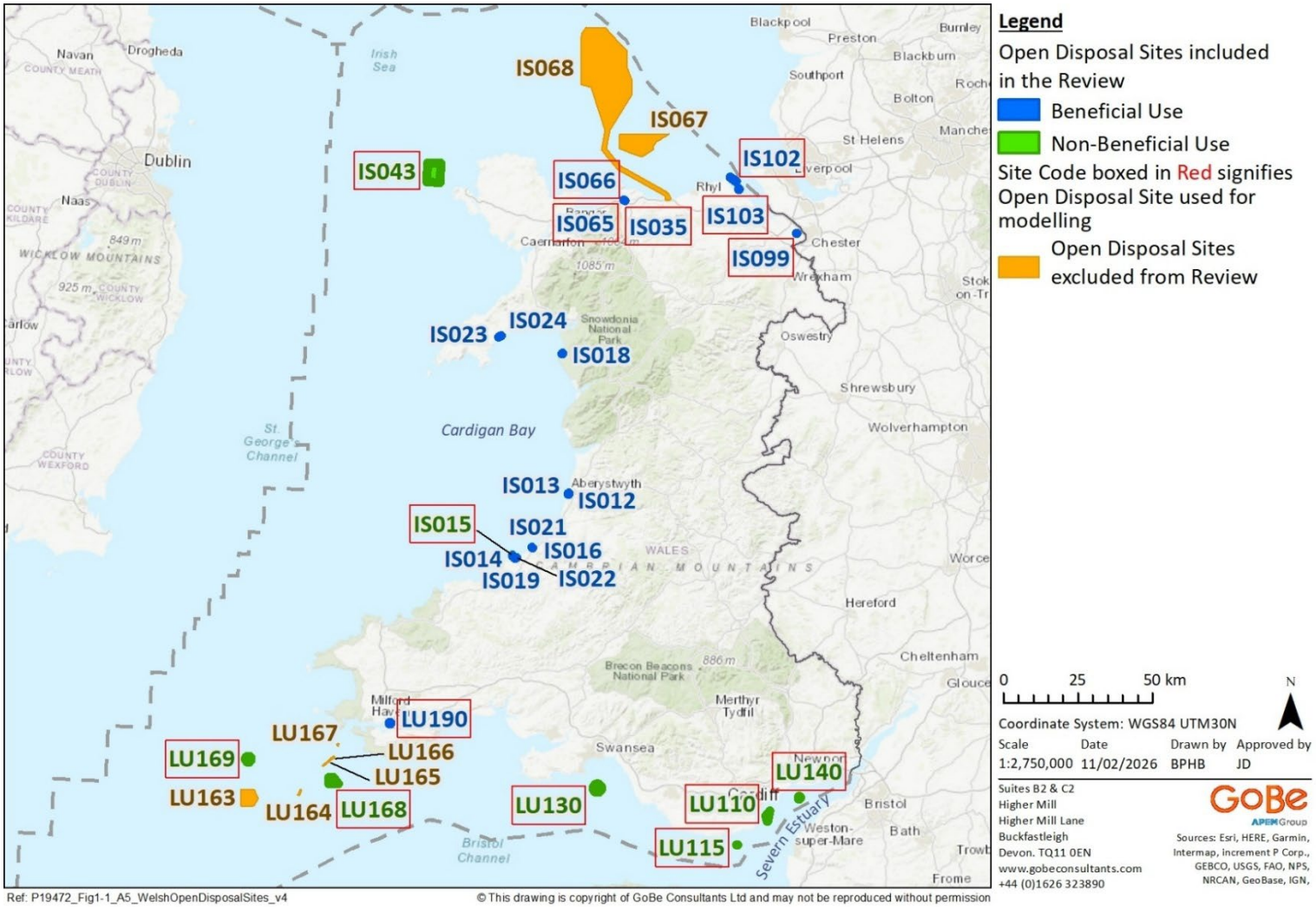



Figure 1-1: A map showing the location of open disposal sites within Welsh waters.

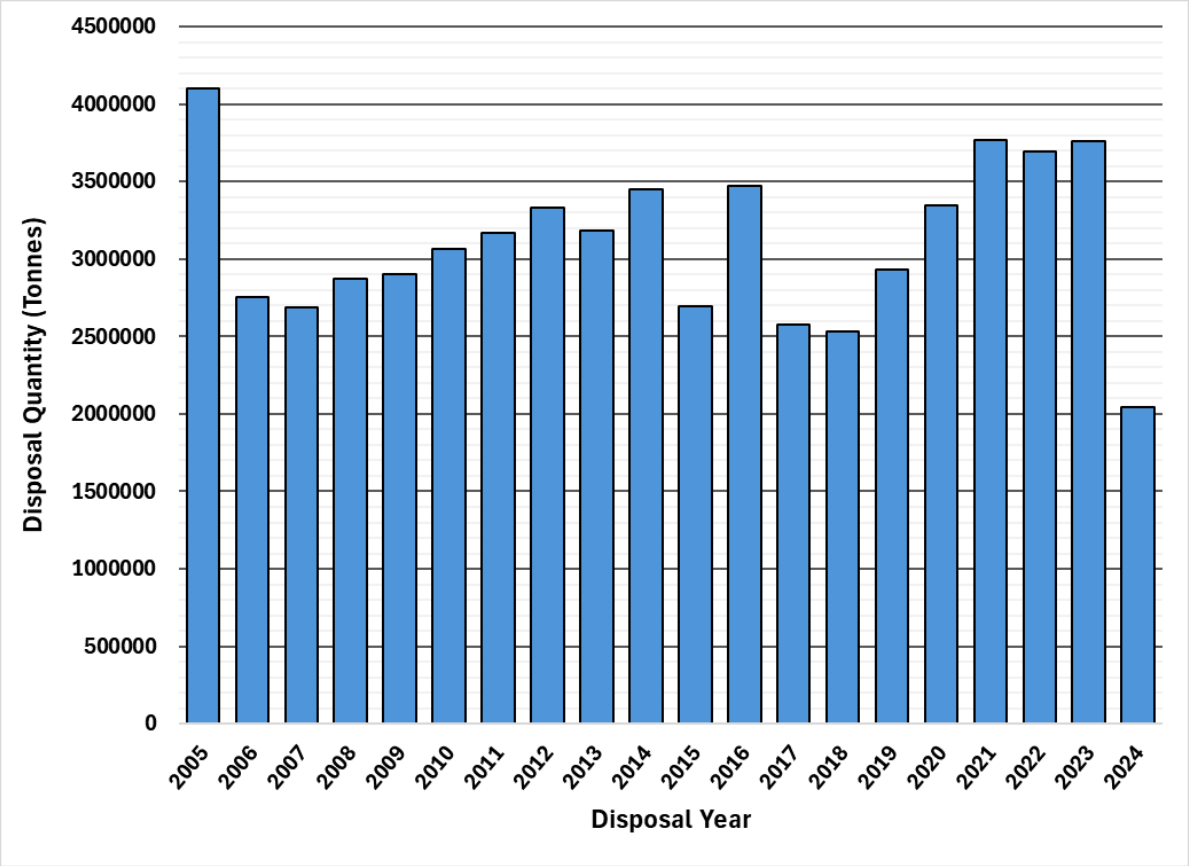



Figure 1-2: A bar graph representing the total quantity of dredged material disposed at licensed Welsh disposal sites from 2005 to 2024.

1.2.4 The Welsh National Marine Plan (WNMP) considers dredge and disposal operations to be essential for the safe passage of vessels to and from ports, harbours and marinas and are often required to support the build of new coastal infrastructure projects (e.g., land reclamations for the extension of existing ports and harbour) (Welsh Government, 2019). Furthermore, dredge and disposal activities are recognised as ongoing operations, with demand for disposal sites expected to increase in response to future sustainable marine developments.

1.2.5 Within the WNMP, dredging is considered vital to social and economic development and has therefore been identified as an area of priority for Welsh Government. In addition, the WNMP notes that whilst there is a requirement to ensure adequate provision for port access and disposal sites, beneficial use of dredged material is to be encouraged. Furthermore, disposal site selection should be adequately assessed to avoid any interference with, or devaluation of, other legitimate users and uses of the marine environment, or to result in significant adverse effects upon ecosystem resilience (Welsh Government, 2019).

1.2.6 Beneficial use in this case may include, but is not limited to, retaining sediment within the natural sediment system to support sediment-based habitats, shorelines, and infrastructure (known as Sustainable Deposit), as well as habitat restoration, beach nourishment, shoreline stabilisation/protection and engineering uses (Welsh Government, 2023).

## 1.3 Potential Impacts of disposal of dredge material

1.3.1 The disposal of dredged sediment in the marine environment can affect the water column features, the physical and chemical nature of the seabed, and the seabed biota, in both the short- and long-term and at near- and far- field scales (MEMG, 2003; Donazar-Aramendia *et al.*, 2020; Fernandes *et al.*, 2021; Dauvin *et al.*, 2022). The potential impacts could result in the following:

- degradation of the marine ecosystem concerning both health and quality;
- decrease in the socio-economic aspects of the sea including fisheries, shellfisheries and residential or touristic amenity of interests;
- interference with the other legitimate uses of the sea, such as tourism (recreational navigation) and other navigational aspects (e.g., nautical depth); and
- decrease in the aesthetic qualities associated with the area (e.g., change of sediment leading to passive plume, or deposition of non-desirable material on beaches).

1.3.2 Disposed material released in the water column results in a mixture of sediment and water, denser than the surrounding sea water, which descends to the seabed. This leads to a dispersive plume that can be divided into three stages (Figure 1-3; Gundlach *et al.*, 2024):

1. Convective descent (also called dynamic plume): the material descends rapidly (within minutes) to the seabed as a cloud, which grows and dilutes towards the seabed due to ambient currents (Figure 1-3);
2. Dynamic collapse: this stage starts when the sediment cloud hits the seabed leading to a horizontally propagating current which spreads radially from the impact point (Figure 1-3); and
3. Passive diffusion (also called passive plume): as the plume of sediment and water descends through the water column, disposed material can be entrained (stripped out) from the dynamic plume into the surrounding water column and is dispersed laterally as a passive plume (sometimes referred to as a suspended plume) by currents, such as wave and tidal regimes (Figure 1-3).

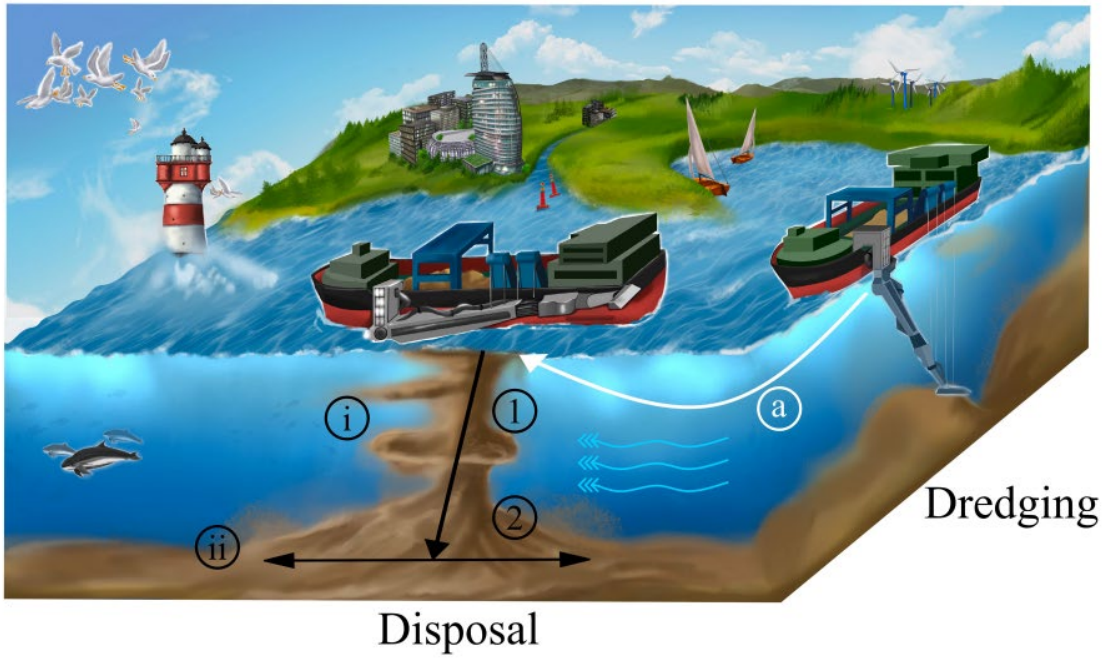



Figure 1-3: Transport of dredged material to a disposal site (a). At the disposal site, the material is released for convective descent (1), and the dynamic collapse starts upon impact on the ground (2). During the convective descent, material can be stripped (i) and during dynamic collapse settle (ii) while spreading on the ground. (From Gundlach *et al.*, 2024).

1.3.3 Dispersal and settlement rates of sediment will depend on the oceanographic conditions of the area and the material that is being disposed. In highly dynamic areas (i.e., stronger tidal and wave regime), sediment will travel further than in areas of weak tidal and wave regime. Furthermore, finer sediment disposed (e.g., mud and silt) has a higher potential of dispersal than coarser sediment (e.g., sand and gravel) (this statement excludes the case of highly cohesive sediment such as mudstone).

1.3.4 According to the location and the depth of disposal sites, the newly settled sediment can be re-suspended through tidal currents alone, wind and wave actions and through storm events (Uncle *et al.*, 2015). Viitak *et al.* (2025) showed the importance of storm-driven processes on the long-term (i.e., annual cycle) sediment transport, with low sediment movement during spring and summer and considerable transport between autumn and winter, associated with storms.

1.3.5 Sediment disposal results in the following:

- Increased, temporary, suspended sediment concentrations; and
- Seabed deposition.

1.3.6 If disposal sites are located in a dynamic area, this suggests a potential high dispersal of sediment with impacts that could be far reaching (Centre for Environment, Fisheries and Aquaculture Science (Cefas), 2020). Therefore, it is essential to characterise the oceanographic features, as well as the type of dredged material disposed, to accurately assess the potential impact of disposal activities. This is carried out through the regulatory marine licensing process.

1.3.7 The disposal of dredge sediment will temporarily increase Suspended Particulate Matter (SPM)[6] concentrations, which may interfere with the functioning of gills of fish by clogging, and food intake of filter-feeders (e.g., bivalves and copepods) (OSPAR, 2009). Increases of Suspended Sediment Concentrations (SSC)[7] will result in high turbidity, which can negatively impact light-dependent organisms (e.g., phytoplankton, eel gras and visual predators such as fish) by reducing the level of light transmitted into the water column (Li *et al.*, 2021; Wiltshire, 2023; Lohrer *et al.*, 2025). Increased turbidity and SPM will also occur due to natural processes, lasting from several hours (e.g., during spring tide) to several days (e.g., during storm events). The impact from the increase of turbidity and SPM related to the disposal of material is temporary, typically occurring over the order of hours, reducing the risk for detrimental impacts upon benthic organisms in subtidal and intertidal areas (Wiltshire, 2023). However, it is important to mention that the level of impacts will depend on the nature of activities (e.g., intermittent disposal of sediment) and on the receiving environment (e.g., type of sediments, natural turbidity values).

1.3.8 An increase in sediment deposition could adversely affect benthic communities by direct burial and/or habitat alterations (i.e., change of sediment structure) (OSPAR, 2009; Cooper, 2013). From a temporal perspective, direct burial will result in an immediate mortality, whereas habitat alterations can have long term effects (i.e., several years) (Zimmerman *et al.*, 2003; van Dalfsen and Lewis, 2006; Boon and van Dalfsen, 2022). Benthic organisms typically live in the top 10 cm of sediment, where they maintain a connection to the sediment-water interface for ventilation and feeding (Miller *et al.*, 2002), which can be disturbed by a sudden enhancement of sedimentation caused by the disposal of material. However, through time sediment re-suspension occurs (e.g., in result to a strong spring tide or during storms events) which can mitigate this impact.

1.3.9 Ballast water from ships carrying out disposal operations may contain Invasive Non-Native Species (INNS), as well as residual spores and larvae. The disposal of dredge material can also act as a pathway for their spread, including at disposal sites where passive diffusion is high. In order to minimise the risk of spread or introduction of INNS, all dredge and disposal activities must carry out a Biosecurity Risk Assessment.

[6] SPM is defined as the total amount of suspended substances in the water column.
[7] SSC is a specific measure of the concentration of the suspended sediment in the water column.

1.3.10 The capacity of an ecosystem to recover from disposal activities depends on the benthic community types (e.g., life cycles of species, abundance), the disposal activity itself (e.g., mode, timing, frequency, quantity and type of material), and local hydrological and sedimentological conditions (Sánchez-Moyano *et al.*, 2004; De Montaudouin *et al.*, 2023). Benthic communities associated with subtidal sediments in high energy systems are regularly exposed to physical stress and can either move or recolonize rapidly compared to ecosystems in low energetic systems (Robinson *et al.*, 2005). The degree of impact and the recovery period are therefore considered to be highly site specific and require *in-situ* investigations (Ware *et al.*, 2010).

1.3.11 While this report identifies potential impacts, it does not provide an assessment of these impacts as this is considered by NRW on a case-by-case basis as part of the regulatory marine licensing process.

## 1.4 Disposal site management

1.4.1 Applications for disposal at sea must be robustly assessed to avoid impacts on the environment, human health and other legitimates uses of the sea (see Section 1.3) and to be certain that only designated disposal sites are used for the disposal of dredged material.

1.4.2 In Wales, NRW is the regulator for marine licencing and assess the suitability for dredged material to be disposed at sea in line with relevant legislation and UK's international obligations. A key consideration for the disposal of dredged material is based on the Waste Hierarchy, which sets out five tiers for managing all type of waste (e.g., wood, plastics, fibre, dredged material), with disposal being the least favoured option (i.e., Tier 5)[8]. With help from technical consultees and key stakeholders, NRW thoroughly assess applications for dredged sediment disposal at sea through the evaluation of impacts of the proposed activity on marine ecosystems. This includes a consideration of the:

- material to be dredged and disposed of to minimise impacts (e.g., level of contamination, type and quantity); and
- disposal site, to ensure it can accommodate all licenced tonnage (e.g., amounts of disposal previously received by the site, if there are multiple users of the site, number of licences).

[8] For more information on the Waste Hierarchy: https://www.gov.uk/government/publications/guidance-on-applying-the-waste-hierarchy.

1.4.3 Sampling and analysis plans must be undertaken by the applicant to ensure the material will be suitable for disposal at sea. These plans consider the location, method and number of samples, as well as the types of chemical and physical analysis required. These sample plans are provided with consideration of the UK's international obligations and therefore utilise the OSPAR guidelines for the management of dredged material (OSPAR, 2024). Sediment is tested against Cefas Action Levels (AL) with these guidelines providing a weight of evidence approach (MMO, 2014). Dredged material contaminants below AL 1 are of no concern; dredged material contaminants above AL 2 are considered unsuitable for disposal at sea. Dredged material with contaminant levels between the two ALs will require further consideration and testing prior to a final decision being made.

1.4.4 Where disposal is proposed the disposal site is suggested by the applicant in their licence application, whether this may be disposing within an existing site, or proposing to designate a new disposal site. However, it is the responsibility of NRW, following consultation and provision of appropriate supporting information from the applicant, to determine the suitability of the proposed disposal site, ensuring that the dredged material disposed does not interfere with other uses of the sea or have unacceptable impacts on the marine environment or human health. The principal factors to consider when selecting a disposal site are listed within the Revised Specific Guidelines for Assessment of Dredged Material (IMO, 2014) that supplement Annex 2 of the 1996 Protocol (London Protocol) (IMO, 2003), which are:

- There are no existing disposal sites that the project can logistically use in the event of a proposed new disposal site;
- Location of amenities, protected areas, and other uses of the sea in the area;
- Characteristics of the water-column and the seabed at potential disposal sites;
- Economic and operational feasibility of marine transport of the material to the site;
- Size of the disposal site: large enough to accommodate the anticipated ongoing volumes of waste without unacceptable degradation of the marine environment or interference with other uses of the sea, but small enough for practical monitoring;
- Characteristics of the material to be dumped, including the presence and mobility of contaminants; and
- The presence of other disposal sites in the vicinity

1.4.5 The applicant's proposed disposal site may be rejected if:

- The existing disposal sites cannot take the type of material that will be dredged (due to contamination and/or sediment type);
- Capacity at an existing disposal site has been reached; and/or
- Unacceptable impacts upon marine ecosystems.

1.4.6 If the applicant requires the designation of a new disposal site, the responsibility for undertaking the process of characterising a new disposal site would normally lie with the applicant.

1.4.7 A disposal site can be authorised solely for the objectives of the beneficial use (e.g., frequency and volume of disposal, as well as the physicochemical characteristics of the sediment that it can accept). To authorise a new disposal site or to change the use of an existing disposal site (e.g., increased use or changes to the management objectives), a disposal site characterisation assessment is required.

1.4.8 Disposal site characterisation reports are evaluated by NRW. These reports are site-specific and thus some sites may require more information than others before being approved.

# 2 Aims and objectives

## 2.1 Project aims

2.1.1 The aim of this project is to conduct a strategic review of the current open disposal sites within Welsh waters, excluding those associated with Offshore Wind Farm (OWF) developments, up to and including 2025, to further inform understanding of how the disposal sites are interacting with the wider marine environment.

2.1.2 The project is being carried out through a high-level desk-based review, including the application of numerical models (Appendix D), to provide an overview of the sediment dispersion, within and outside disposal sites, following deposition.

## 2.2 Objectives

2.2.1 The first objective (hereafter "Objective 1") is to identify the current open disposal sites within Welsh waters, and detail the status of these disposal sites, including but not limited to:

- Disposal site name and code;
- Location and size (i.e., surface area); and
- Annual volumes and type of material disposed.

2.2.2 The second objective (hereafter "Objective 2") is to identify for wider context any potential receptors in the vicinity of each disposal site identified under Objective 1 (paragraph 2.2.1), including but not be limited to:

- Designated sites (including designated features) (e.g., Special Protected Area (SPA), Special Area of Conservation (SAC), Ramsar, Site of Special Scientific Interest (SSSI) and Marine Conservation Zone (MCZ)); and
- Other socio-economic coastal and offshore activities (e.g., fishing and bathing waters).

2.2.3 The third objective (hereafter "Objective 3") is to consider the likely dispersal behaviour of disposed sediment at each disposal site identified under Objective 1 (paragraph 2.2.1).

# 3 Methods

## 3.1 Objective 1: Identification of disposal sites

3.1.1 For the aim of marine licencing marine disposal sites in Wales are classified in three categories:

- "open": a disposal site is currently available for use;
- "disused": a disposal site that has not been used for a period of 5 years; and
- "closed": a disposal site that has not been used for a period of 10 years or if evidence suggests that the deposit of material could have a detrimental impact on marine environment, human health and/or interfering with other legitimate uses of the sea.

3.1.2 This review has focussed exclusively on the current open disposal sites in Welsh Waters (32 sites). Any sites previously licensed but now classified as "closed" are not included.

3.1.3 Amongst the current open disposal sites, seven are related to OWF developments (Figure 1-1; Appendix C) and, as agreed with Welsh Government, these are not included within this study. Twenty-five sites have therefore been characterised in detail.

3.1.4 The disposal sites classified as "open" have been identified using the disposal returns data provided by NRW, a previous report on Welsh disposal sites (Clarke and Rees, 2020) and DataMapWales (Welsh Government, 2025), which includes data on active Marine Licences and designated disposal sites until the end of 2024.

3.1.5 Disposal returns are provided by licence holders to the Licensing Authority twice a year and submitted to Cefas for reporting to OSPAR, as required by the OSPAR Convention (1992), London Convention (1972) and London Protocol (1996). These data include:

- Information on volume and type of material;
- Information on the composition of licensed disposal material; and
- New marine licences that have been granted for disposal at sea.

## 3.2 Objective 2: Collection of sensitive receptor data

3.2.1 Two main data sources were identified and utilised for the collection of data under Objective 2 (paragraph 2.2.2). These are:

- Marine Protected Area Mapper, which is an interactive web map providing information about the Marine Protected Areas (MPAs) within UK (i.e., status, coordinates, area and protected features); and
- DataMapWales, which is an interactive web map giving information on bathing waters and Shellfish Waters Protected Areas (SWPA).

3.2.2 The primary focus of this objective was to determine the location of potentially sensitive receptors, as defined in paragraph 2.2.2, in the vicinity of each disposal site characterised within this report. Sensitive receptors are included in the assessment if their distance from the disposal site is less or equal to the spring tidal ellipse excursion. For example, if the tidal excursion is between 5 km and 6 km at a disposal site, any designated site located within 6 km from the disposal site would be considered as a potentially sensitive receptor.

3.2.3 This report provides no consideration or assessment of the potential impacts of deposited material upon the features of designated sites, including the potentially sensitive receptors which are identified. It is important to mention that not all designated features are sensitive to the deposition of dredged material. For example, it is unlikely that the disposal of dredge material at sea would have an impact on features above Highest Astronomical Tide (HAT)[9] within SSSI designated sites. As part of the regulatory process, it is the role of NRW to assess these impacts in accordance with the requirements of all relevant environmental regulations and requirements[10].

## 3.3 Objective 3: Modelling

3.3.1 The numerical model used in this review is presented in detail in Appendix D. The modelling report (Appendix D) includes details such as:

- Model description (e.g., software used, data to represent tidal and wave regime);
- Model parameters (e.g., sediment release method, type and quantity of sediment released);
- Validation methods and results; and
- Model limitations (e.g., availability of data such as bathymetry and erosion rates).

3.3.2 The outputs from the numerical model were analysed by statistical analysis (e.g., concentration of particle, distant and direction from released location) and mapped, using ArcGIS, alongside the disposal site of interest to represent the plume extent at the surface through time.

3.3.3 The figures resulting from numerical model are composed of two panels:

- The left panel shows the variation of bed layer thickness (in m), SSC (in mg/L), Significant wave height ($H_S$) (in m) and Mean Sea Level (MSL) (in m) through time (i.e., six months); and
- The right panel presents the highest SSC (in mg/L) simulated.

[9] HAT is defined as the maximum predicted water level occurring under average meteorological conditions, resulting from any combination of astronomical conditions.

[10] NRWs approach to marine advice can be found here: Guidance for Environmental Impact Assessments for marine developments and guidance for Environmental Impact Assessment for marine development can be found here: https://naturalresources.wales/guidance-and-advice/business-sectors/marine/?lang=en.

3.3.4 The parameters presented on the figures resulting from modelling (paragraph 3.3.3) have been selected due to their influence on the potential impacts (i.e., increase of SSC and seabed deposition; paragraph 1.3.5) resulting from the disposal of material. For example, it has been shown that if the bed elevation is greater by 5% of the total water depth, the potential changes to marine and coastal physical processes could be seen over a distance of (up to) approximately 5x the maximum dimension of the disposal area (Brooks *et al.*, 2022).

3.3.5 Explanations for the parameters presented on the numerical modelling figures in Section 4.3 are provided in Figure 3-1 below:

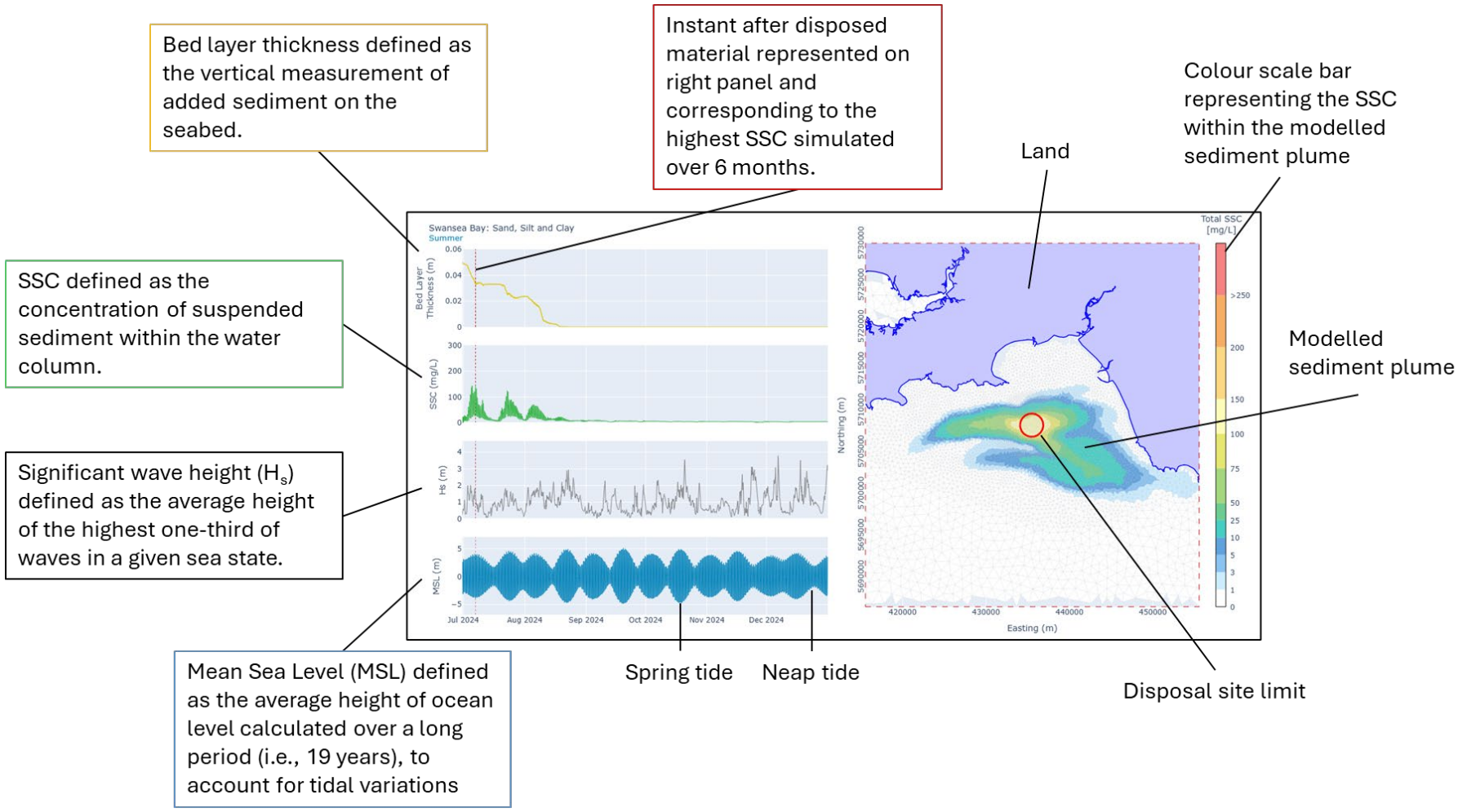



Figure 3-1: An infographic describing the of parameters on numerical modelling figures.

# 4 Results

## 4.1 Identification of disposal sites

4.1.1 As discussed in Section 3, this review has focussed on the open disposal sites but does not include the seven open disposal sites licensed specifically for OWF activities (paragraph 4.1.4; Figure 1-1; Appendix C).

4.1.2 Of the 32 open disposal sites within Welsh waters:

- 25 are included for characterisation within this review with the:
  - dispersal of disposed material assessed using numerical modelling at 15 locations (section 4.3); and
  - remaining ten sites characterised without numerical modelling due to being located within the intertidal (section 4.2; Figure 1-1; Appendix C).

4.1.3 Within Welsh waters, the 25 open disposal sites are classified into two categories[11] (Figure 1-1):

- "Beneficial use" in the case of dredged material treated as a valuable resource for environment and/or economic gain (e.g., habitat creation/restoration, beach nourishment and land reclamation) - 17 of the 25 open sites are classified as "beneficial use"; and
- "Non-beneficial use" in the case of dredged material considered simply as waste to be discarded (e.g., unrestricted open-water disposal and confined aquatic disposal) (OSPAR, 2024) - 8 of the 25 open sites are categorised as "non-beneficial use".

4.1.4 The disposal sites in Welsh waters primarily receive dredge arisings from the maintenance dredging of nearby ports and harbours, as well as occasional capital dredge arisings from new constructions or expansions to existing ones, where:

- Maintenance dredging is a periodic and ongoing activity removing sediment deposited as a result of oceanographic (i.e., tidal and wave regime) and hydrological (i.e., river flow) processes. This activity is typically used to maintain water depths to, for example, ensure safe navigation into ports/ harbours; and
- Capital dredging is a singular activity typically required during major port expansion (e.g., deepening of a channel, harbour or berthing facility, area which has not been dredged in the last 10 years) or construction activities (e.g., excavation of underwater trenches for tunnels, cables or pipelines) (Ware *et al.*, 2010).

4.1.5 The main differences between maintenance and capital dredging are summarised below (Table 4-1):

[11] The classification of disposal sites between "beneficial use" and "non-beneficial use" was determined based on previous report (Clarke and Rees, 2020) and available disposal marine licences.

Table 4-1: Differences between maintenance and capital dredging.

| | Maintenance dredging | Capital dredging |
|---|---|---|
| Goal | Maintain existing features (e.g., depth or beach) | Create and/or expand capacity |
| Material | Recently deposited sediment | Often un-dredged and/or hard-packed soil |
| Frequency | Routine and/or periodic | Once-off and/or major expansion |
| Example | Clearing channel sandbanks | Dredging for a new port |

### Summary of sites that were excluded from this review

4.1.6 Those sites excluded from this review are:

- 27 closed sites (as listed in Appendix C);
- Seven open disposal sites related to OWF activities (Figure 1-1; Appendix C):
  - five are located off the Pembrokeshire coast; and
  - two are in the Irish Sea, off the North Wales coast (Figure 1-1).

## 4.2 Disposal sites without modelled sediment dispersal

4.2.1 The dispersal of disposed material has been assessed based on expert knowledge, available online data sources and scientific literature. The available online data sources are summarised in Table 4-2 below.

Table 4-2: Key sources of online data sources related to oceanographic processes.

| Data source | Summary |
|---|---|
| Atlas of UK Marine Renewable Energy Resources (ABPmer *et al.*, 2008) | Low resolution modelled hindcast tide, wave, wind and sediment transport. |
| SEASTATES Metocean Data and Statistics Interactive Map (ABPmer, 2018) | Modelled hindcast wave and wind data. |
| Metocean atlas (MetOceanWorks, 2025) | Low resolution modelled hindcast for wave and wind. |

4.2.2 Within this section, the open disposal sites are exclusively located in Cardigan Bay and are all categorised as beneficial use (Figure 1-1). The open disposal sites characterised within this section are all located in the intertidal zone, predominately receiving material for beach replenishment. In coastal areas, defined as the interface between land and sea, sediment transport is a highly complex process involving hydrodynamic regimes (i.e., tides, waves and wind) coupled with the influence of coastal shape (i.e., headlands and human infrastructure), river inputs, and coastal erosion due to climate change (i.e., sea level rise and storm increase) (Brown and Davies, 2009).

4.2.3 The open disposal sites within this section have been grouped depending on the respective forcing environmental parameters (i.e., tide and wave). The assessments provided are based on average hydrodynamic conditions; extreme weather conditions (e.g., storm, freak waves[12], surges and flood due to abnormal rain fall), will strongly influence the dispersal of disposed dredged material making it difficult to accurately predict sediment transport. Furthermore, storm events can induce the resuspension of disposed dredged material especially in shallower, coastal areas.

[12] Freak waves are defined as waves exceeding two times the surrounding significant wave height.

## Tanybwlch beach (IS012) and Aberystwyth South Beach (IS013)

### Site characterisation

4.2.4 Both disposal sites are located intertidally in the centre of Cardigan Bay (Figure 4-1). IS012 and IS013 are located directly in the south and the north of the mouth of the Rheidol River respectively (Figure 4-1). The two beneficial use sites are associated with the maintenance dredging of Aberystwyth Harbour. At the time of review writing[13], no disposed material was registered at IS012, whereas IS013 received 1985 tonnes of disposed dredged material in 2022 (only) which was predominately composed of gravel (60%) with the remainder being composed of sand and silt.

4.2.5 Disposal of dredge material is likely to occur post-2024 at IS012 and IS013 as a Marine Licence (DML2473) has been granted in 2025 for the disposal of harbour maintenance dredge material at these sites. The Marine Licence, valid for a period of five years, has been granted for the deposition of gravel, sand and silt with a maximum deposit of 10,000 tonnes per year, which corresponds to a potential total disposal of 50,000 tonnes.

4.2.6 The oceanographic features at these sites are presented in Figure 4-2 and are summarised as follow:

- The tidal range ranges between 4.2 m and 1.9 m during spring and neap tides, respectively (ABPmer *et al.*, 2008). The tidal regime is orientated north to south, with a tidal ellipse excursion between 3 km and 4 km (Figure 4-2; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is, on average, simulated at 0.44 m/s and the neap peak flow at 0.23 m/s with a residual current towards the north (Figure 4-2; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$)[14] is shown to be less than 2 m for 90% of the time, however in extreme condition wave height can reach 6 m (Figure 4-2). The waves predominate from the west (50%), followed by the southwest (30%) (Figure 4-2; MetOceanWorks, 2025); and
- The wind regime is less than 10 m/s for 75% of the data, with a main direction from the southwest (28%) followed by south, west and northwest (15% each) (Figure 4-2; MetOceanWorks, 2025).

4.2.7 Given the above parameters, the net sediment transport is shown to be orientated northward at both ISO12 and IS013, explained by the wave direction coming from southwest (30%) and enhanced during flood tide orientated towards the north (Royal Haskoning, 2011a).

[13] Disposal returns up to 2024 have been used to inform this review. Returns during 2025 were not available at the time of writing.

[14] $H_m0$ is defined as statistical measure of the overall wave energy, representing the average height of the highest one-third (33%) of waves.

4.2.8 Monitoring has shown a very slow net loss of sediment near IS013, which is often made up from the disposed dredged material from the harbour (Royal Haskoning, 2011a). This result correlates with the UK Renewable Atlas hindcast model which classifies the net sediment transport rate as low (ABPmer *et al.*, 2008). Given that the dredge material is mostly gravel (paragraph 4.2.4) and in an area of very low net sediment transport, it is expected that the disposed dredged material at IS013 will have a minimum dispersal and have a tendency to remain within the disposal sites and/or close by.

4.2.9 IS012 is located in a more dynamic area when compared to IS013 due to the presence of surficial sediment composed essentially of gravel and pebbles. However, the presence of the harbour pier directly to the north of IS012 could retain the sediment (e.g., gravel and coarse sand) within the disposal site. Finer material (e.g., sand and silt) might potentially pass the harbour mouth and settle further north at IS013 and beyond.

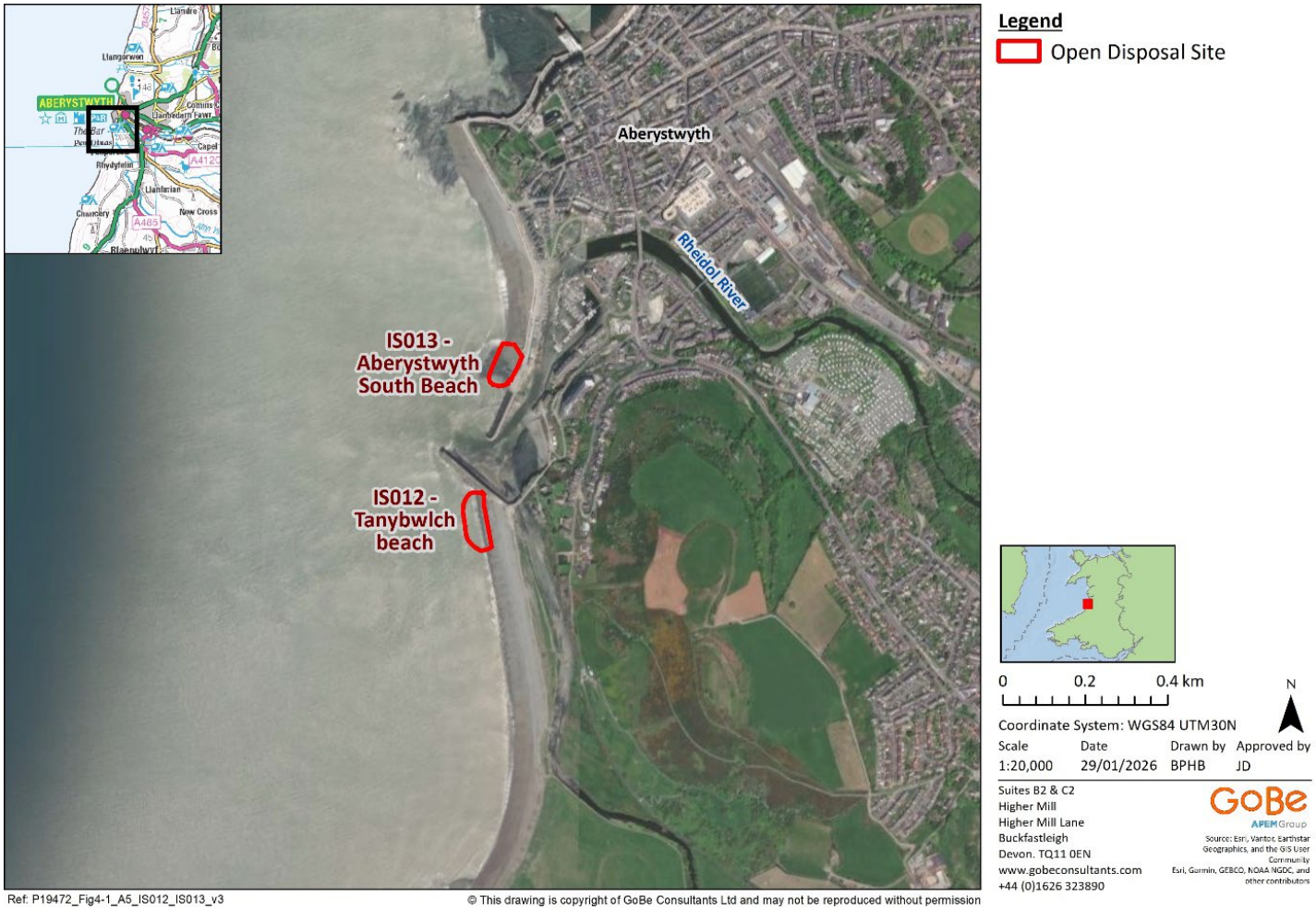



Figure 4-1: A map showing Tanybwlch beach (IS012) and Aberystwyth South Beach (IS013) locations.

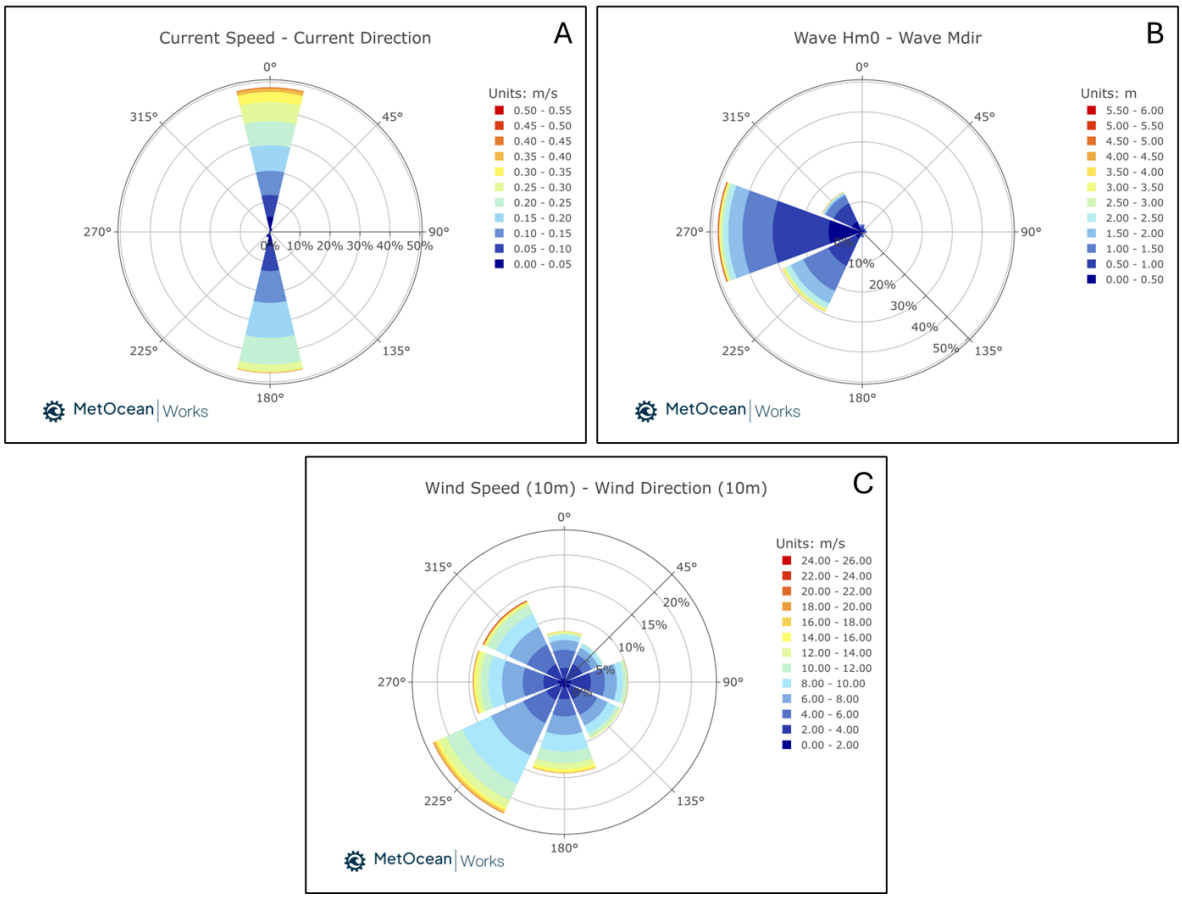



Figure 4-2: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Tanybwlch beach (IS012) and Aberystwyth South Beach (IS013) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.2.10 The tidal excursion ellipse is between 4 km and 5 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.1 (Appendix D).

4.2.11 IS012 and IS013 are located within the West Wales Marine SAC which is designated for harbour porpoise (section D.1 in Appendix D). Heinänen and Skov (2015) showed that the species density near IS012 and IS013 remains low throughout the year (i.e., < 0.3 N/km$^2$).

4.2.12 IS012 and IS013 are located within the Northern Cardigan Bay SPA, which is designated for red-throated diver (section D.1 in Appendix D). The density of distribution of red-throated diver is shown to be negligible at both disposal sites IS012 and IS013 (O'Brien *et al.*, 2015). However, the bird density increases gradually northward along the coast, reaching values of between 1.4 and 2.75 birds/km$^2$ at around 2.5 km from the disposal sites (O'Brien *et al.*, 2015).

4.2.13 IS012 is located within the Allt Wen a Traeth Tanybwlch SSSI at the northern limit, with IS013 located 200 m north from the designated site (section D.1 in Appendix D). Allt Wen a Traeth Tanybwlch SSSI is designated for geological features (shingle) as well as biological features (Sand hopper) (section D.1 in Appendix D). The shingle ridge along the coastline is composed mainly of pebbles and gravel acting as a natural barrier against marine erosion.

4.2.14 Three bathing waters are located in the vicinity of IS012 and IS013 (section D.1 in Appendix D). Aberystwyth North and Clarach South bathing waters are located approximately 2.9 km ± 0.1 km and 1.1 km ± 0.1 km respectively from the disposal sites. Aberystwyth South Bathing Water is located close to both disposal sites (i.e., approximately 0.4 km ± 0.1 km) (section D.1 in Appendix D).

## Spending Harbour (IS016) and New South Beach (IS021)

### Site characterisation

4.2.15 These disposal sites are located intertidally in the centre of Cardigan Bay (Figure 4-5). Spending Harbour (IS016) is located directly to the south of the Aeron River mouth and New South Beach (IS021) is found in the southeast of Aberaeron Harbour (Figure 4-5).

4.2.16 These two beneficial use sites are associated with the maintenance of Aberaeron Harbour. At the time of writing[15], no disposed material was registered at both IS016 and IS021. The disposal of dredge material is likely to occur post-2025 at both disposal sites as two Marine Licences have been granted in this year.

4.2.17 The Marine Licence granted for IS016 (DML2130) is valid for a period of 3 years, which includes an amount of disposal of 2,000 tonnes per year (i.e., potentially 6,000 tonnes in total) for gravel, sand, mud and silt.

4.2.18 The Marine Licence granted for IS021 (DML2302) is valid for a period of 5 years, which includes an amount of disposal of 3,000 tonnes per year (i.e., potentially 15,000 tonnes in total) for gravel, sand, mud and silt.

4.2.19 The oceanographic features of these sites are presented in Figure 4-6 and can be summarised as:

- The tidal range ranges between 4.1 m and 1.9 m during spring and neap tides, respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated southwest to northeast with a tidal ellipse excursion comprised between 4 km and 5 km (Figure 4-4; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is, on average, 0.38 m/s and the neap peak flow at 0.19 m/s, with a residual current towards the northwest (Figure 4-4; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 85% of the data, however in extreme conditions the wave height can reach 4 m (Figure 4-4). The waves predominately originate from the northwest (65%) and the west (25%) (Figure 4-4; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 80% of the time, with a main direction from the southwest (25%) followed by south, west and northwest (14% ± 1% each) (Figure 4-6; MetOceanWorks, 2025).

[15] Disposal returns up to 2024 have been used to inform this review. Returns during 2025 were not available at the time of writing.

4.2.20 Owing to the position of Spending Harbour (IS016) disposal site within Aeron River mouth, the precise oceanographic features at this site, such as wave and tide, may be slightly different from those described above (paragraph 4.2.19). Furthermore, the presence of the new breakwater, north of Aeron River mouth (Figure 4-3), may influence the impact of wave and tide regime directed towards the south and southwest (Figure 4-4).

4.2.21 The net sediment transport is shown to be orientated northward at both ISO16 and IS021, explained by the coast being exposed to the waves coming from west (25%) and enhanced during flood tide orientated towards the northeast parallel to the coast (Royal Haskoning, 2011b; Figure 4-4). Recent video footage of Aberaeron Harbour entrance shows the development of a shingle bank composed of cobbles, sand and silt. Further investigations are required to understand the link, if any, to the presence of a new breakwater at the north of Aeron River which may provide a barrier to the northward sediment transport[16] (Figure 4-3).

4.2.22 The extensive coastal protections (i.e., series of groynes and large rock revetment) to both the south and north of the Aeron River have a large influence on sediment transport by limiting northwards sediment transport (Royal Haskoning, 2011b).

4.2.23 Based on the disposal sites' location, it is anticipated that disposed material remains in the near vicinity of the release location principally due to the breakwater presence. The disposed dredged material at IS016 may be influenced by river hydrodynamics during events of rainfall leading to a higher dispersal of disposed dredged sediment. The sediment disposed at IS016 and IS021 comes exclusively from Aberaeron Harbour and is therefore the same type of sediment as the disposal sites.

[16] The author would like to inform the reader that the information concerning the development of a shingle bank outside Aberaeron Harbour comes from recent observations from a local newspaper. This phenomenon has not been studied by either scientists, NGOs and/or government. The phenomenon could result from particular weather forecast (e.g., storms) and could dissipate in time.




Figure 4-3: An illustration showing the disposal sites located at Aberaeron (in red) with the direction of long-shore sediment transport (orange arrow) and position of sediment accretion (orange circle) (Base image taken from Ceredigion County Council website, 2025).

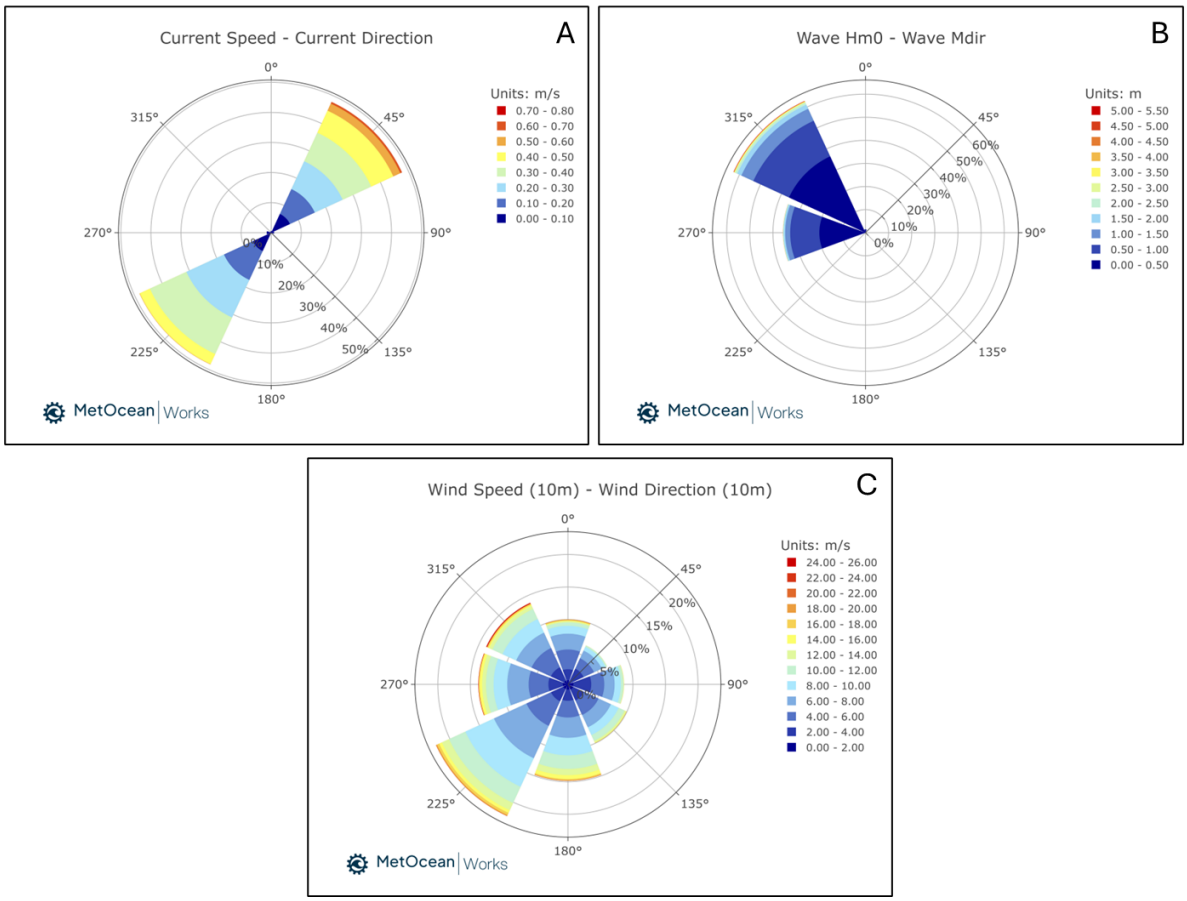



Figure 4-4: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) at New South Beach (IS021) and wind speed and direction (Panel C) at both New South Beach (IS021) and Spending Harbour (IS016) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.2.24 The tidal excursion ellipse is between 4 km and 5 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.2 (Appendix D).

4.2.25 IS016 and IS021 are located within the West Wales Marine SAC, which is designated for harbour porpoise (section D.2 in Appendix D). The density of this species is, approximately, 1.5 N/km$^2$ between April and September and 0 N/km$^2$ between October and March (Heinänen and Skov, 2015; Figure 4-4).

4.2.26 The geological features within Cardigan Bay SAC are found exclusively in the south of the disposal sites for sea caves and 2 km offshore for the closest subtidal sandbank (section D.2 in Appendix D).

4.2.27 Within Cardigan Bay SAC, two marine mammal species are designated features: bottlenose dolphins and grey seal (section D.2 in Appendix D). Bottlenose dolphins have been recorded all year round near the disposal sites in low numbers (i.e., 1 animal/km$^2$) except between January and March when no animal was recorded (Evan and Waggitt, 2023). Grey seals are found south of the disposal sites in remote areas which are inaccessible to humans and undisturbed (NRW, 2025a).

4.2.28 River and sea lamprey within Cardigan Bay SAC are mainly from the Aeron River (section D.2 in Appendix D). For both species, the period of migration upstream to spawning grounds occurs between spring and early summer, influenced by freshwater flows (NRW, 2025a).

4.2.29 Intertidal communities such as the honeycomb worm reef is present within Cardigan Bay SAC and is sensitive to both increase of SSC and the deposition of sediment (paragraphs 1.3.7 and 1.3.8; section D.2 in Appendix D).

4.2.30 Aberarth - Carreg Wylan SSSI covers a long coastal area of approximately 50 km (section D.2 in Appendix D). A passive plume resulting from disposed material (i.e., for fine sediment such as sand and mud/silt) could be expected to further disperse north of the disposal sites in the direction of the net (northwards) sediment transport. Within Aberarth - Carreg Wylan SSSI, several designated features are located above the HAT (i.e., maritime and wild thyme grassland and coastal heathland as well as associated invertebrates' species, and rare and uncommon plant species). Three bird species are designated features within the site: Kittiwake have been recorded between July and September only (more than 5 animal/km$^2$) (Evan and Waggitt, 2023); Lesser black-backed gull have not been recorded in the coastal area near IS016 and IS021; chough forage only on land (e.g., insects and larvae) (Evan and Waggitt, 2023; Cross *et al.*, 2023).

## Shell Lagoon, Llanbedr (IS018)

### Site characterisation

4.2.31 Shell Lagoon, Llanbedr (IS018) is located in Tremadog Bay, which is part of the larger Cardigan Bay, in front of Artro River mouth (Figure 4-5). This beneficial use site is associated with disposal of dredge material from Artro River. At the time of writing[17], only one disposal was registered of 4,000 tonnes in 2020 under the Marine licence DML 1961 concerning a dredged area within the Artro River located behind Shell Island (Figure 4-5).

4.2.32 The oceanographic features at this site are presented in Figure 4-6 and can be summarised as:

- The tidal range varies between 4.2 m and 1.9 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated southwest to northeast with a tidal ellipse excursion comprised between 4 km and 5 km (Figure 4-6; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.28 m/s and the neap peak flow at 0.14 m/s with a residual current towards the northwest (Figure 4-6; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 95% of the data, however in extreme condition wave height can reach 3 m (Figure 4-6; MetOceanWorks, 2025). The waves are mostly coming from the southwest (98%) (Figure 4-6; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 80% of the data, with a main direction from the southwest (26%) followed by south, west and northwest (13% ± 1% each) (Figure 4-6; MetOceanWorks, 2025).

4.2.33 This disposal site is located in a sheltered area, where waves are coming essentially from the southwest (98%) as the fetch[18] is not long enough in other directions (ABPmer, 2018; Figure 4-6). The net sediment transport shows a more complex pattern with sediment transport directed towards Artro Estuary with both influence of northward longshore drift along the Cardigan Bay coast and southward sediment drift due to waves refraction within Tremadog Bay (Royal Haskoning, 2011c).

4.2.34 At IS018, the marine licence was granted for the disposal of both silt and sand sized material (paragraph 4.2.31), which are classified as fine sediment. Consequently, the disposal of material would have potentially created a passive plume and dispersed further away from the disposal site. The tidal flow has been modelled to be low near the disposal site (paragraph 4.2.29), consequently the main factor affecting sediment transport at IS018 is the wave regime.

[17] Disposal returns up to 2024 have been used to inform this review. Returns during 2025 were not available at the time of writing.
[18] Fetch is defined as the uninterrupted distance over open water that wind blows in a single direction, acting as a critical factor in generating ocean waves.




Figure 4-5: A map showing Shell Lagoon, Llanbedr (IS018) location.

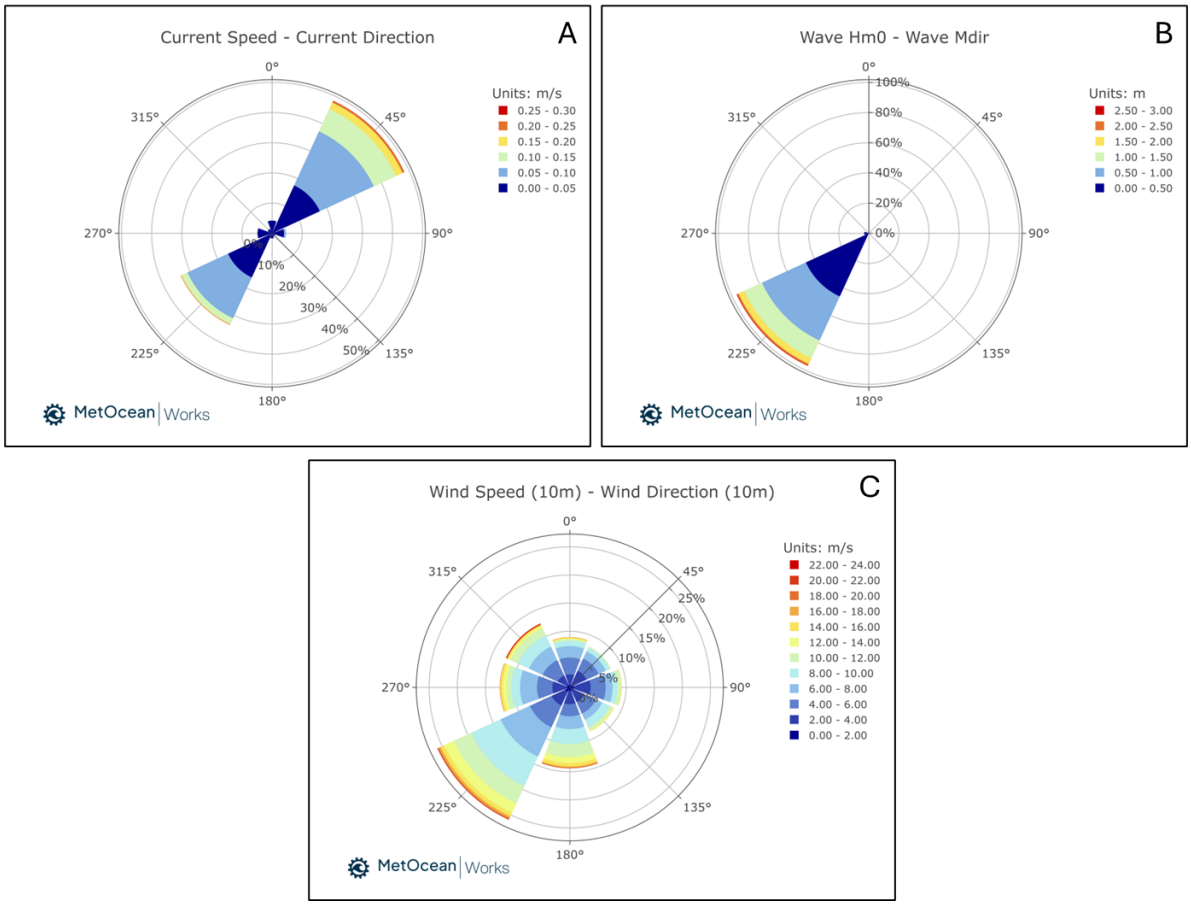



Figure 4-6: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Shell Lagoon, Llanbedr (IS018) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.2.35 The tidal excursion ellipse is between 4 km and 5 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.3 (Appendix D).

4.2.36 The designated feature dynamic sand dune system, and associated fauna and flora (e.g., Petalworth), is present in several designated sites (D.3 in Appendix D).

4.2.37 IS018 is located within Pen Llyn a'r Sarnau / Llŷn Peninsula and the Sarnau SAC (D.3 in Appendix D). Designated features such as sandbanks, coastal lagoon, submerged or partially submerged sea caves and mudflats and sandflats not covered by seawater at low tide are located more than the tidal ellipse excursion of 5 km from the disposal site (D.3 in Appendix D).

4.2.38 At its closest to IS018 (i.e., 0.4 km west), Northern Cardigan Bay SPA shows a density distribution of Red-Throated Diver estimated between 0.6 and 0.8 birds/km$^2$ (O'Brien *et al.*, 2015; D.3 in Appendix D).

4.2.39 The two bathing waters are located northeast of the disposal site, however Harlech bathing water is distant by 3.7 km, whereas Llandawyg bathing water is closer (0.5 km.

## Traeth Crugan 1 (IS023) and Traeth Crugan 2 (IS024)

### Site characterisation

4.2.40 Traeth Crugan 1 (IS023) and Traeth Crugan 2 (IS024) are located intertidally in the north of Tremadog Bay, which is part of Cardigan Bay, along the south coast of the Llyn Peninsula near Pwllelhi (Figure 4-13). Both beneficial use sites are associated with the disposal of dredge material from the mouth of Pwllheli Harbour. At the time of writing[19], no disposed material was registered at both IS023 and IS024.

4.2.41 The Marine Licence granted for both IS023 and IS024 (DEML2502) is valid for a period of 10 years, which includes a total amount of disposal of 43,000 tonnes for gravel and sand.

4.2.42 The oceanographic features of these sites are presented in Figure 4-14 and can be summarised as:

- The tidal range varies between 4.2 m and 1.9 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated west to east with a tidal ellipse excursion comprised between 4 km and 5 km (Figure 4-14; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.26 m/s and the neap peak flow at 0.13 m/s with a residual current towards the east (Figure 4-14; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 95% of the data, however in extreme condition wave height can reach 2.5 m (Figure 4-14; MetOceanWorks, 2025). The waves are mostly coming from the south (50%) followed by southeast (35%) (Figure 4-14; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 77% of the data, with a main direction from the southwest (26%) followed by south (16%) (Figure 4-14; MetOceanWorks, 2025).

4.2.43 These disposal sites are exposed to waves coming from the south due to the headland, located approximately 8 km southwest, blocking the waves coming from the southwest (Figure 4-14; Figure 4-15; Royal Haskoning, 2011d). The net sediment transport along the shore is directed towards the east (Figure 4-15; Royal Haskoning, 2011d), which is due to area complex interaction between wave and tidal regime (paragraph 4.2.42; MetOceanWorks, 2025). The predominant sediment transport towards the east along the coast leads to an 'accretion phenomenon' at Carreg yr Imbill, which is supported by Lidar data showing an increase of beach width and elevation (i.e., from 4 m to 10 m) towards the east (Figure 4-15; Royal Haskoning, 2011d).

[19] Note that disposal returns up to 2024 have been used to inform this review. Returns during 2025 were not available at the time of this review.

4.2.44 The disposal of dredged material is expected to travel east along the coast. In the long-term, the sediment dispersal from the disposal sites has the potential to contribute to the 'accretion phenomenon' occurring at Carreg yr Imbill (i.e., 2.3 km and 3 km east of IS023 and IS024 respectively), especially if the coarse sediments (i.e., gravel and coarse sand) are resuspended during storm events (Figure 4-15).

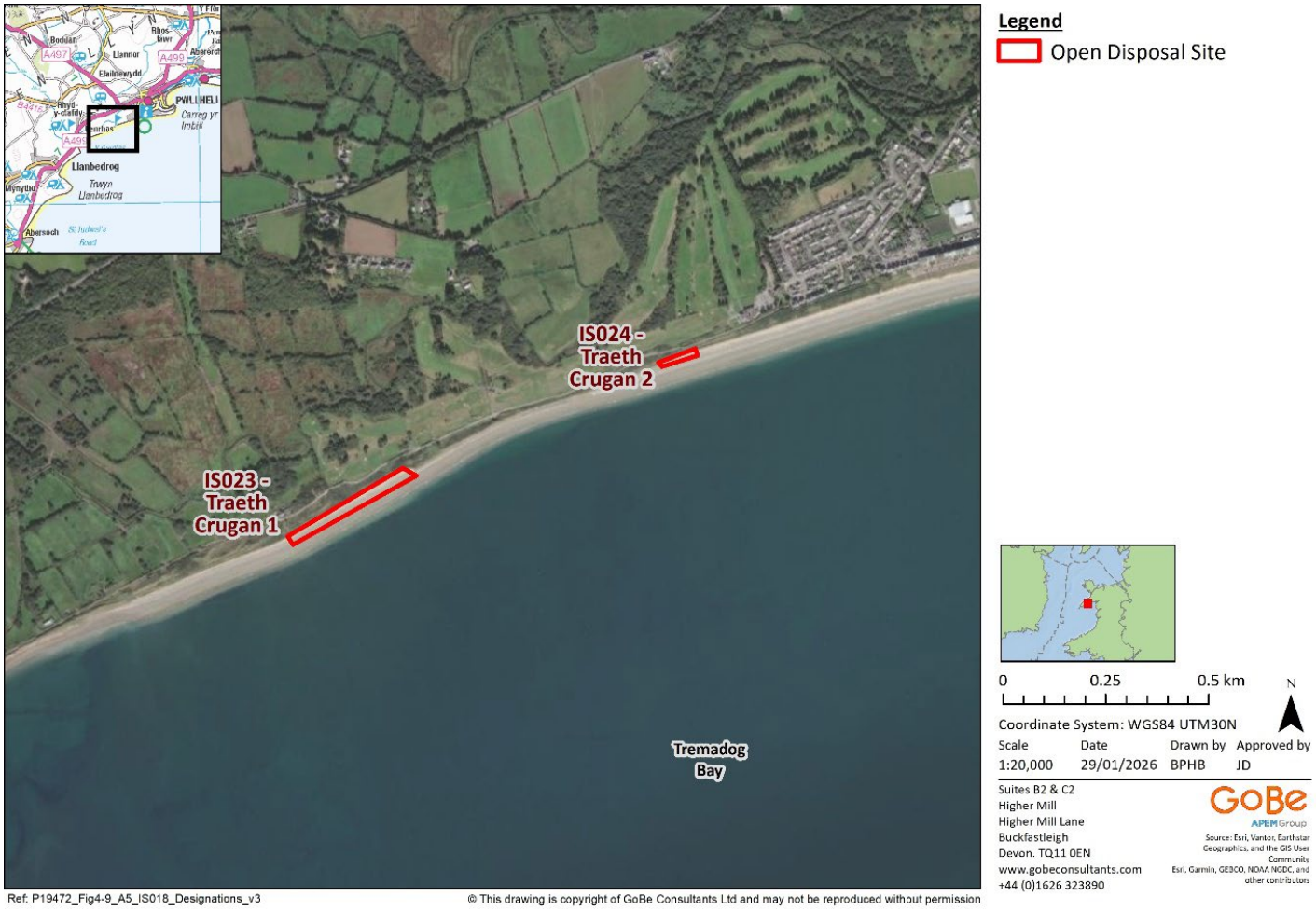



Figure 4-7: Map showing Traeth Crugan 1 (IS023) and Traeth Crugan 2 (IS024) locations.

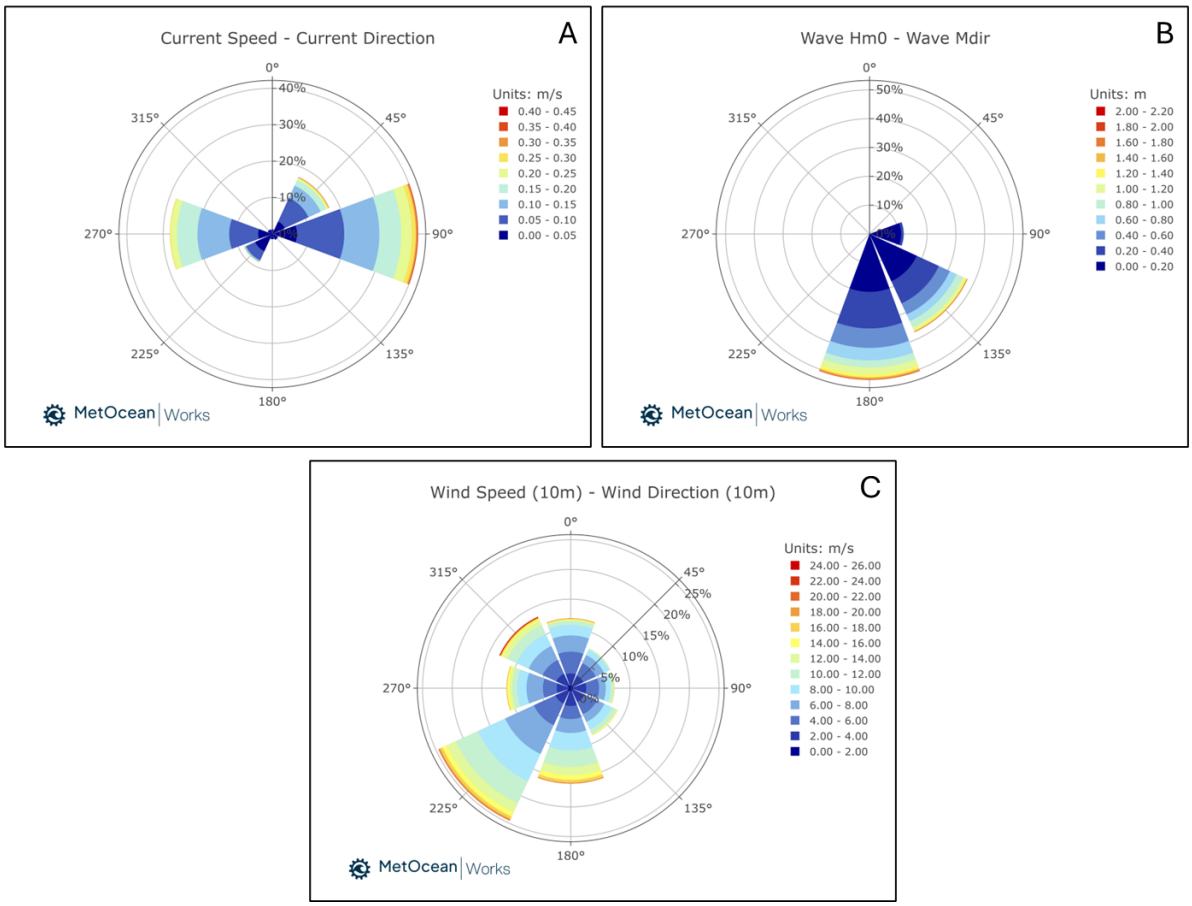



Figure 4-8: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Traeth Crugan 1 (IS023) and Traeth Crugan 2 (IS024) (MetOceanWorks, 2025).

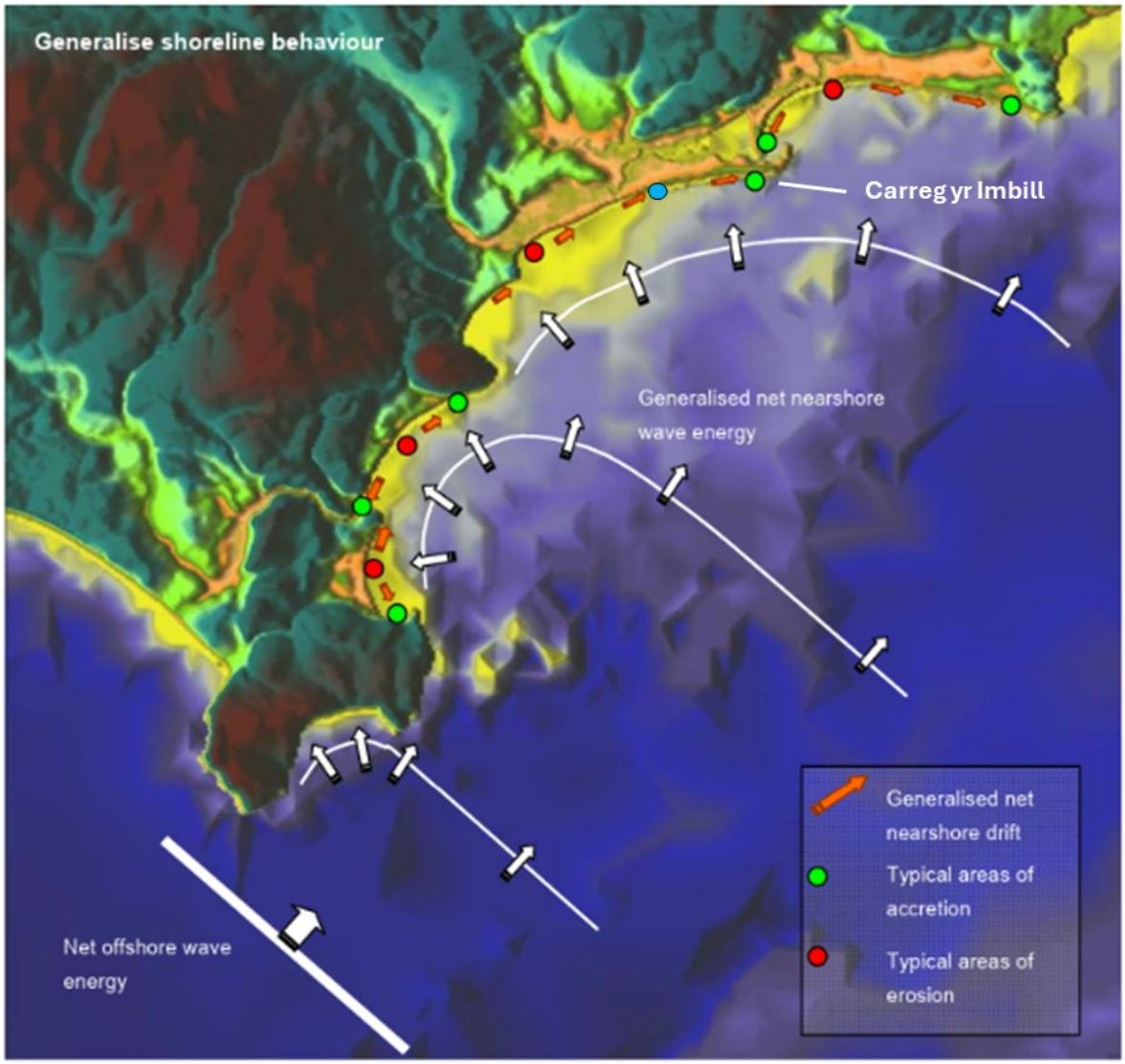



Figure 4-9: Illustration showing the net sediment transport along the south coast of the Llyn Peninsula with the disposal sites location (blue dot) (From Royal Haskoning, 2011d).

## Potentially sensitive receptors

4.2.45 The tidal excursion ellipse is between 4 km and 5 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.4 (Appendix D).

4.2.46 IS023 and IS024 are located within Pen Llyn a'r Sarnau / Llŷn Peninsula and the Sarnau SAC (section D.4 in Appendix D). Intertidal reefs are located 0.5 km west from the disposal site, whereas designated features such as sandbanks, coastal lagoon, submerged or partially submerged sea caves and mudflats and sandflats not covered by seawater at low tide are located more than the tidal ellipse excursion of 5 km from the disposal site (section D.4 in Appendix D).

4.2.47 IS023 and IS024 are located within Mynydd Tir y Cwmwd a'r Glannau at Garreg yr Imbill SSSI (section D.4 in Appendix D). The dispersal of sediment is expected towards the east of the disposal sites; there are no caves and overhangs present in this area as they are all located to the extreme west of the designated site near Mynydd Tir-y-Cwmwd (section D.4 in Appendix D).

4.2.48 The sediment disposed at IS023 and IS024 is composed of gravel and sand which is expected to limit the passive plume associated with the disposal activity. However, if a passive plume were to disperse from the disposal sites, it would be expected to disperse towards Pwllheli bathing water and Glan Don Beach bathing water (section D.4 in Appendix D).

## Dolau Beach (IS014), Cei Bach Beach A (IS019) and Cei Bach Beach B (IS022)

### Site characterisation

4.2.49 The three disposal sites, Dolau Beach (IS014), Cei Bach Beach A (IS019) and Cei Bach Beach B (IS022), are located intertidally in the south of Cardigan Bay (Figure 4-18). IS014 is located directly in the north of New Quay Pier, whereas IS019 and IS022 are found on the beach facing New Quay Bay (Figure 4-18).

4.2.50 These three beneficial use sites are associated with the disposal of dredge material from New Quay Harbour. At the time of writing[20], no disposed material was registered at both IS029 and IS024, whereas IS014 received 4,990 tonnes of disposed dredged material in 2022 only. Disposal of dredge material has likely occurred in 2024 as a marine licence (DML2301) was granted in August 2023 for Cei Bach beach nourishment operations.

4.2.51 The Marine Licence granted for both IS019 and IS022 (DML2301) is valid for a period of 2 years, which includes a total amount of disposal of 32,000 tonnes (i.e., 16,000 tonnes per year) for sand.

4.2.52 The oceanographic features at these sites are presented in Figure 4-19 and can be summarised as follow:

- The tidal range varies between 4.1 m and 1.9 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated northwest to southeast with a tidal ellipse excursion comprised between 6 km and 7 km (Figure 4-19; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.4 m/s and the neap peak flow at 0.2 m/s with a residual current towards the southeast (Figure 4-19; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 90% of the data, however in extreme condition wave height can reach 4.5 m (Figure 4-19; MetOceanWorks, 2025). The waves are mostly coming from the northwest (55%) followed by west (27%) (Figure 4-19; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 80% of the data, with a main direction from the southwest (26%) followed by south (15%) (Figure 4-19; MetOceanWorks, 2025).

4.2.53 Owing to the complexity of the coast (headlands, harbour pier and shallow bay), the local hydrodynamics at the New Quay Bay scale may be slightly different from these broad characteristics. It has been suggested that a tidal gyre exists within New Quay Harbour (Royal Haskoning, 2011e), which is not represented by the hindcast model and at this date no survey or record exist to represent this hydrodynamic phenomenon accurately.

[20] Disposal returns up to 2024 have been used to inform this review. Returns during 2025 were not available at the time of writing.

4.2.54 The three disposal sites are relatively sheltered from the dominant south-westerly offshore wave climate (Royal Haskoning, 2011e; MetOceanWorks, 2025). New Quay Head, west of IS014, induces stronger tidal currents reinforcing the sediment transport towards the east and southeast. Since the construction of the pier, New Quay Harbour acts as an area of accretion which is reinforced by a tidal gyre, leading sediment to move locally westerly (Royal Haskoning, 2011e). At IS019 and IS022, the net transport of sediment is towards the northeast along the coast (Royal Haskoning, 2011e). To summarise, New Quay Bay is close to an equilibrium regarding net sediment transport, with its west part showing accretion and east part showing erosion.

4.2.55 Based on the information provided in paragraph 4.2.54, the disposed material at IS014 could theoretically be transported into the New Quay Harbour (i.e., due to the net sediment transport towards the east). If the net sediment transport within New Quay Bay is close to equilibrium, any disposal of dredged material will remain at the disposal sites, IS019 and IS022, or nearby, in the long-term, except during storm events when wind from the south and southwest may transport sediment north and northeast.




Figure 4-10: Map showing the location of Dolau Beach (IS014), Cei Bach Beach A (IS019) and Cei Bach Beach B (IS022).

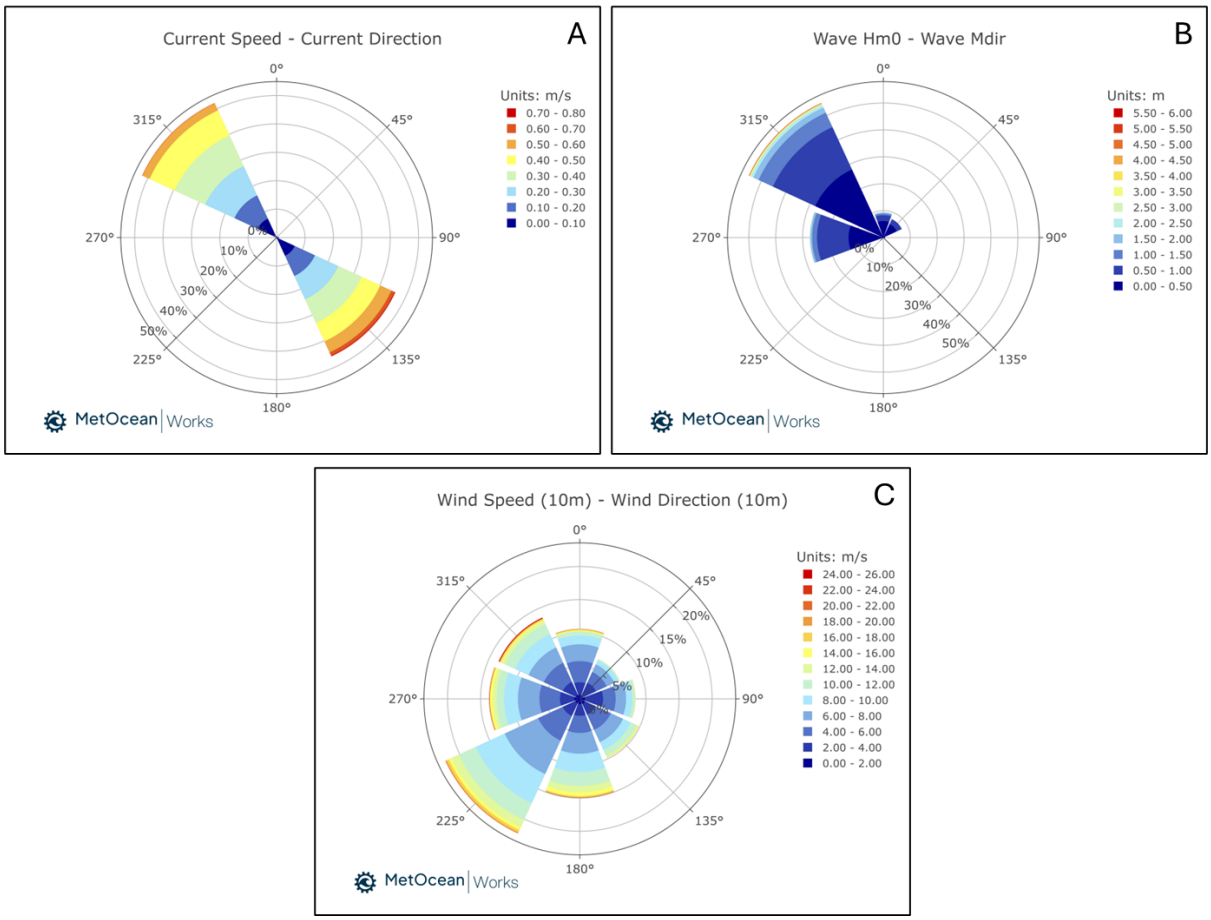



Figure 4-11: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Dolau Beach (IS014), Cei Bach Beach A (IS019) and Cei Bach Beach B (IS022) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.2.56 The tidal excursion ellipse is between 6 km and 7 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.5 (Appendix D).

4.2.57 Owing to the net sediment transport eastward (paragraph 4.2.54), dispersal of disposed dredged sediment to the west where several designated features can be found is unlikely (section D.5 in Appendix D). Based on the ability of New Quay Bay to act as a sink, and the impact on waves leading to transport sediment towards the coast and northeast, any sediment plume is not expected to disperse offshore.

4.2.58 Eastward from the disposal site, the closest sea cave and intertidal reef, both designated features within Cardigan Bay SAC, are located approximately 4.3 km and 3.5 km respectively (section D.5 in Appendix D).

4.2.59 Within Cardigan Bay SAC, two marine mammal species are designated features: bottlenose dolphins and grey seal (section D.5 in Appendix D). Bottlenose dolphins have been recorded all year near the disposal sites in low numbers (i.e., > 1 animal/km$^2$) except between January and March when no animal was recorded (Evan and Waggitt, 2023). Grey seals are found near the disposal sites in remote areas inaccessible to humans and undisturbed (NRW, 2025a).

4.2.60 River and sea lampreys within Cardigan Bay SAC come mainly from the Aeron and Teifi Rivers, which are located approximately 7 km north and 25 km south respectively. River lampreys remain close to their river during their marine residency phase, whereas sea lampreys can travel far (i.e., several km) from their river during their marine phase (NRW, 2025a).

4.2.61 The disposal sites are located within the West Wales Marine SAC which is designated for harbour porpoise (section D.5 in Appendix D). Heinänen and Skov (2015) showed that the density of this species is high all year along, between 2 N/km$^2$ and 3 N/km$^2$ (section D.5 in Appendix D).

4.2.62 Within Aberath - Carreg Wylan SSSI, several designated features are located above the Highest Astronomical Tide (HAT) such as maritime and wild thyme grassland and coastal heathland as well as associated invertebrates' species, and rare and uncommon plant species.

4.2.63 Within Aberath - Carreg Wylan SSSI, there are three designated bird species (Ortega *et al.*, 2020; section D.5 in Appendix D):

- Kittiwake have been recorded between July and September only (more than 5 animal/km$^2$) (Evan and Waggitt, 2023);
- Lesser black-backed gull was not observed in the coastal area near IS014, IS019 and IS022; and
- Chough forage only on land (e.g., insects and larvae) (Evan and Waggitt, 2023; Cross *et al.*, 2023).

4.2.64 The disposal sites IS014, IS019 and IS022 are close (i.e., less than 1 km) to three designated bathing waters (section D.5 in Appendix D). Traeth Gwyn New Quay bathing water is located between IS019 and IS022, whereas New Quay North bathing water is located within IS014 (section D.5 in Appendix D).

## 4.3 Disposal sites with modelled sediment dispersal

4.3.1 The following sections present an overview of the remaining open sites not previously presented, in addition to the respective sediment dispersal modelling results. For a summary of these results, please refer to Table 5-1 of this report.

4.3.2 The numerical model methodology (i.e., the type and quantity of material) for each modelled site is developed in detail in Appendix E.

### New Quay Track (IS015)

#### Site characterisation

4.3.3 New Quay Track (IS015) is located in the south of Cardigan Bay less than 50 m from the coast (Figure 4-22). This disposal site was licenced solely for the disposal of small volumes of fish waste (i.e., clean shellfish shells). Disposal returns were observed between 2013 and 2017, with 609 tonnes per year on average, however a decrease in disposal volume is observed from 927 tonnes in 2013 to 165 tonnes in 2017 (Figure 4-23). Fish waste is no longer deposited in Welsh waters, and no disposal return has been observed since 2017; the status of New Quay Track (IS015) is however maintained as open.

4.3.4 The oceanographic features at this site are presented in Figure 4-24 and can be summarised as follow:

- The tidal range varies between 4.1 m and 1.9 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated northwest to southeast with a tidal ellipse excursion comprised between 6 km and 7 km (Figure 4-24; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.3 m/s and the neap peak flow at 0.12 m/s with a residual current towards the southeast (Figure 4-24; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 94% of the data, however in extreme condition wave height can reach 4.6 m (Figure 4-24; MetOceanWorks, 2025). The waves are mostly coming from the northwest (57%) followed by west (27%) (Figure 4-24; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 80% of the data, with a main direction from the southwest (24%) followed by south (15%) (Figure 4-24; MetOceanWorks, 2025).




Figure 4-12: Map showing the New Quay Track (IS015) location.

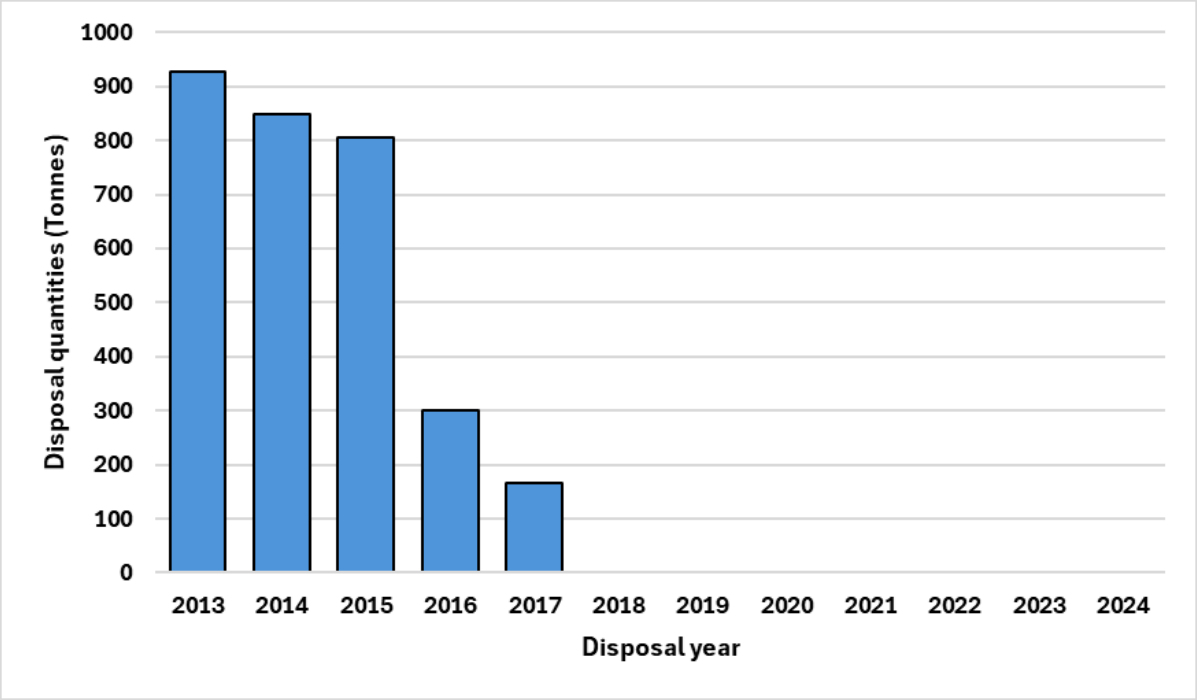



Figure 4-13: Bar graph representing the annual disposal quantities (tonnes) at New Quay Track (IS015) between 2013 and 2017.

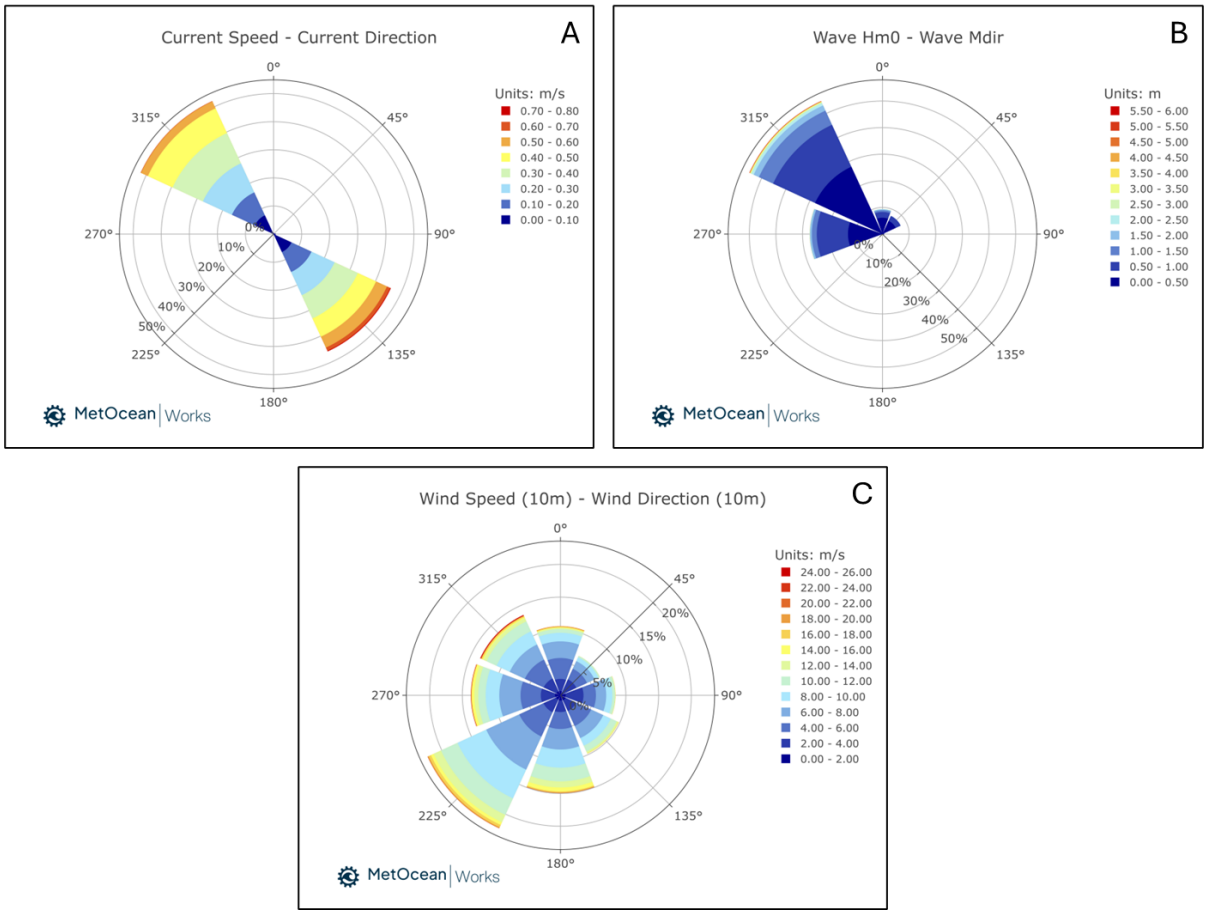



Figure 4-14: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at New Quay Track (IS015) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.5 The tidal excursion ellipse is between 6 km and 7 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.6 (Appendix D).

## Modelling results

4.3.6 IS015 was first licenced for the disposal of fish waste which is no longer deposited in Welsh waters. Consequently, the dispersal of disposed material within the numerical model was carried out for sand (33%), silt (33%) and clay (33%). The total volume simulated corresponds to 950 $m^3$ (equivalent to 900 tonnes). Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 758 mm.

4.3.7 The modelling results simulated at New Quay Track (IS015) can be summarised as follow:

- The sediment plume is shown to fully disperse after 11.2 days and 5.1 days when the deposition of dredged material occurs in summer and winter, respectively (Figure 4-15);

- The maximum SSC is observed to reach a value exceeding 250 mg/l after five days in summer and directly after deposition in winter. The maximum SSC is observed directly at the disposal location (Figure 4-15);
- The bed thickness increased by 0.12 m and reached background levels after 15 days in summer, whereas in winter results showed an increase of 0.05 m with return to background levels within 10 days (Figure 4-15);
- The sediment plume disperses no further than 4 km east and 6 km west during winter. During the summer months, the sediment plume is retained within a distance of 3 km and and 7 km to the east and west, respectively (data not shown);
- The sediment plume extends to a maximum of approximately 2 km offshore for both simulations during summer and winter; and
- No sediment retention of disposed dredged material is observed at New Quay Track (IS015).

4.3.8 The sediment plume disperses faster in winter due to the coupled action of tidal and wave regimes. The maximum SSC observed five days after deposition during the summer months is the consequence of wave action (significant wave height ($H_s$) of 2 m) leading to sediment re-suspension (Figure 4-15). Finally, the dispersal of the sediment plume in the winter is restricted in a westerly direction as a consequence of the waves predominately originating from the southwest (paragraph 4.3.4).

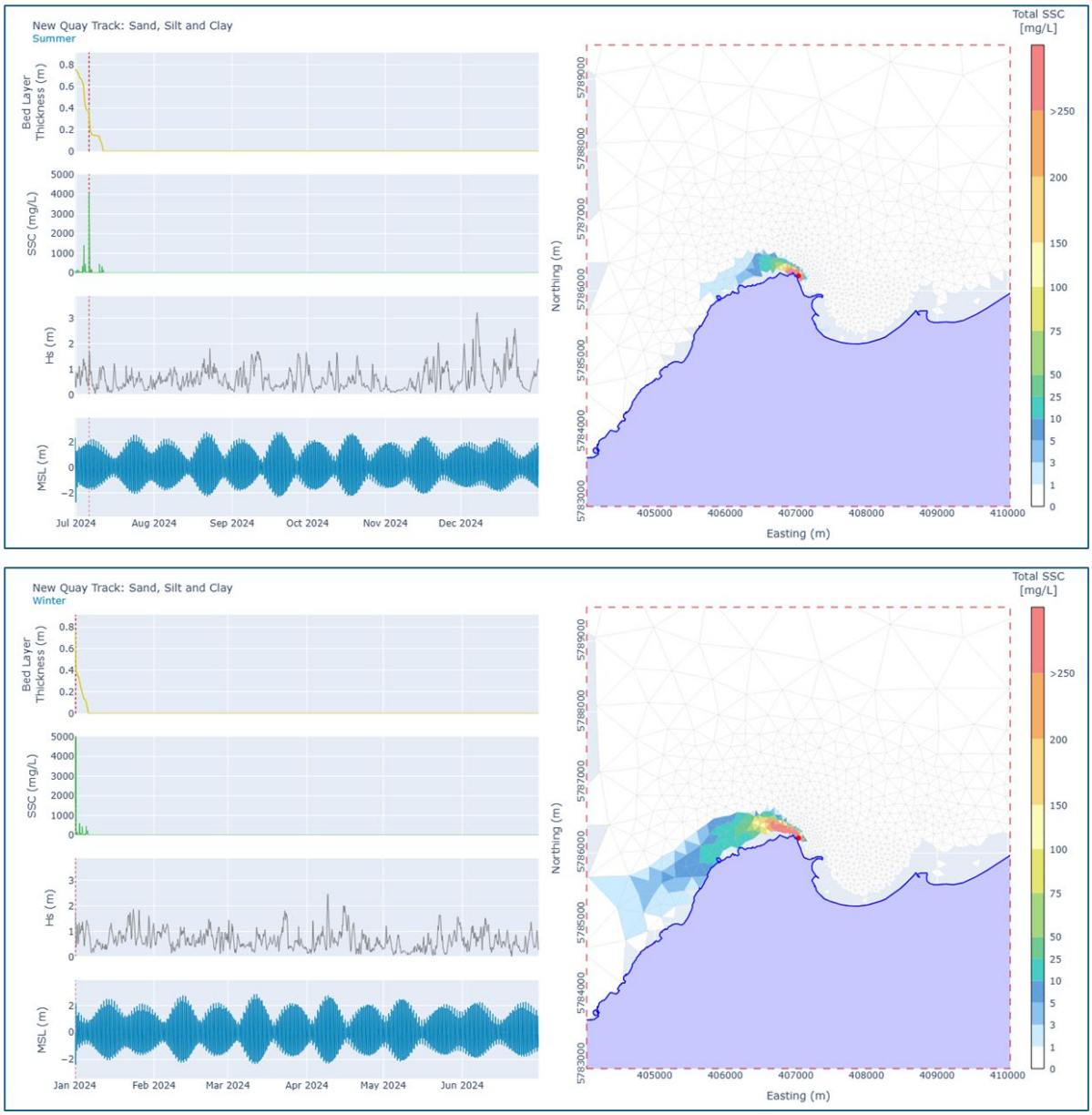



Figure 4-15: Illustration showing the maximum SSC simulated at New Quay Track (IS015) when disposed dredged material is released in summer (top panel) and winter (bottom panel).

## Deganwy Beneficial Use (IS035)

### Site characterisation

4.3.9 Deganwy (IS035) is located near the mouth of Conwy River in North Wales (Figure 4-16). This beneficial use site is associated with the maintenance dredging of the nearby marina (e.g., Deganwy Marina). Disposal returns have occurred since 2009; however, the disposal of dredge material does not occur annually (Figure 4-17). Since 2009, the average disposal returns are 3,684 tonnes, however the average of disposed dredged material for the year with disposal returns observed (i.e., nine out of 16 years) is 6,550 tonnes per year (Figure 4-17).

4.3.10 The Marine Licence DML 2301 was granted in 2023 for a period of 10 years and includes a total amount of disposal of 70,000 tonnes (i.e., 7,000 tonnes per year) for sand and silt.

4.3.11 The oceanographic features at this site are presented in Figure 4-18 and can be summarised as:

- The tidal range varies between 6.2 m and 3.6 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated north to south, with a tidal ellipse excursion between 5 km and 6 km (Figure 4-18; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.57 m/s and the neap peak flow at 0.31 m/s with a residual current towards the south (Figure 4-18; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 98% of the data, however in extreme condition wave height can reach 2.36 m (Figure 4-18; MetOceanWorks, 2025). The waves are mostly coming from the northwest (81%) followed by north (12%) (Figure 4-18; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 83% of the data, with a main direction from the southwest (28%) followed by west (15%) (Figure 4-18; MetOceanWorks, 2025).




Figure 4-16: Map showing the Deganwy Beneficial Use (IS035) location.

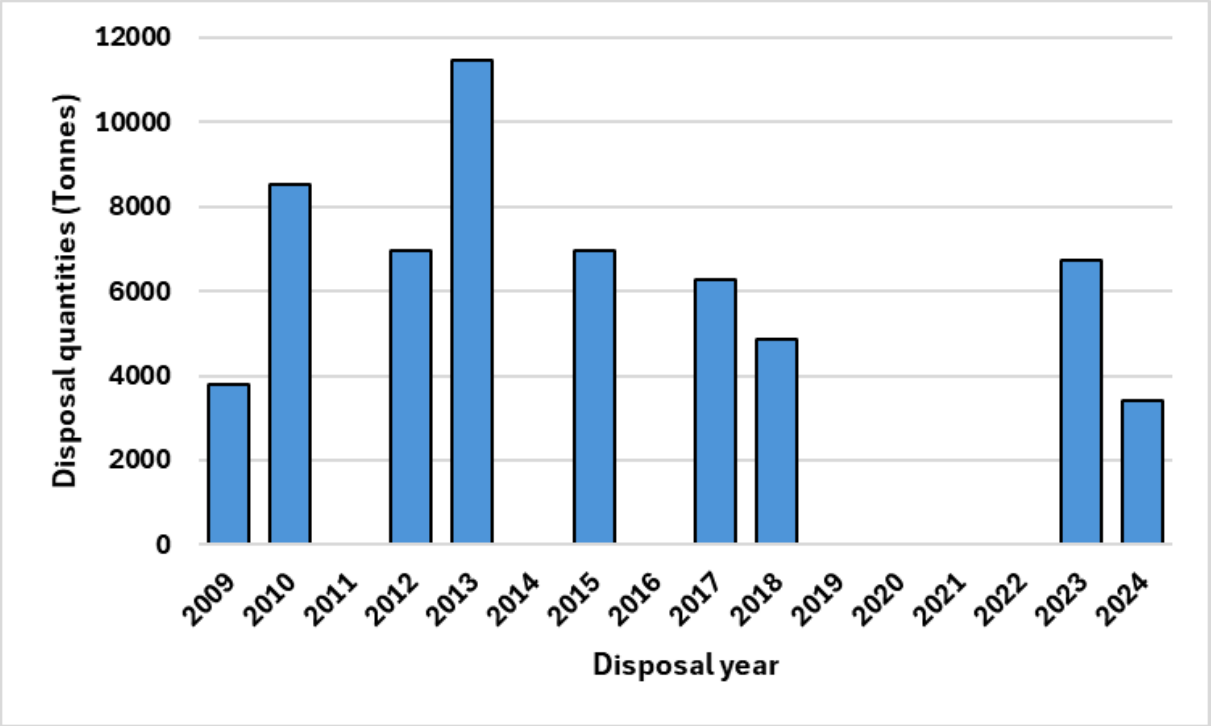



Figure 4-17: Bar graph representing the annual disposal quantities (tonnes) at Deganwy Beneficial Use (IS035) between 2009 and 2024.

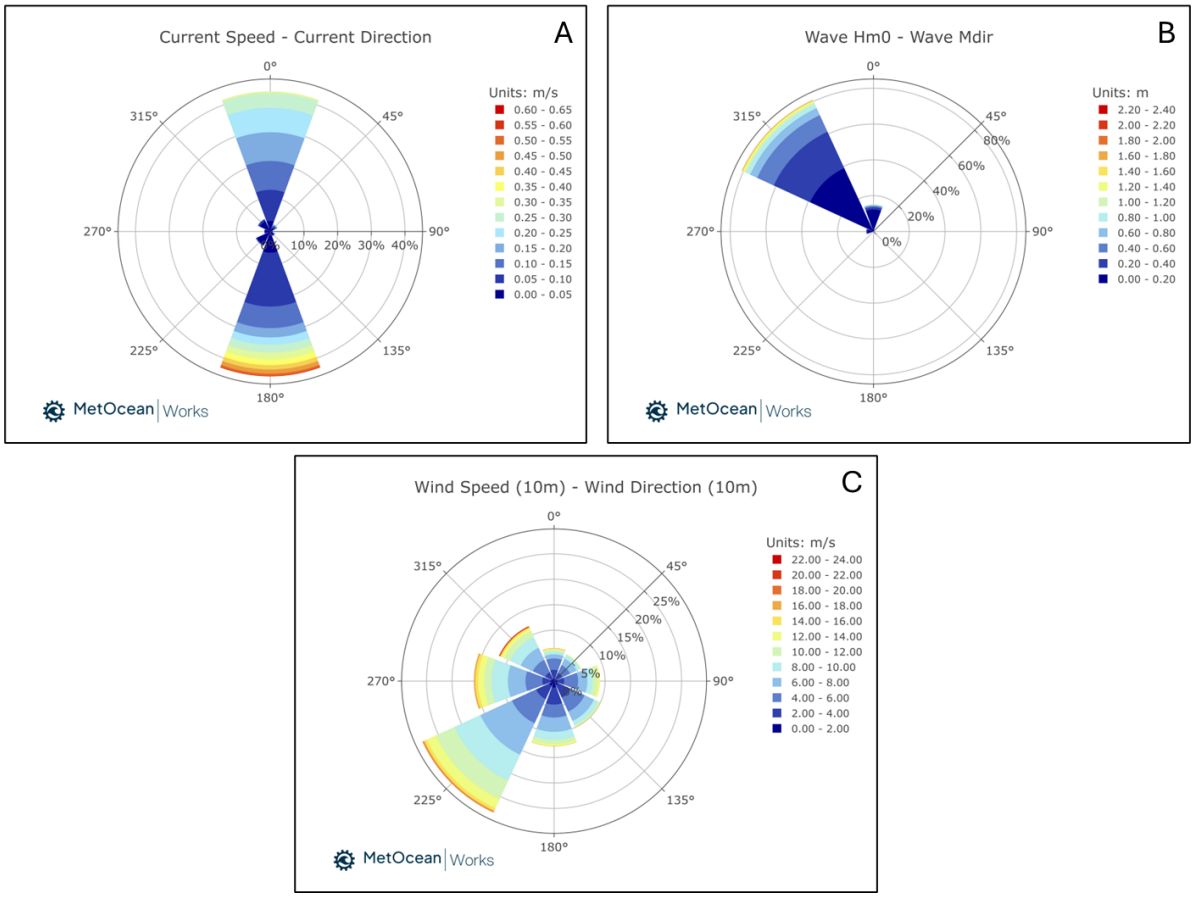



Figure 4-18: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Deganwy Beneficial Use (IS035) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.12 The tidal excursion ellipse is between 5 km and 6 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.7 (Appendix D).

## Modelling results

4.3.13 The dispersal of disposed material was carried out for sand (50%) and silt (50%). The total volume simulated corresponds to 630 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 2000 mm.

4.3.14 The modelling results for Deganwy Beneficial Use (IS035) show that:

- The sediment plume does not fully disperse after six months (i.e., approximately 90% of placed sediment) for releases during both summer and winter simulations (Figure 4-19);
- The bed thickness increased to a maximum of 0.32 m for both summer and winter simulations (Figure 4-19);
- SSC is predicted to reach a maximum value of:

- 25 mg/L after 157 days in summer (Figure 4-19);
- 10 mg/L after 145 days in winter (Figure 4-19);

- The sediment plume is shown to disperse to a maximum of 2 km and 3 km downstream for simulations in winter and summer respectively, whereas the sediment plume is shown to travel 15 km upstream for both winter and summer simulations (data not shown);
- The sediment plume extends to a maximum of, approximately, 3 km and 5 km to the west along the coast for simulations during winter and summer, respectively (data not shown); and
- Deganwy Beneficial Use (IS035) shows a retention of disposed dredged material of 90.5% ± 1.5% for both winter and summer simulations.

4.3.15 At the end of the simulations approximately 90% of sediment placed on the bed is predicted to be retained within the site for winter and summer placement, respectively. This is equivalent to an erosion of approximately 1 mm per day. However, it is important to mention that the predicted sediment retention in the model is likely to be sensitive to the assumed water depths in the River Conwy (see limitation of the numerical model in Appendix E).

4.3.16 The SSC variation is highly correlated with $H_s$ during both winter and summer simulations (Figure 4-19). The sediment plume extending 15 km upstream can be explained by the combined influence of both the tidal residual current towards the south and the predominant wave direction being from the northwest (paragraph 4.3.11 and Figure 4-18). Further, waves from the northwest are more frequent during winter than summer, which explains why the sediment travel less downstream in winter (2 km) than summer (3 km).

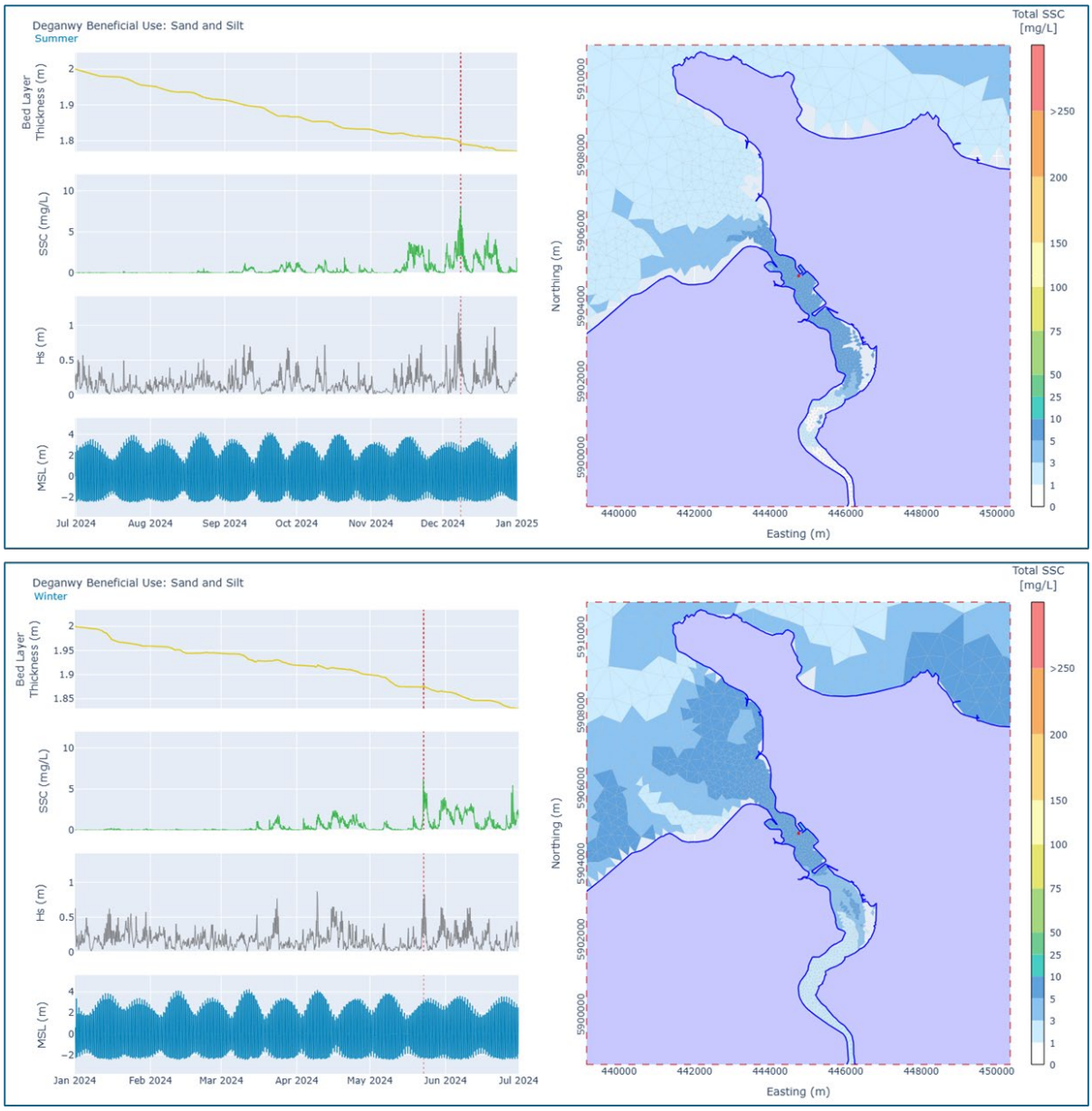



Figure 4-19: Illustration to represent the maximum SSC simulated at Deganwy Beneficial Use (IS035) when disposed dredged material is released in summer (top panel) and winter (bottom panel).

## Conwy Beneficial Use (IS065 and IS066)

### Site characterisation

4.3.17 The Conwy Beneficial Use (IS065 and IS066) disposal sites are located near the mouth of Conwy River in North Wales (Figure 4-20). These two disposal sites are presented together as they are close to each other (i.e., approximately 30 m), meaning that the dispersal of disposed dredged material is expected to be similar.

4.3.18 These beneficial use sites are associated with the maintenance dredging of the nearby marina (e.g., Conwy Marina and Deganwy Marina). To date, no disposal returns were observed at Conwy Beneficial Use (IS066). It is important to mention that disposal of dredge material is likely to occur post 2024 at IS066 as a marine licence (DML1833) has been granted for harbour maintenance dredging disposal. Between 2009 and 2024, IS065 received 298,867 tonnes with annual averages of 21,348 tonnes (Figure 4-21). The disposal returns varied between the years with a maximum of 39,537 tonnes in 2016 and a minimum of 4,572 tonnes in 2024 (Figure 4-21). No disposal return was observed in 2011 and 2013 at IS065 (Figure 4-21).

4.3.19 The Marine Licence DML 1833 was granted in 2021 for a period of 6 years., which includes a total amount of disposal of 168,000 tonnes (i.e., 28,000 tonnes per year) for sand (10%) and silt (90%).

4.3.20 The oceanographic features at these sites are presented in Figure 4-22 and can be summarised as:

- The tidal range varies between 6.2 m and 3.6 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated north to south (Figure 4-22; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.69 m/s and the neap peak flow at 0.36 m/s with a residual current towards the south (Figure 4-22; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 99% of the data, however in extreme condition wave height can reach 2.4 m (Figure 4-22; MetOceanWorks, 2025). The waves are mostly coming from the northwest (82%) followed by north (15%) (Figure 4-22; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 82% of the data, with a main direction from the southwest (28%) followed by west (15%) (Figure 4-22; MetOceanWorks, 2025).




Figure 4-20: Map of the Conwy Beneficial Use (IS065 and IS066) locations.

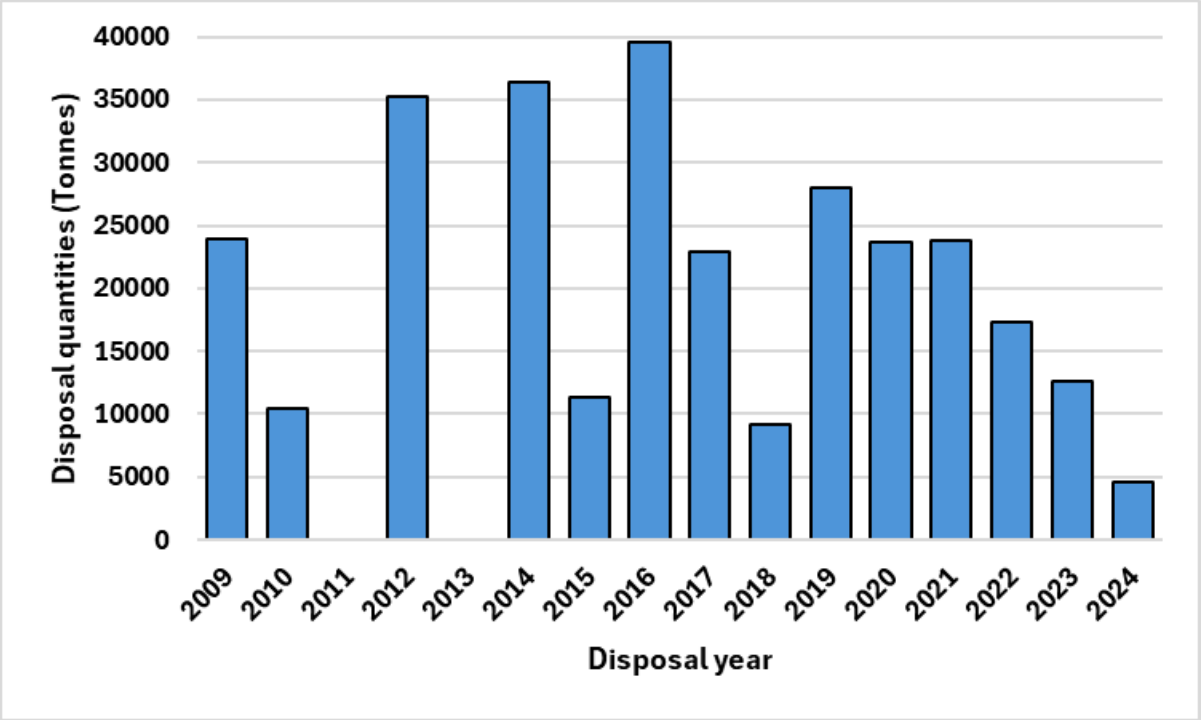



Figure 4-21: Bar graph representing the annual disposal quantities (tonnes) at Conwy Beneficial Use (IS065) between 2009 and 2024.

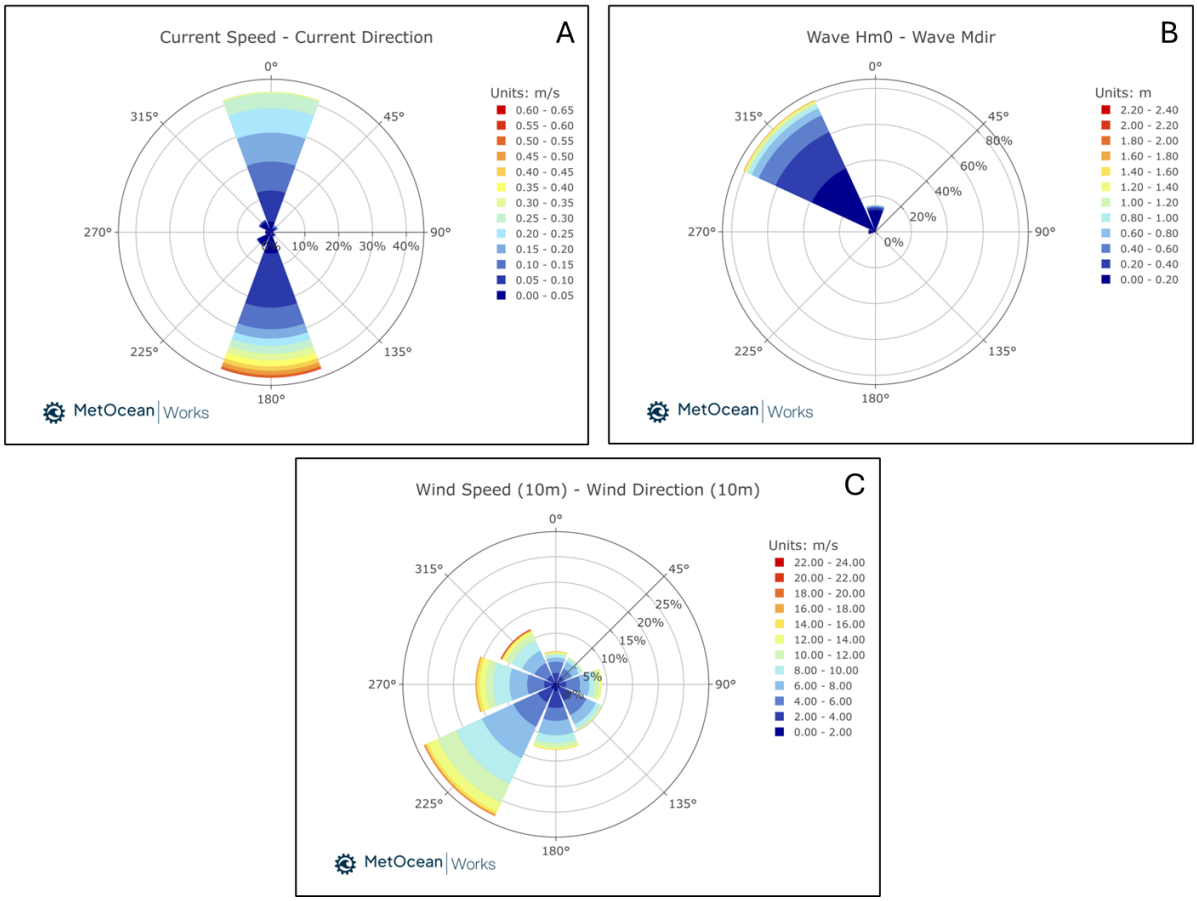



Figure 4-22: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Conwy Beneficial Use (IS065 and IS066) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.21 The tidal excursion ellipse is between 5 km and 6 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.9 (Appendix D).

## Modelling results

4.3.22 At IS066, the dispersal of disposed material was carried out for sand (50%) and silt (50%). The total volume simulated corresponds to 630 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 2000 mm.

4.3.23 At IS065, the dispersal of disposed material was carried out for sand (33%), silt (33%) and clay (33%). The total volume simulated corresponds to 630 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 2000 mm.

4.3.24 The modelling results simulated at Conwy Beneficial Use (IS066) can be summarised as:

- The sediment plume does not fully disperse after six months for both simulations when disposed dredged material is released in summer and winter (Figure 4-23);
- The bed thickness increased to a maximum of 0.32 m for both summer and winter simulations (Figure 4-23);
- The maximum SSC is predicted to reach values comprised between 5 mg/L and 10 mg/L after 155 days in summer (Figure 4-23);
- The maximum SSC is predicted to reach values comprised between 3 mg/L and 5 mg/L after 157 days in winter (Figure 4-23);
- The sediment plume disperses to a maximum of 5 km and 15 km downstream and upstream, respectively for both simulations during summer and winter (data not shown);
- The sediment plume extends to a maximum of, approximately, 7 km west along the coast for both simulations during summer and winter (data not shown); and
- Conwy Beneficial Use (IS066) shows a retention of disposed dredged material of 80% for both summer and winter simulations.

4.3.25 The modelling results simulated at Conwy Beneficial Use (IS065) can be summarised as follow:

- The sediment plume is shown to not fully disperse after 6 months for both simulations when disposed dredged material are released in winter and summer (Figure 4-24);
- The bed thickness increased to a maximum of 0.24 m for both summer and winter simulations (Figure 4-24);
- The maximum SSC is observed to reach values comprised between 3 mg/L and 5 mg/L after 159 days in summer (Figure 4-24);
- The maximum SSC is observed to reach values comprised between 1 mg/L and 3 mg/L after 141 days in winter (Figure 4-24);
- The sediment plume is shown to disperse to a maximum of 5 km and 15 km downstream and upstream respectively for both simulations during winter and summer (data not shown);
- The sediment plume extends to a maximum of approximately 4 km west along the coast for both simulations during winter and summer (data not shown); and
- Conwy Beneficial Use (IS065) shows a retention of 82% for both winter summer simulations.

4.3.26 The numerical modelling indicates that Conwy Beneficial Use (IS065) retains more sediment (approximately 80% equivalent to an erosion of 2 mm per day) than Conwy Beneficial Use (IS066) (approximately 65% equivalent to an erosion of 3.6 mm per day), which is explained by the relative location of the disposal sites (Figure 4-20). Indeed, Conwy Beneficial Use (IS065) is more sheltered from the wave regime than Conwy Beneficial Use (IS066). However, it is important to mention that the predicted sediment retention in the model is likely to be sensitive to the assumed water depths in the River Conwy (see limitation of the numerical model in Appendix E).

4.3.27 For both disposal sites, modelling results show that the increase of SSC is often correlated with a $H_s$ exceeding 0.5 m. Of note however is that Hs, for the same storm events, is shown to be lower at Conwy Beneficial Use (IS065) than at Conwy Beneficial Use (IS066) (Figure 4-23 and Figure 4-24).

4.3.28 The sediment plume extends further upstream due to the impact of the residual tidal current towards the north, coupled with the predominant wave direction from the northwest, which results in the transport of the sediment plume upstream in the Conwy River (paragraph 4.3.20 and Figure 4-22).

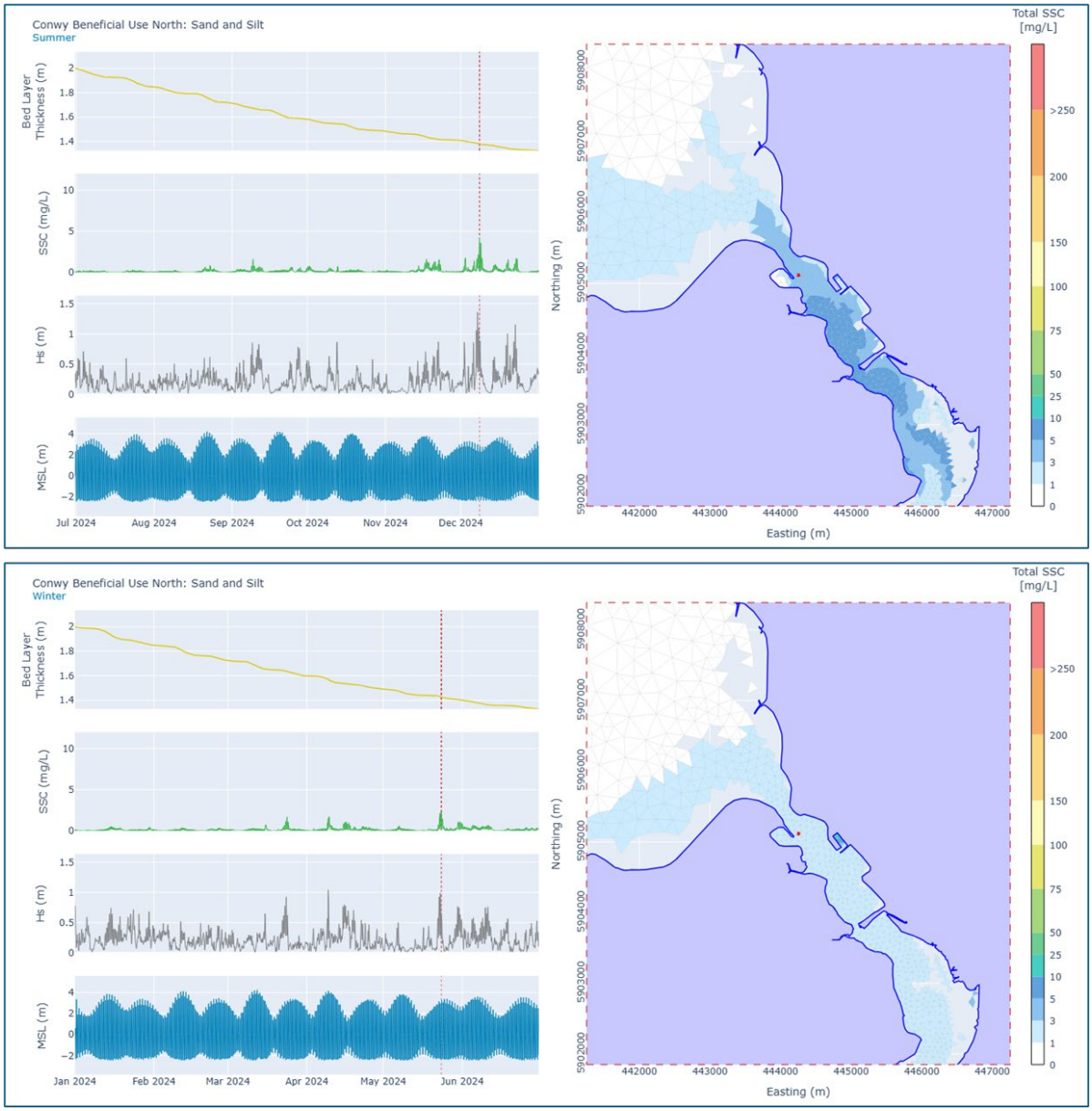



Figure 4-23: Illustration demonstrating the maximum SSC simulated at Conwy Beneficial Use (IS066) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

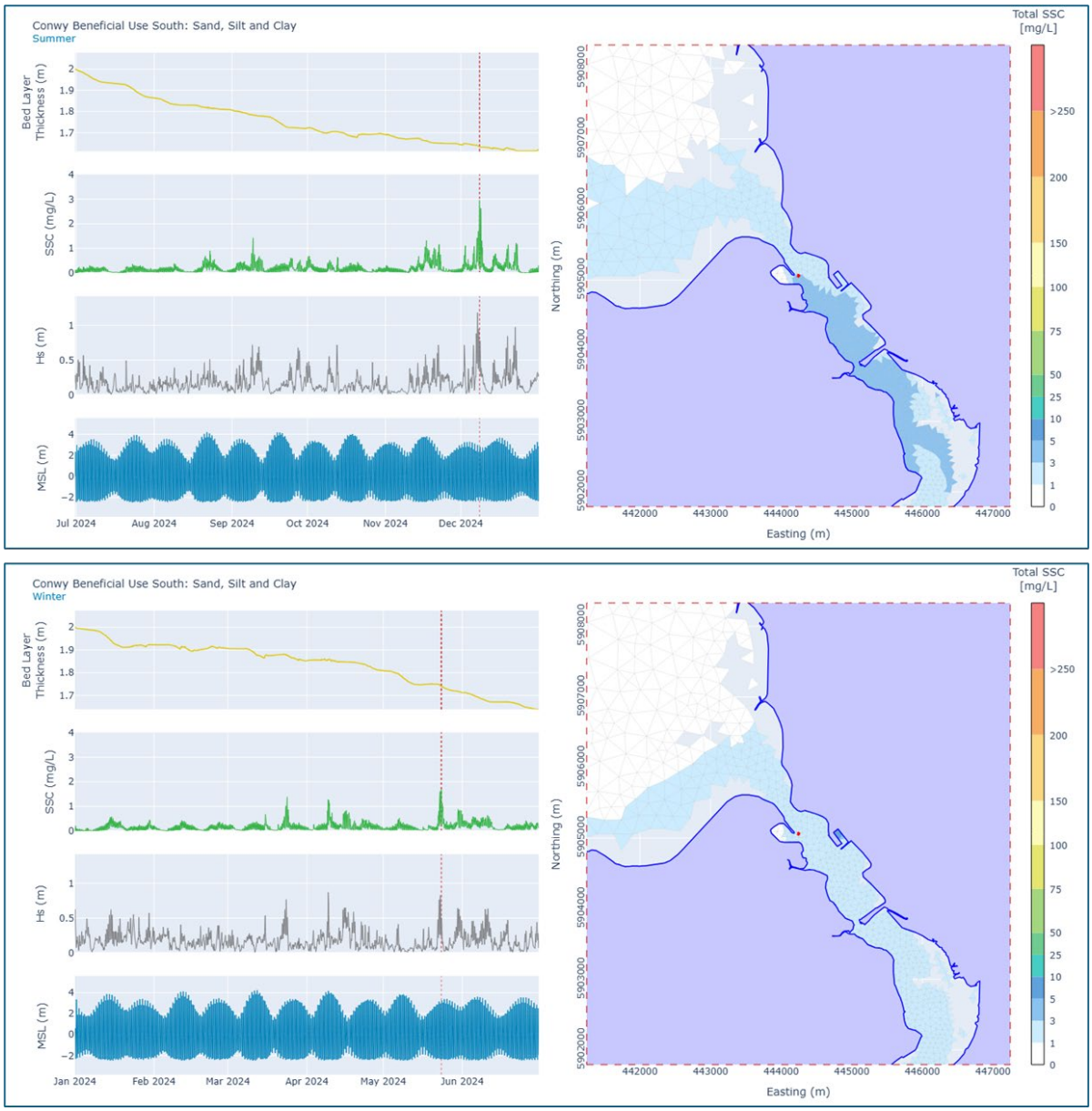



Figure 4-24: Illustration demonstrating the maximum SSC simulated at Conwy Beneficial Use (IS065) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Holyhead North (IS043)

### Site characterisation

4.3.29 Holyhead North (IS043) is located, approximately, 5 km northwest offshore from the coast of Anglesey in the north of Wales (Figure 4-25). This site was originally part of the larger Holyhead Deep (IS040) disposal site which was closed in 2017 but had previously received an average of 422,460 tonnes of material per year since its initial returns in 1993. To date, this non-beneficial use site has received two disposal returns of 34,070 tonnes and 98,770 tonnes in 2019 and 2021 respectively Figure 4-26).

4.3.30 The Marine Licence DML 2278 was granted in 2023 for a period of 5 years and includes a total amount of disposal of 495,000 tonnes (i.e., 99,000 tonnes per year) for silt.

4.3.31 The oceanographic features at this site are presented in Figure 4-27 and can be summarised as:

- The tidal range varies between 3.8 m and 1.9 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated north to south with a tidal ellipse excursion comprised of between 25 km and 30 km (Figure 4-27; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 1.8 m/s and the neap peak flow at 0.94 m/s with a residual current towards the north (Figure 4-27; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 80% of the data, however in extreme condition wave height can reach 8.9 m (Figure 4-27 MetOceanWorks, 2025). The waves are mostly coming from the southwest (51%) followed by northwest (13%) (Figure 4-27; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 75% of the data, with a main direction from the southwest (24%) followed by south (17%) (Figure 4-27; MetOceanWorks, 2025).

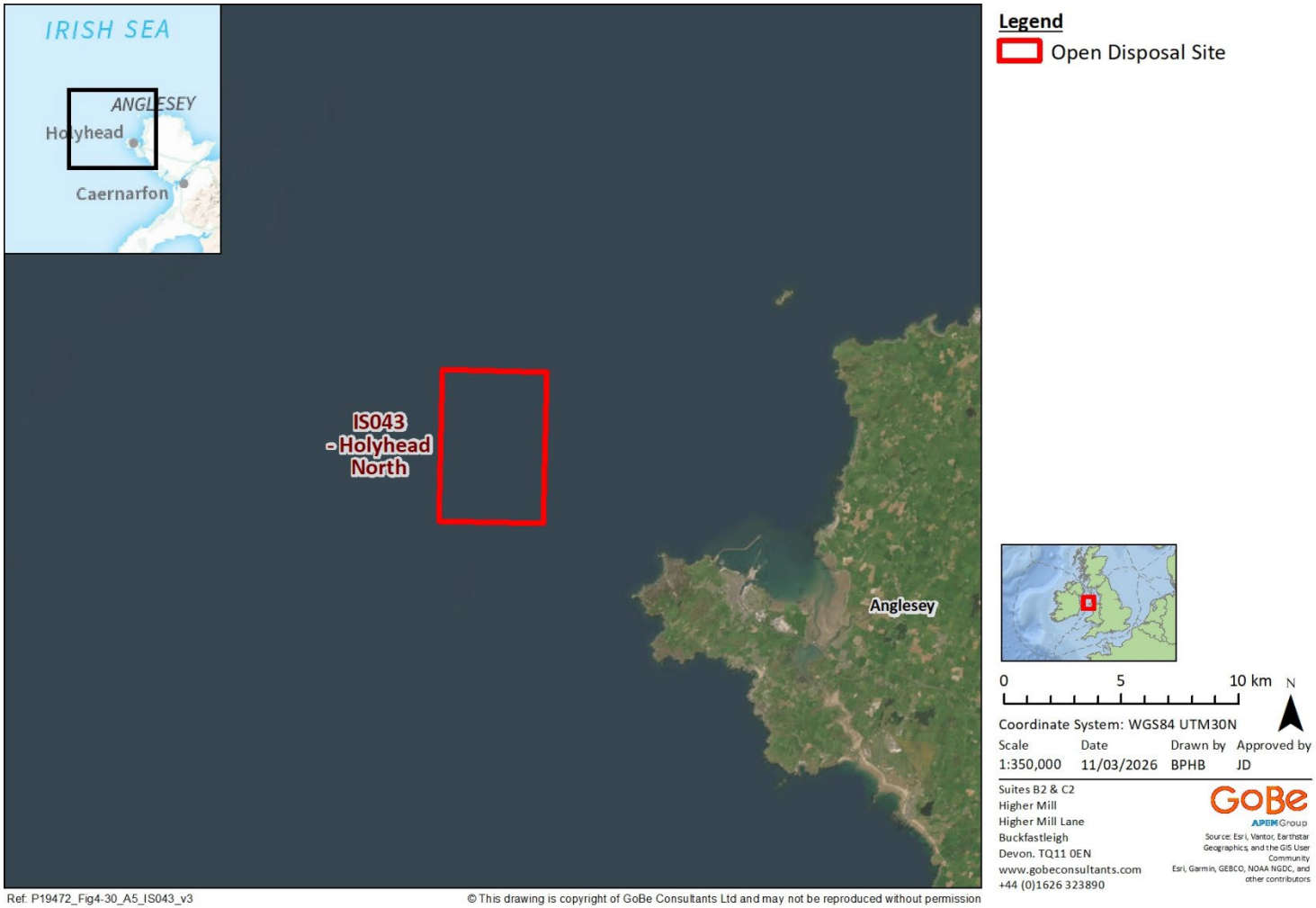



Figure 4-25: Map showing the Holyhead North (IS043) location.

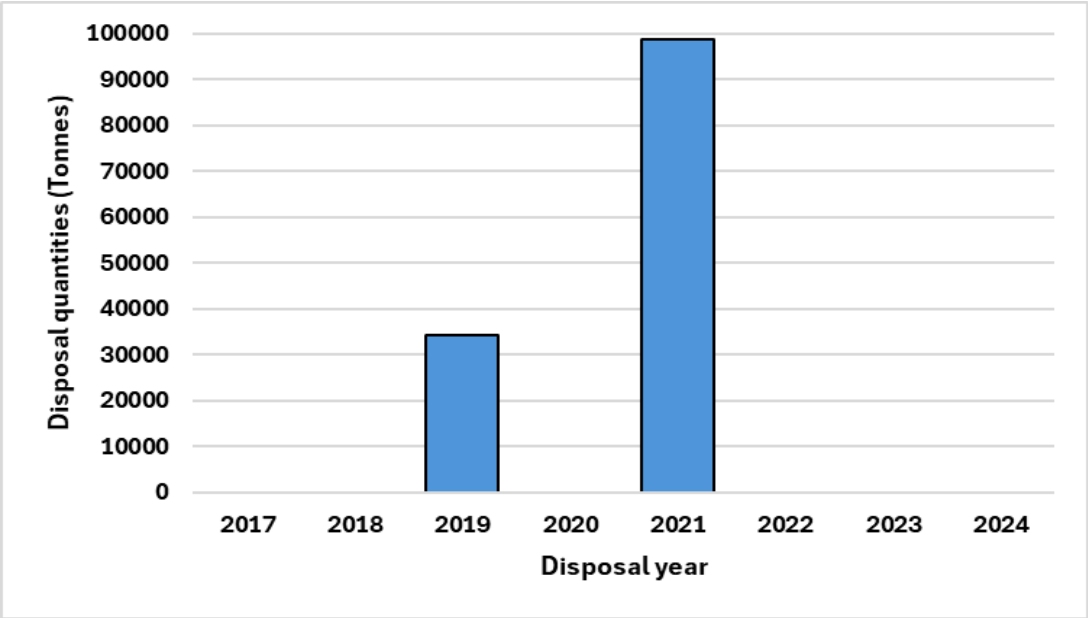



Figure 4-26: Bar graph representing the annual disposal quantities (tonnes) at Holyhead North (IS043) between 2009 and 2024.

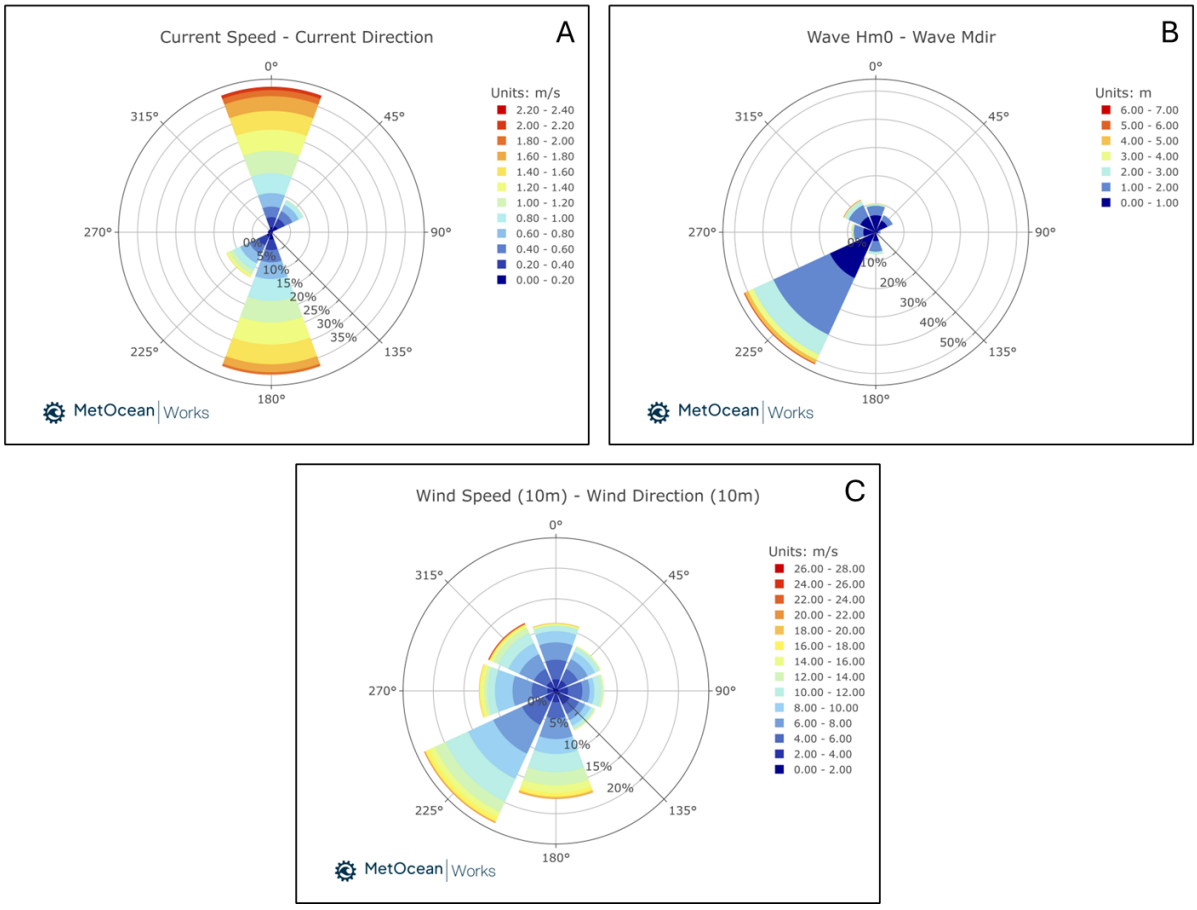



Figure 4-27: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Holyhead North (IS043) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.32 The tidal excursion ellipse is between 25 km and 30 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.8 (Appendix D).

## Modelling results

4.3.33 The dispersal of disposed material was carried out for sand (33%), silt (33%) and clay (33%). The total volume simulated corresponds to 11,400 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 0.4 mm.

4.3.34 The modelling results simulated at Holyhead North (IS043) can be summarised as:

- The sediment plume is shown to fully disperse after 0.3 days and 0.4 days when the deposition of dredged material occurs in summer and winter, respectively (Figure 4-28);
- No significant increase of bed layer thickness is simulated (i.e., increased in order of 400 µm) (Figure 4-28);
- The maximum SSC is observed directly after deposition for both winter and summer simulations. However maximum SSC values do not exceed 10 mg/L in summer and 5 mg/L in winter (Figure 4-28); and
- No retention of disposed dredged material, during either summer or winter, is predicted at Holyhead North (IS043).

4.3.35 The sediment plume extends in four directions which are summarised in Table 4-3 below:

Table 4-3: Direction and distance of the sediment plume at Holyhead North (IS043) for both summer and winter simulations.

| Direction | Maximum distance travelled (km) | |
|---|---|---|
| | Summer simulation | Winter simulation |
| Northeast | 15 | 20 |
| Southeast | 20 | 15 |
| East | 7 | 10 |
| West | 5 | 4 |

4.3.36 The strong tidal regime (i.e., current speed often exceeding 1 m/s), results in large tidal ellipses excursion (i.e., between 25 km and 30 km), at Holyhead North (IS043). This in turn results in the fast dissipation of the sediment plume in addition to its large extension towards the northeast and southeast (i.e., values comprised between 15 km and 20 km) (paragraph4.3.31; Table 4-11 and Figure 4-34).

4.3.37 The sediment plume extends more eastward in winter (approximately 10 km) than summer (approximately 7 km) (Table 4-11). This phenomenon can be explained by the impact of waves coming from the southwest combined with a higher frequency of these events during winter (Figure 4-34).

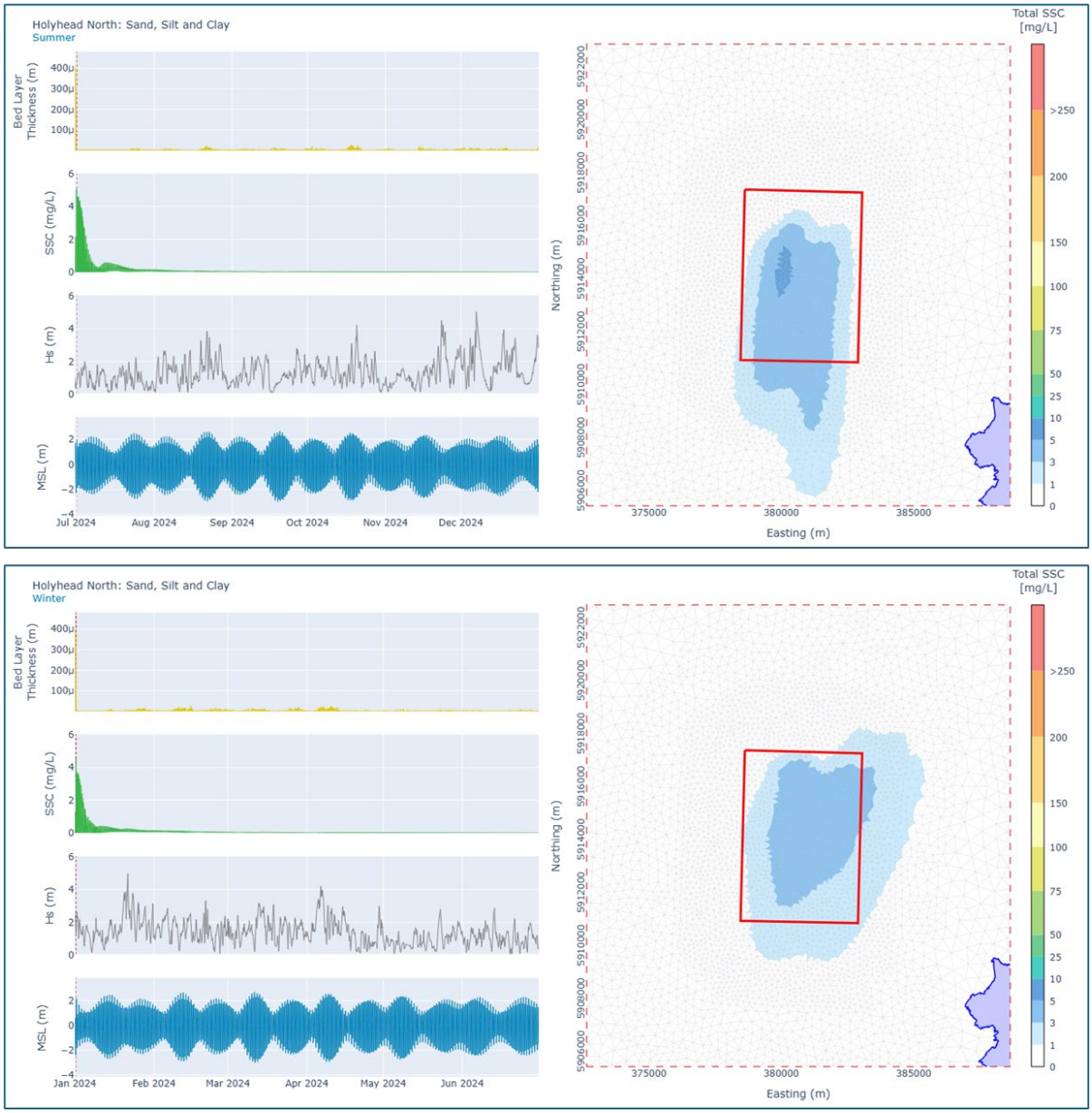



Figure 4-28: Illustration showing the maximum SSC simulated at Holyhead North (IS043) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Broughton (IS099)

### Site characterisation

4.3.38 Broughton (IS099) is located between Chester and the Dee estuary in the Canalised section of the Afon River (Figure 4-29). It received approximately 825,225 tonnes over the years 2010 to 2024, however this was dominated by a single disposal of 733,718 tonnes in 2012 (Figure 4-30). The site, on average, annually receives 9,682 tonnes (excluding the 2012 disposal and the year with no disposal return (i.e., 5 out of 14 years)) (Figure 4-30).

4.3.39 It is expected that sediment dispersal will be a combined effect of tidal current and river flow, with waves not expected to influence the dispersal of the disposed dredged material. Consequently, the wave regime was not characterised for Broughton (IS099).

4.3.40 At the entrance of Dee Estuary (approximately 14 km northwest from Broughton (IS099)), tidal current was simulated to be orientated northwest to southeast with tidal speed varying from 0.3 m/s to 0.05 m/s (MetOceanWorks, 2025).

4.3.41 The volumetric flow rate (i.e., discharge) of the Dee River is on average 30 $m^3/s$ which correspond to an average flow speed[21] at Broughton (IS099) of 0.1 m/s. It is important to mention that the flow speed can vary greatly between periods of rainfall and dry weather, which can significantly change the dispersal of disposed dredged material at Broughton (IS099).

[21] The flow speed was calculated by dividing the flow rate by the cross-sectional area, which corresponds to the width of the river (i.e., 65 m at Broughton (IS099)) multiplied by the river depth (i.e., maximum of 5 metres recorded at Chester).




Figure 4-29: Map showing the Broughton (IS099) location.

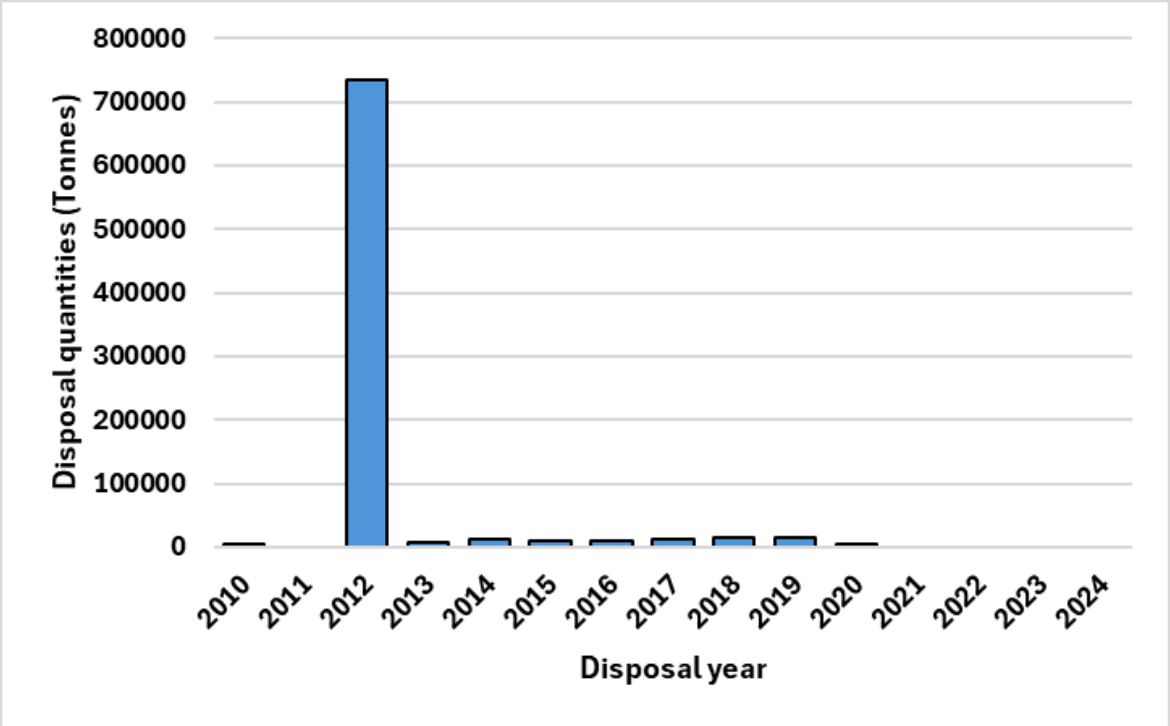



Figure 4-30: Bar graph representing the annual disposal quantities (tonnes) at Broughton (IS099) between 2010 and 2024.

## Potentially sensitive receptors

4.3.42 The designated sites and associated designated receptors identified are presented in section D.10 (Appendix D).

## Modelling results

4.3.43 The dispersal of disposed material was carried out for sand (50%) and silt (50%). The total volume simulated corresponds to 16,630 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 2285 mm.

4.3.44 The modelling results simulated at Broughton (IS099) can be summarised as:

- The sediment plume is shown to not fully disperse after six months for both simulations when disposed dredged material is released in summer and winter (Figure 4-31);
- The bed thickness increased to a maximum of 1.67 m for both summer and winter simulations (Figure 4-31);
- The maximum SSC is predicted to reach 10 mg/L after 52 days in summer (Figure 4-31);
- The maximum SSC is predicted to reach 10 mg/L after 130 days in winter (Figure 4-31);

- The sediment plume disperses no further than 8 km downstream for both simulations in winter and summer. However, the sediment plume disperses 2 km and 1 km upstream during winter and summer simulations, respectively (data not shown); and
- Broughton (IS099) shows a retention of disposed dredged material of 98% during winter and 97% during summer.

4.3.45 Any exceedances in the critical erosion bed shear stress at this site are short-lived limiting the potential for erosion. Due to the confined nature of the site location, a large proportion of deposited sediment is predicted to remain within the site, with any resuspended sediment falling back to the bed within the site. At the end of the simulations 97% of sediment placed on the bed is predicted to be retained within the site for both winter and summer simulations. This is equivalent to an erosion of approximately 0.2 mm per day. However, it is important to mention that the predicted sediment retention in the model is likely to be sensitive to the assumed water depths in the River Dee channel (see limitation of the numerical model in Appendix E).

4.3.46 The SSC is shown to be correlated with tidal regime, with maximum SSC predicted to occur during a spring tide, which might induce sediment re-suspension of (Figure 4-31). Further, as the sediment is predominately simulated to be downstream in the Dee River, it can be concluded that the direction of river flow is the main influence upon disposed dredged material dispersal.

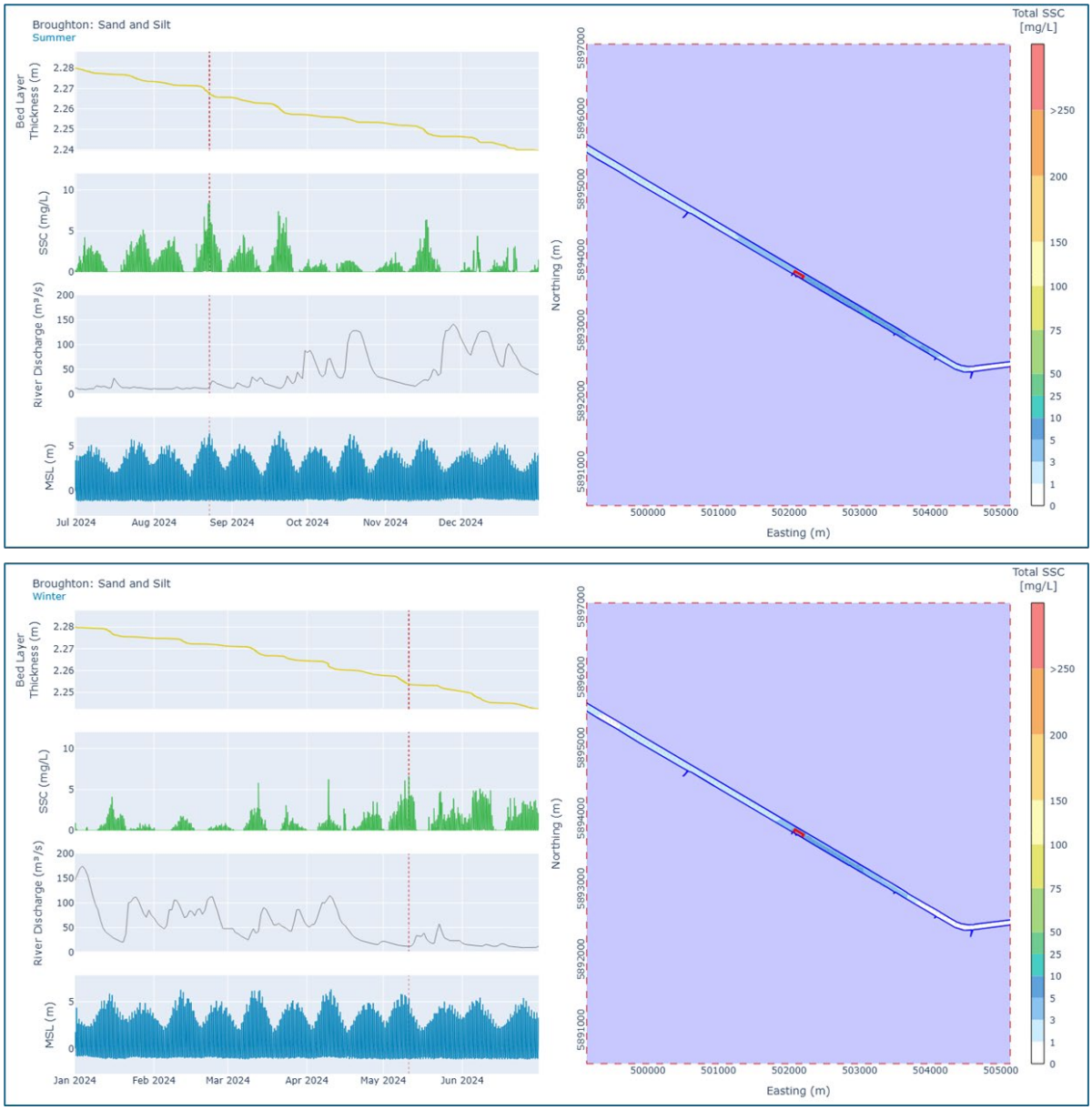



Figure 4-31: Illustration showing the maximum SSC simulated at Broughton (IS099) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Mostyn Deep (IS102)

### Site characterisation

4.3.47 Mostyn Deep site (IS102) is located within the Dee Estuary, approximately 0.8 km from the North Wales coastline (Figure 4-32). From the first disposal return in 2005 to 2024, Mostyn Deep (IS102) received a total of 3,258,222 tonnes of dredged material (Figure 4-33). The site receives 203,639 tonnes on annual average (excluding the year with no disposal return (i.e., 4 out of 14 years)). The disposal returns varied between the years with a maximum of 357,322 tonnes in 2010 and a minimum of 5,625 tonnes in 2024 (Figure 4-33Figure 4-33). Also, no disposal return was observed in 2012, 2018, 2021 and 2022 at Mostyn Deep (IS102) (Figure 4-33).

4.3.48 The Marine Licence CML 2283 was granted in 2025 for a period of 7 years and includes a total amount of disposal of 6,300,000 tonnes (i.e., 900,000 tonnes per year) for sand and silt.

4.3.49 The oceanographic features at this site are presented in Figure 4-34 and can be summarised as follow:

- The tidal range varies between 7.2 m and 3.8 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated northwest to southeast with a tidal ellipse excursion between 6 km and 7 km (Figure 4-34; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 1.03 m/s and the neap peak flow at 0.5 m/s (Figure 4-34; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 94% of the data, however in extreme condition wave height can reach 3.8 m (Figure 4-34; MetOceanWorks, 2025). The waves are mostly coming from the northwest (70%) followed by northeast (10%) (Figure 4-34; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 83% of the data, with a main direction from the southwest (20%) followed by west (17%) (Figure 4-34; MetOceanWorks, 2025).




Figure 4-32: Map showing the Mostyn Deep (IS102) location.

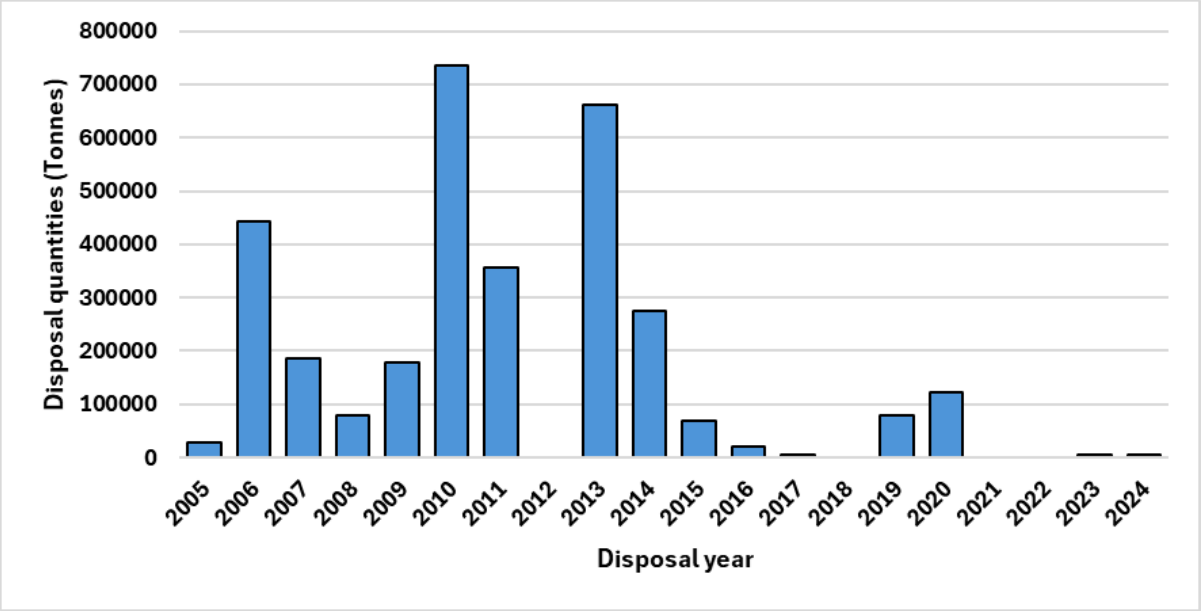



Figure 4-33: Bar graph representing the annual disposal quantities (tonnes) at Mostyn Deep (IS102) between 2005 and 2024.

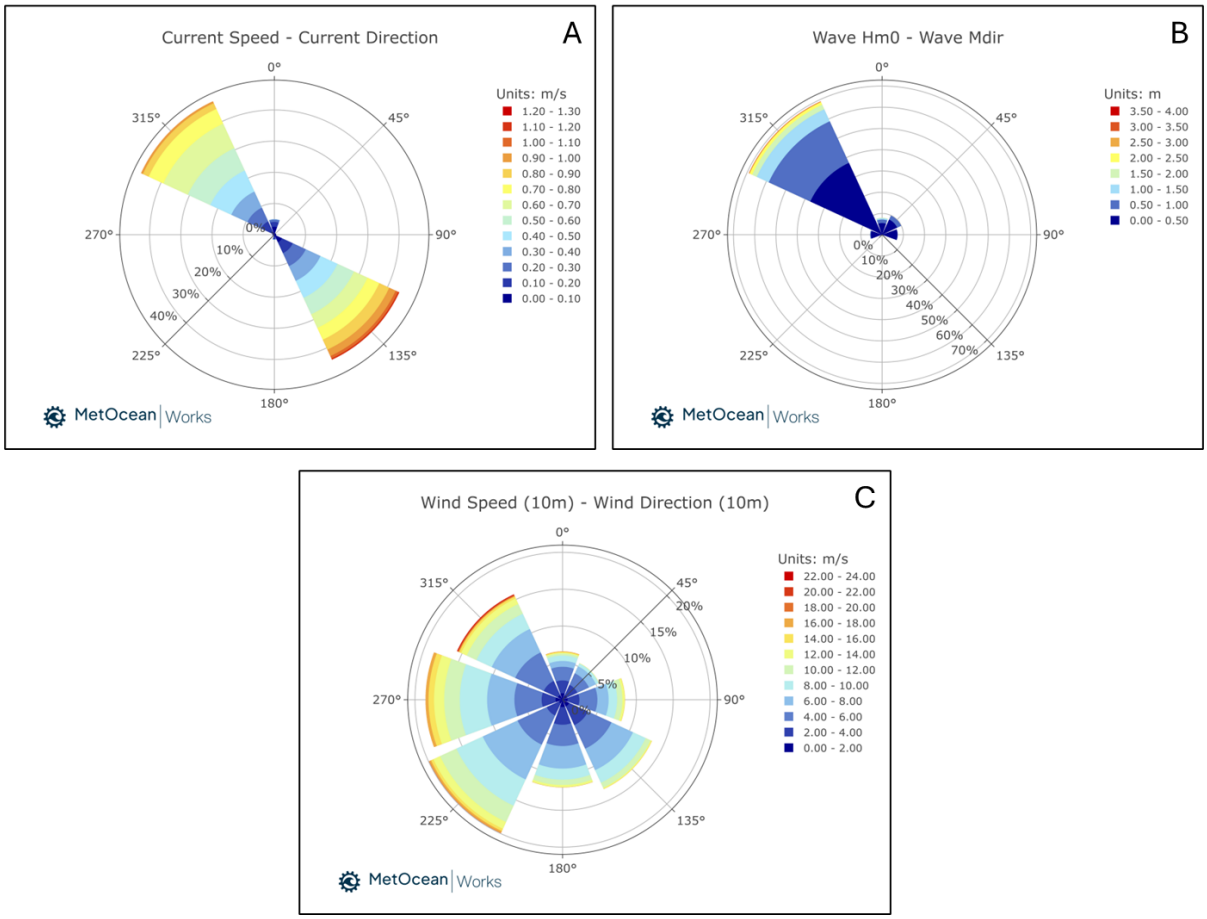



Figure 4-34: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Mostyn Deep (IS102) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.50 The tidal excursion ellipse is between 6 km and 7 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.11 (Appendix D).

## Modelling results

4.3.51 The dispersal of disposed material was carried out for sand (50%) and silt (50%). The total volume simulated corresponds to 449,830 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 680 mm.

4.3.52 The modelling results simulated at Mostyn Deep (IS102) can be summarised as:

- The sediment plume does not fully disperse after six months for both simulations when disposed dredged material is released in summer and winter (Figure 4-35);

- The bed thickness increased to a maximum of 0.7 m for both summer and winter simulations (Figure 4-35);
- The maximum SSC does not exceed 200 mg/L after 160 days in summer (Figure 4-35);
- The maximum SSC is shown after 100 days and for a value of 250 mg/L in winter (Figure 4-35);
- The sediment plume disperses along the coastline either side of the Dee Estuary mouth to, approximately, 40 km east and 50 km west for both winter and summer simulations (data not shown);
- The sediment plume extends to a maximum of, approximately, 20 km offshore for both simulations during summer and winter; and
- Mostyn Deep (IS102) shows a retention of disposed dredged material of 95% for simulations during both winter and summer.

4.3.53 SSC data collected at the Port of Mostyn show a tidal pattern with an increase of SSC higher during flood tide (approximately 35 mg/l) than during ebb tide (approximately 25 mg/l) (ABPmer, 2022). This observation correlates with the numerical model results which show that the highest SSC is observed in the southeast of the disposal site due to residual current orientated southeast during flood tide.

4.3.54 There is a notable spatial variation in resuspension of placed sediment at this site. In the northwest of the site, resuspension is relatively low compared to the southeast of the site where resuspension is much higher. At the end of the six-month simulations, approximately 40% of the placed sediment is predicted to remain within the site. All of the retained sediment is in the northwestern half of the site.

4.3.55 Both simulations during winter and summer show similar results in terms of disposal site retention and sediment plume dispersal. Results show that an increase in SSC is often correlated with an increase of $H_s$ (Figure 4-35). Furthermore, the maximum SSC values are often observed when increase of $H_s$ occurred at the same time as a peak spring tide (Figure 4-51).

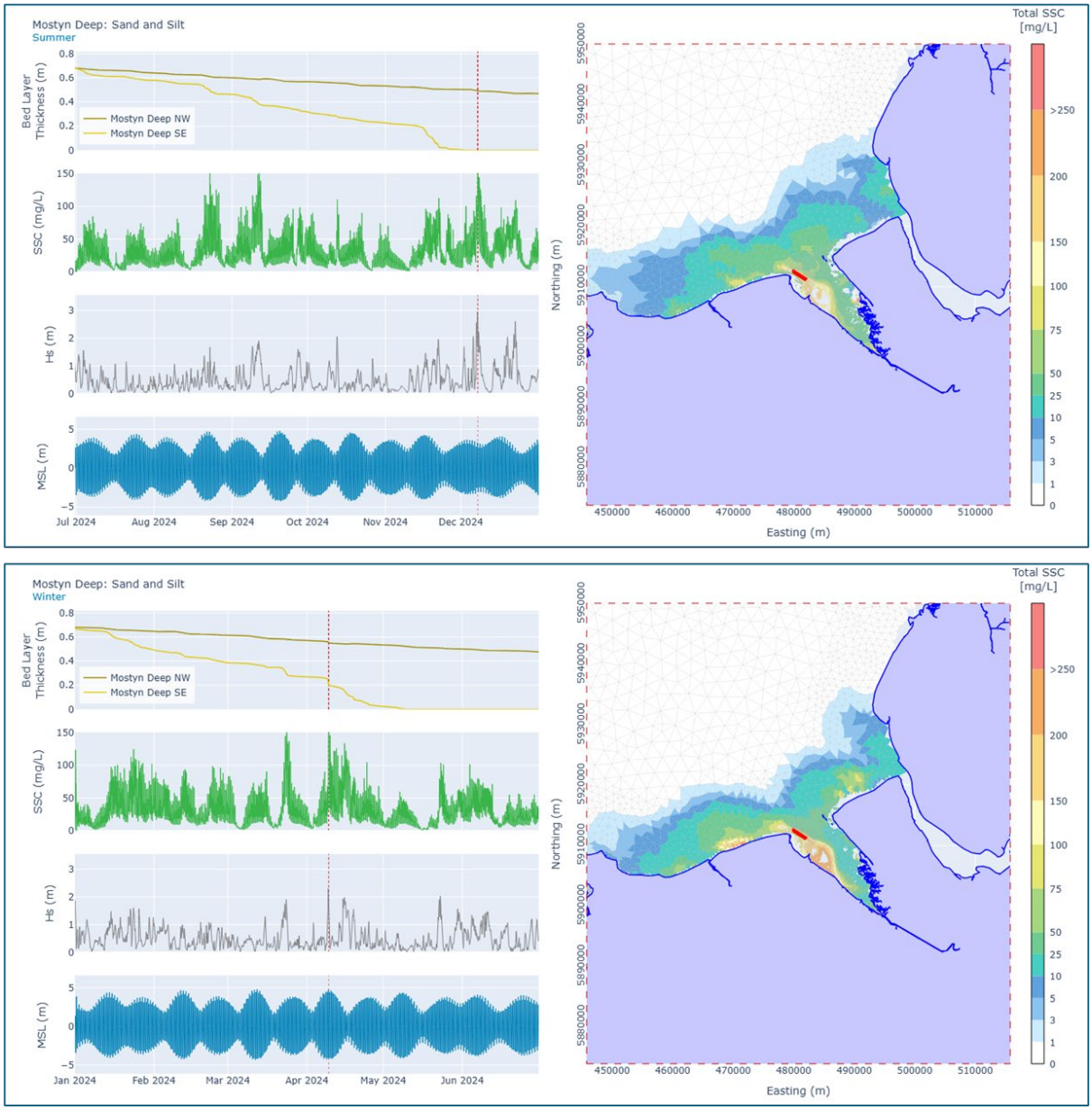



Figure 4-35: Illustrations showing the maximum SSC simulated at Mostyn Deep Maintenance (IS102) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Mostyn Breakwater (IS103)

### Site characterisation

4.3.56 Mostyn Breakwater (IS103) is located within the Dee Estuary, approximately 0.8 km from the North Wales coastline (Figure 4-36). To date, this beneficial use site received only one disposal return of 3,715 tonnes in 2024.

4.3.57 It is important to mention that disposal of dredge material is likely to occur post 2025, as a marine licence (CML2283) has been granted for the disposal of dredge material composed of sand and silt for a total amount of 699,930 tonnes (i.e., 99,900 tonnes per year) for a period of 7 years.

4.3.58 The oceanographic features at this site are presented in Figure 4-37 and can be summarised as:

- The tidal range varies between 7.2 m and 3.8 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated northwest to southeast with a tidal ellipse excursion comprised between 6 km and 7 km (Figure 4-37; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.56 m/s and the neap peak flow at 0.17 m/s (Figure 4-37; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 94% of the data, however in extreme conditions wave height can reach 3.8 m (Figure 4-37; MetOceanWorks, 2025). The waves are mostly coming from the northwest (70%) followed by northeast (10%) (Figure 4-37; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 83% of the data, with a main direction from the southwest (20%) followed by west (17%) (Figure 4-37; MetOceanWorks, 2025).

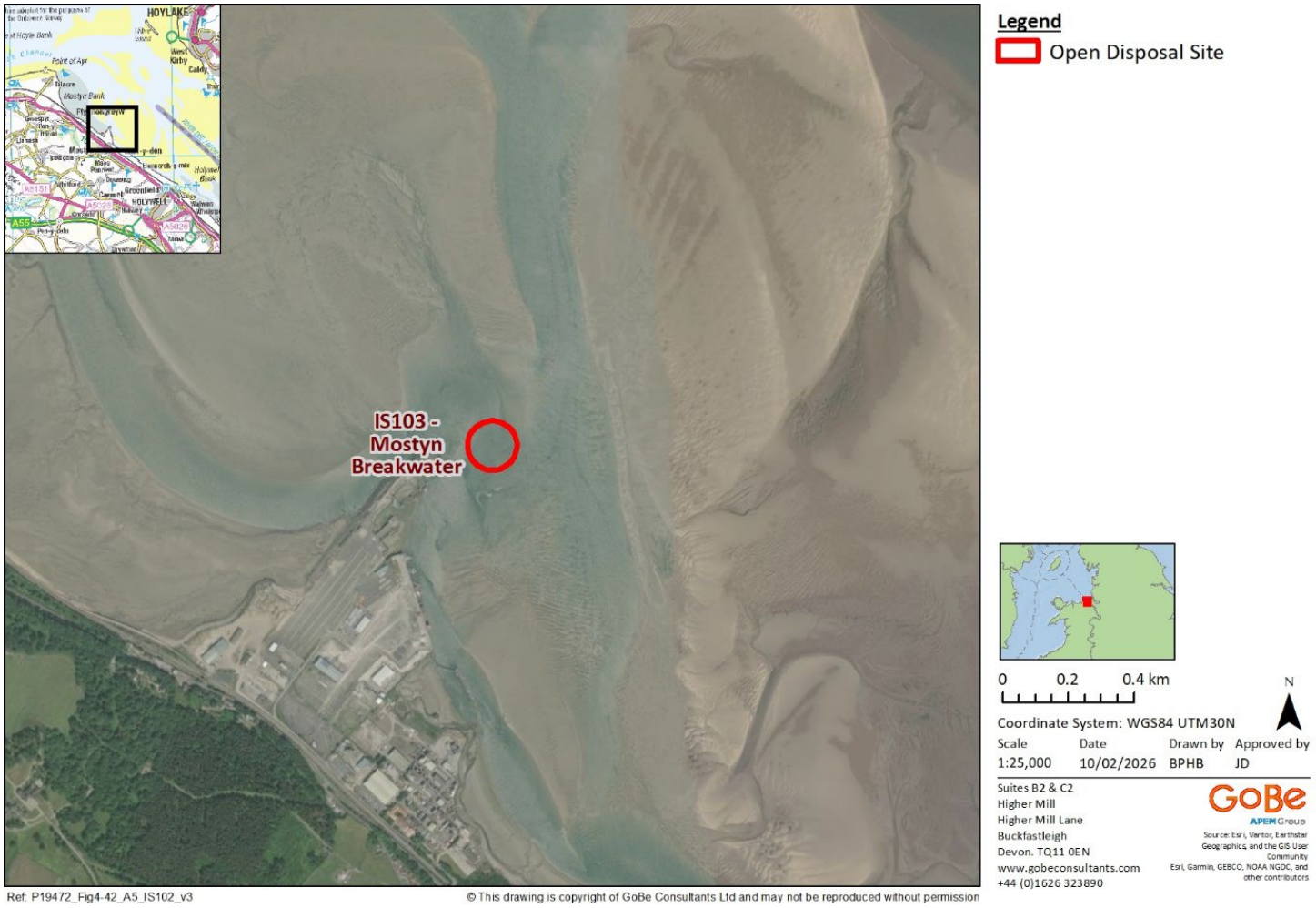



Figure 4-36: Map showing the Mostyn Breakwater (IS103) location.

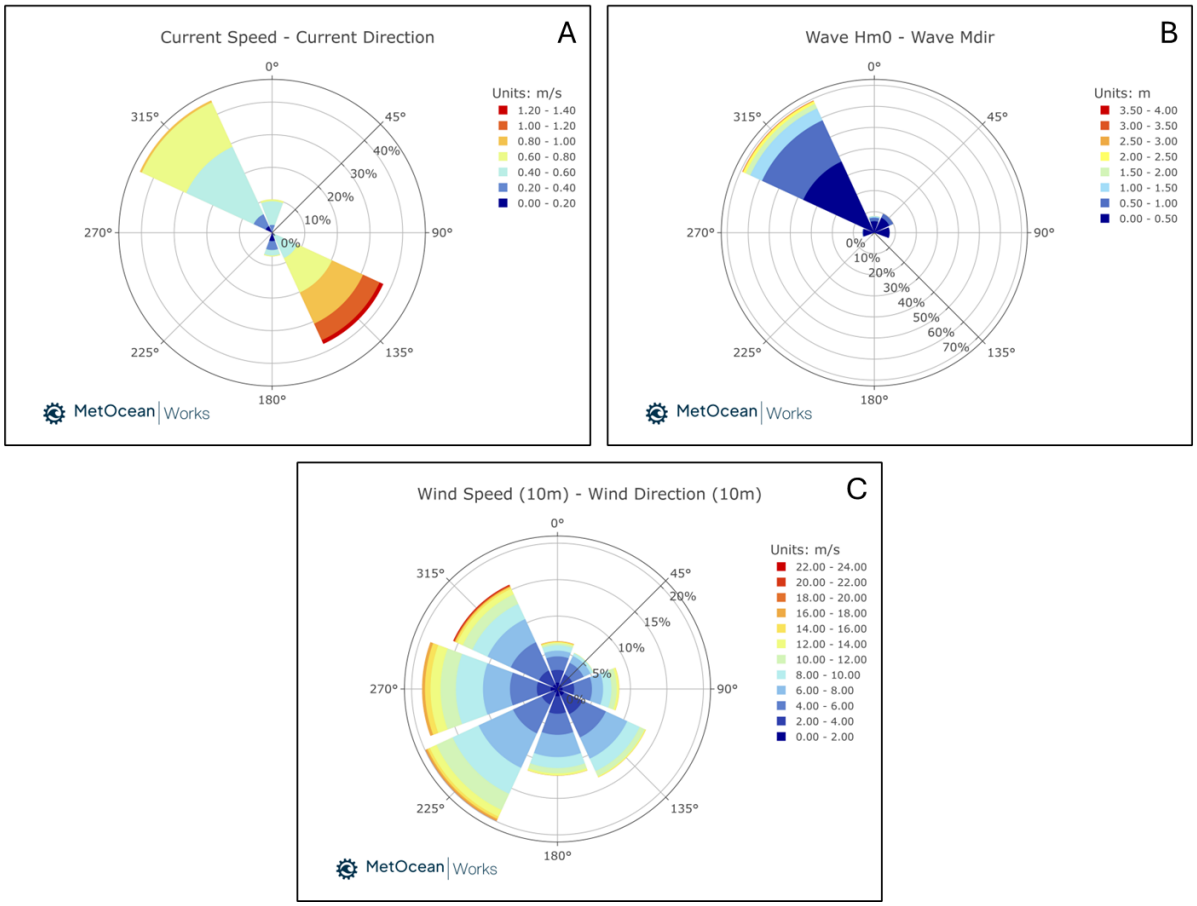



Figure 4-37: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Mostyn Breakwater (IS103) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.59 The tidal excursion ellipse is between 6 km and 7 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.12 (Appendix D).

## Modelling results

4.3.60 The dispersal of disposed material was carried out for sand (50%) and silt (50%). The total volume simulated corresponds to 49,920 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 2834 mm.

4.3.61 The modelling results simulated at Mostyn Breakwater (IS103) can be summarised as:

- The sediment plume does not fully disperse after six months (approximately 95% of material remained, which is equivalent to an erosion of 0.8 mm per day) for both simulations when disposed dredged material are released in summer and winter (Figure 4-38);
- The bed thickness increased to a maximum of 0.45 m for both summer and winter simulations (Figure 4-38);
- The maximum SSC is predicted to reach values comprised between 75 mg/L and 100 mg/L after 160 days in summer (Figure 4-38);
- The maximum SSC is predicted after 105 days for values comprised between 50 mg/L and 75 mg/L in winter (Figure 4-38);
- The sediment plume disperses along the coastline either side of the Dee Estuary mouth to, approximately, 15 km in both east and west directions for both winter and summer simulations (data not shown);
- The sediment plume extends to a maximum of, approximately, 10 km and 5 km offshore for simulations during summer and winter respectively. Also, the sediment plume is observed 20 km upstream form the site in the Dee River; and
- Mostyn Breakwater (IS103) shows a retention of disposed dredged material of 40% for both simulations during winter and summer.

4.3.62 The high retention of the site could be potentially explained by the presence of break water (Figure 4-36), which reduces the impact of wave and tidal regime. However, it is important to mention that the predicted sediment retention in the model is likely to be sensitive to the assumed water depths in the River Dee channel (see limitation of the numerical model in Appendix E).

4.3.63 The high dispersal upstream in the Dee River can be explained by the coupled impact of waves coming from the northwest and residual tidal current directed towards the southeast (paragraph 4.3.58 and Figure 4-37). As the waves coming from the northwest are more frequent during winter (i.e., due to the increase of storms during winter), sediment is not dispersed as far offshore during this period (i.e., 5 km) than during summer (i.e., 10 km).

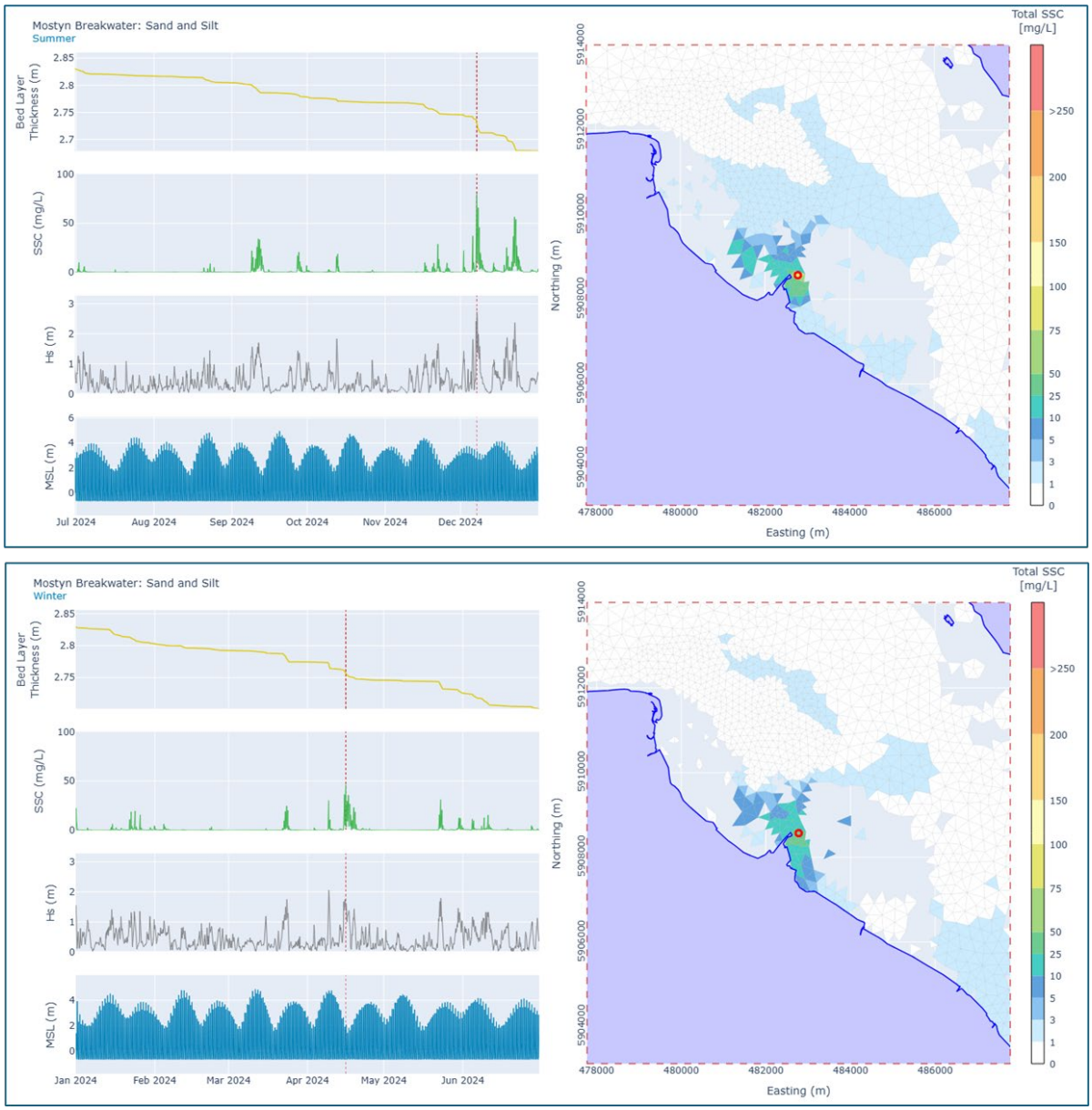



Figure 4-38: Illustration showing the maximum SSC simulated at Mostyn Breakwater (IS103) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Cardiff Grounds (LU110)

### Site characterisation

4.3.64 Cardiff Grounds (LU110) is a non-beneficial use site located within the Severn Estuary, approximately 3 km off the south coast of Wales (Figure 4-39). The first disposal return has been received in 1988 (6,240 tonnes) and the total of disposal from 1988 to 2024 reaches 14,337,752 tonnes, which make it the second largest disposal site in terms of overall disposed volume (Figure 4-40). Between 1988 and 2024, the site receives 434,477 tonnes on annual average (excluding the year with no disposal return (i.e., 4 out of 37 years)). However, the amount of disposal returns varied consequently from one year to another with a maximum of 1,653,859 tonnes (in 2023) and a minimum of 6,240 (1988) (Figure 4-40).

4.3.65 Several Marine Licences have been granted for the disposal of dredged material at LU110, the most recent and still active are summarised in Table 4-4:

Table 4-4: Summarise of Marine Licences granted at LU110.

| Marine Licence | Period of validity (years) | Total amount of disposal (Tonnes) | Type of material |
|---|---|---|---|
| DML 1953 | 7 | 6,999,993 (i.e., 999,999 per year) | Sand, silt and clay |
| DML 1955 | 10 | 99,990 (i.e., 9,999 per year) | Sand, silt and clay |
| DML 2352 | 10 | 2,340,000 (234,000 per year) | Silt |

4.3.66 Tidal currents (i.e., speed and direction) were recorded for one month (12$^{th}$ of February 2024 to the 9$^{th}$ of March 2024) within LU110 (Figure 4-40). The data are presented in Figure 4-41 and can be summarised as:

- The spring peak flow is on average recorded between 1.2 m/s and 1.6 m/s and the neap peak flow between 0.4 m/s and 0.8 m/s; and
- The tidal regime is shown to be orientated southwest to northeast, with residual current orientated toward the southwest (Figure 4-41).

4.3.67 The oceanographic features at this site are presented in Figure 4-42 and can be summarised as:

- The tidal range varies between 11.4 m and 5.8 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal ellipse excursion is comprised between 15 km and 20 km (ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 95% of the data, however in extreme condition wave height can reach 2.8 m (Figure 4-42; MetOceanWorks, 2025). The waves are mostly coming from the southwest (31%) followed by west (27%) (Figure 4-42; MetOceanWorks, 2025); and

- The wind regime is shown to be less than 10 m/s for 79% of the data, with a main direction from the west (27%) followed by southwest (19%) (Figure 4-42; MetOceanWorks, 2025).

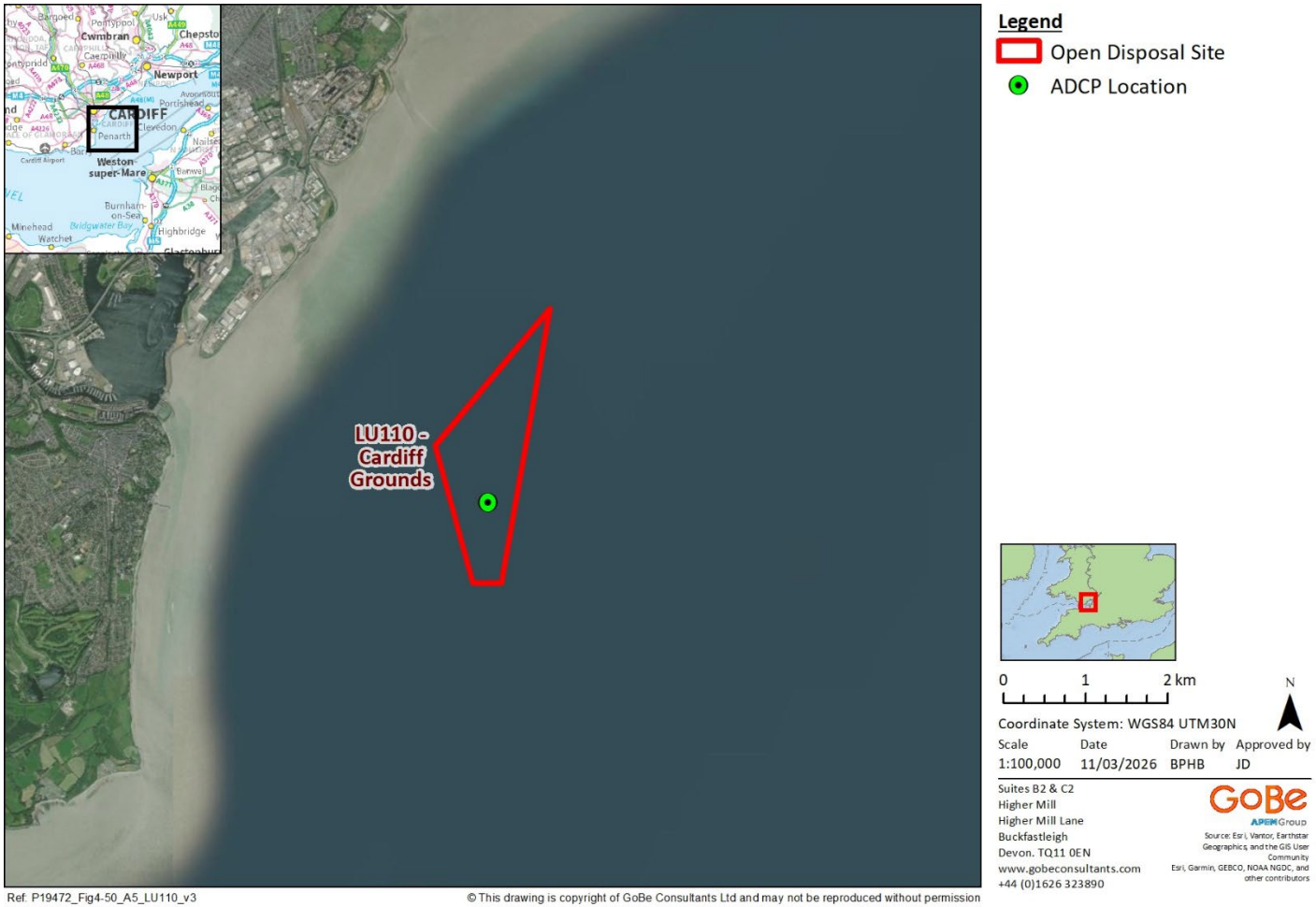



Figure 4-39: Map showing the Cardiff Grounds (LU110) location.

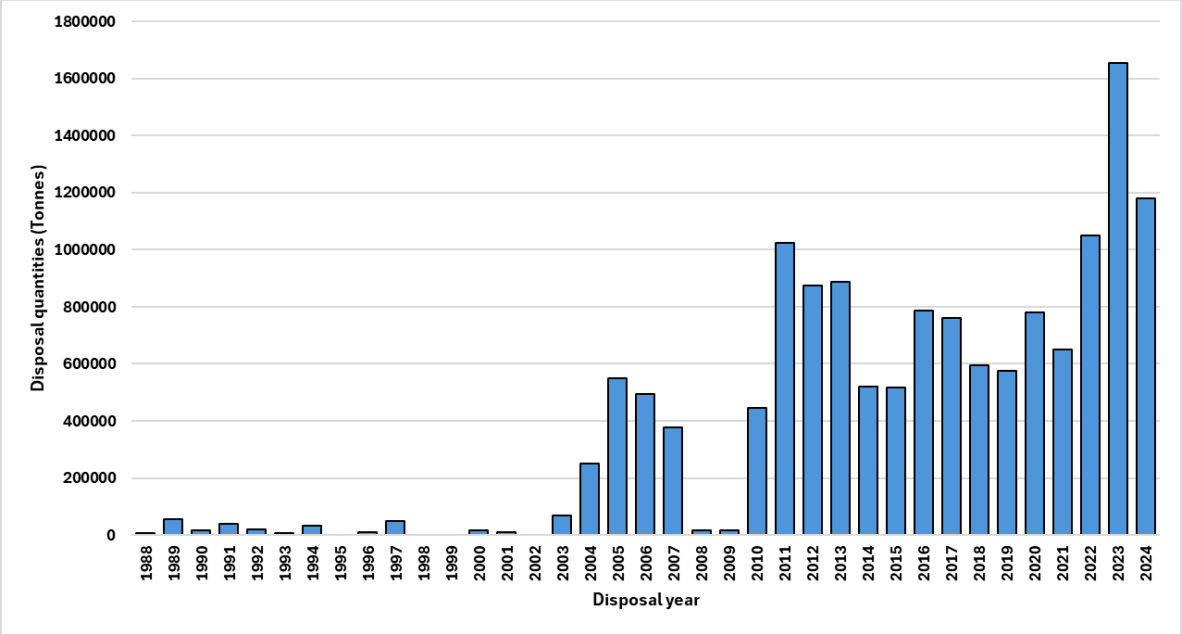



Figure 4-40: Bar graph representing the annual disposal quantities (tonnes) at Cardiff Grounds (LU110) between 1988 and 2024.

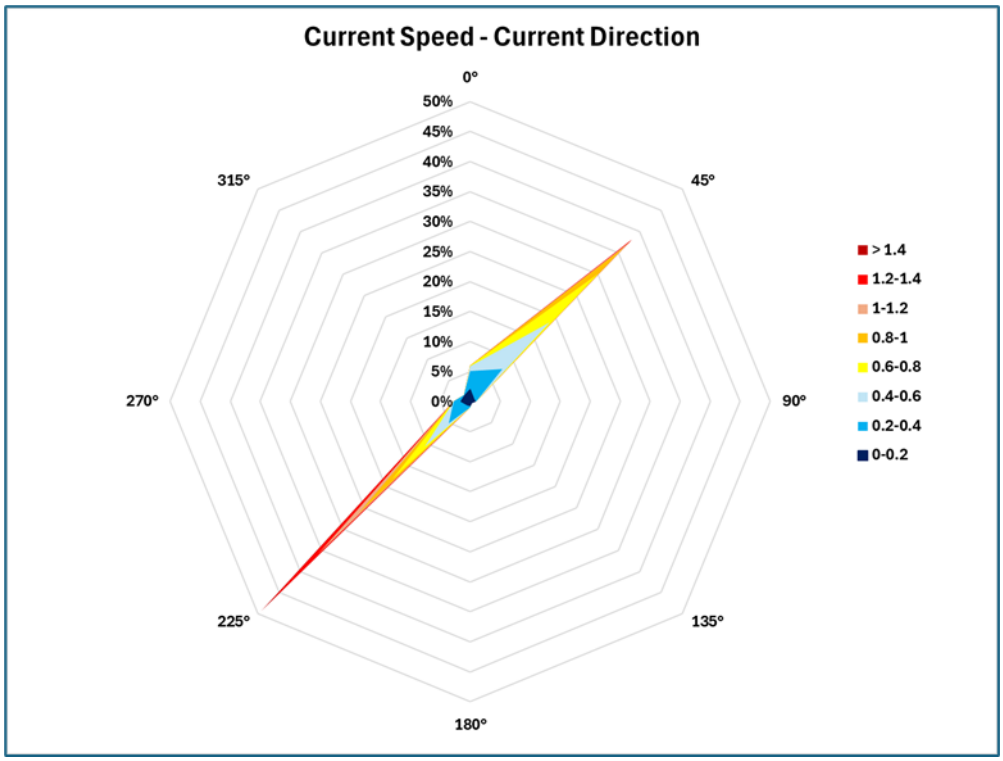



Figure 4-41: Table showing the tidal current speed and direction recorded within Cardiff Grounds (LU110) from the 12th of February 2024 to the 9th of March 2024.

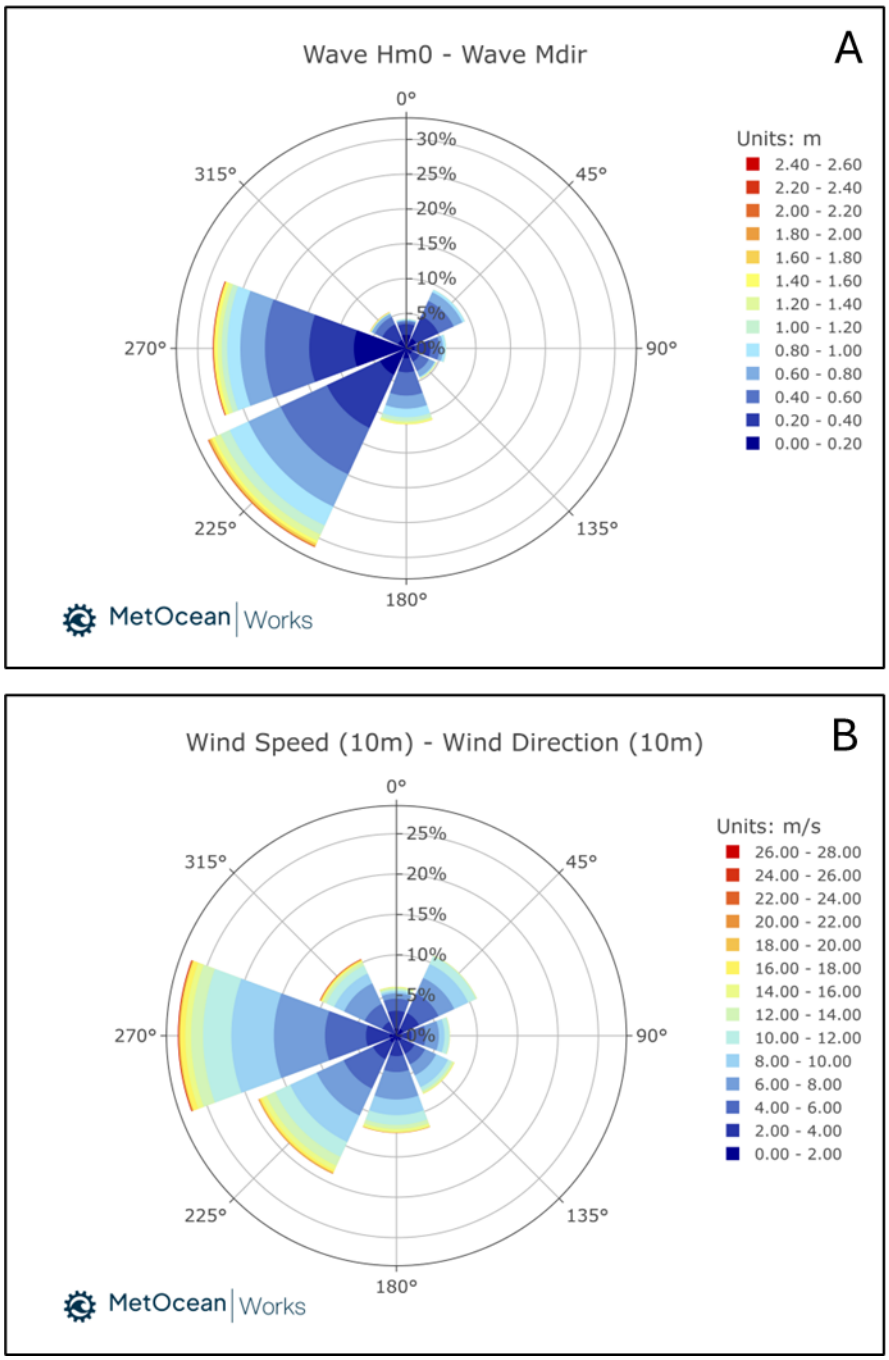



Figure 4-42: Hindcast model data showing wave height and direction (Panel A) and wind speed and direction (Panel B) at Cardiff Grounds (LU110) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.68 The tidal excursion ellipse is between 6 km and 7 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.13 (Appendix D).

## Modelling results

4.3.69 The dispersal of disposed material was carried out for sand (33%), silt (33%) and clay (33%). The total volume simulated corresponds to 10,120 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 5 mm.

4.3.70 The modelling results simulated at Cardiff Grounds (LU110) can be summarised as:

- The sediment plume is shown to fully disperse after 0.2 days and 0.6 days when the deposition of dredged material occurs in summer and winter, respectively (Figure 4-43);
- No significant increase of bed layer thickness is simulated (i.e., increased in order of 5 mm) (Figure 4-43);
- The maximum SSC is observed directly after deposition with values comprised between 100 mg/L and 150 mg/L for both winter and summer simulations (Figure 4-43);
- The sediment plume disperses to a maximum of, approximately, 15 km both upstream and downstream of the site in the Severn Estuary for both summer and winter simulations (data not shown); and
- No retention of disposed dredged material is observed at Cardiff Grounds (LU110).

4.3.71 Comparison of bathymetric survey data between 2020 and 2022 was carried out by APBmer (2023a) and shows very little variation in bed elevation. Changes within Cardiff Grounds (LU110) and the wider area can be summarised as follows:

- Within the disposal site localised bed level changes are observed of up to ± 0.5 m to 1 m, however the average bathymetric change for the whole disposal site showed a shallowing of 0.11 m; and
- Outside and in the vicinity of the disposal site, the bed level change showed a shallowing of around 0.08 m.

4.3.72 The bathymetric survey correlates with evidence from the modelling results that Cardiff Grounds (LU110) is highly dispersive (ABPmer, 2023a). It is important to mention that the modelling results are shown for one disposal event, whereas the observations of very little variation in bed elevation observed between 2020 and 2022 may be the result of multiple disposals of dredged sediment as well as natural variations due to hydrodynamic regime (i.e., action of river discharge, tide and wave regime).

4.3.73 The main driver of sediment dispersal at Cardiff Grounds (LU110) is shown to be the tidal current, which is orientated southwest to northeast (paragraph 4.3.66). The shape of the sediment plume presented in Figure 4-43 for the deposition of dredged material in summer is similar to the tidal excursion ellipses, whereas in winter the sediment plume showed a more complex shape. This difference can be explained by both the impact of waves more frequent during winter and the increase of Severn River flow due to increase of rainfall during winter months.

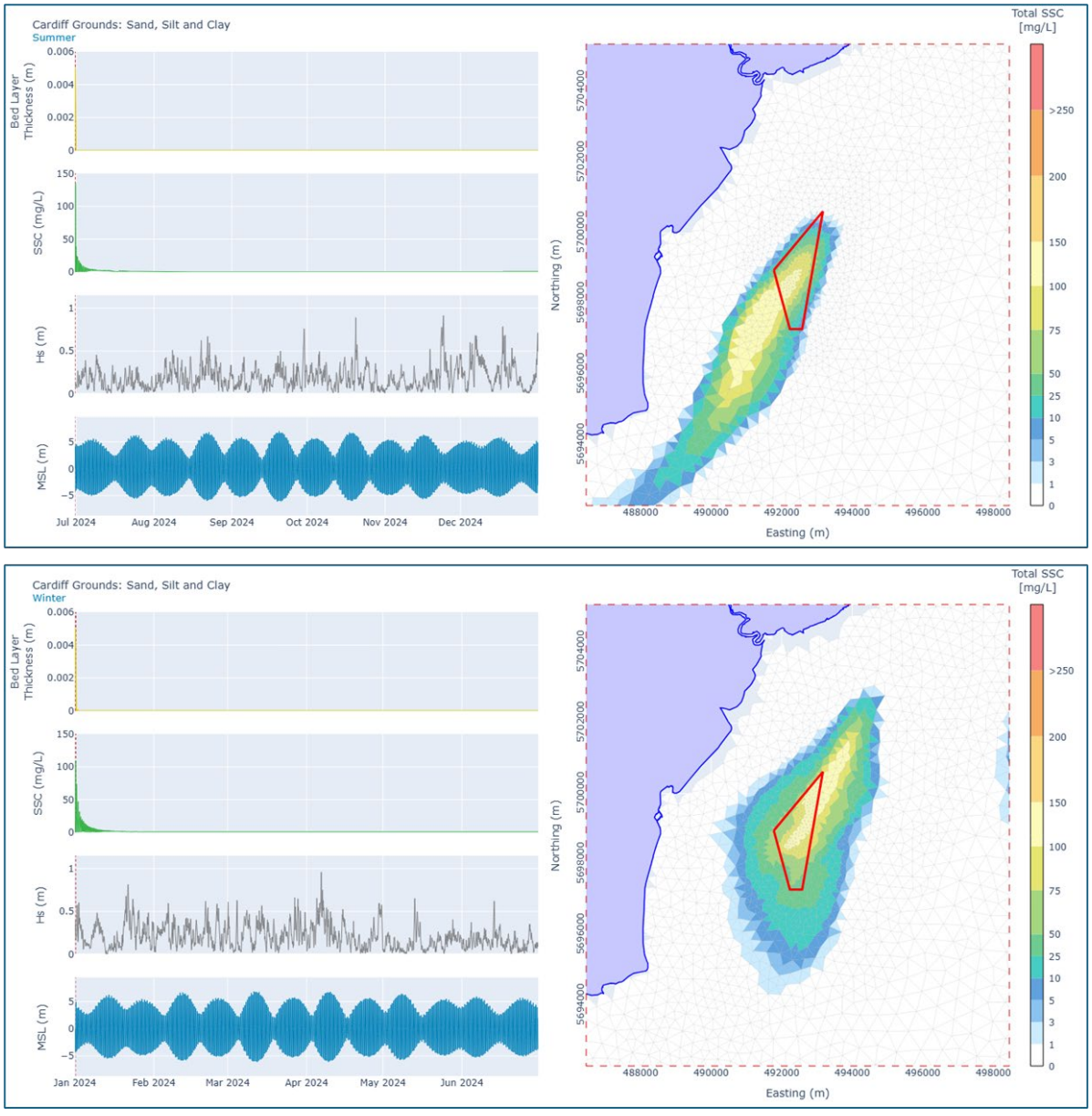



Figure 4-43: Illustration showing the maximum SSC simulated at Cardiff Grounds (LU110) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Merkur Buoy (LU115)

### Site characterisation

4.3.74 Merkur Buoy (LU115) is located approximately 4 km off the south coast of Wales and was first used for disposal in 1993 (Figure 4-44). The first disposal return has been received in 1993 (6,240 tonnes) and the total of disposal from 19993 to 2024 reaches 1,035,433 tonnes (Figure 4-45). Between 1993 and 2024, the site receives 43,143 tonnes on annual average (excluding the year with no disposal return (i.e., 7 out of 32 years)). However, the amount of disposal returns varied consequently form a year to another with a maximum of 83,530 tonnes (in 2017) and a minimum of 2,860 (1993) (Figure 4-45).

4.3.75 The Marine Licence DML 1955 was granted in 2023 for a period of 7 years and includes a total amount of disposal of 69,993 tonnes (i.e., 9,999 tonnes per year) for sand, silt and clay.

4.3.76 The oceanographic features at this site are presented in Figure 4-46 and can be summarised as:

- The tidal range varies between 10.7 m and 5.4 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated west to east with a tidal ellipse excursion comprised between 20 km and 25 km (Figure 4-46; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 1.9 m/s and the neap peak flow at 0.84 m/s (Figure 4-46; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 93% of the data, however in extreme condition wave height can reach 5.05 m (Figure 4-46; MetOceanWorks, 2025). The waves are mostly coming from the west (55%) followed by southwest (30%) (Figure 4-46; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 74% of the data, with a main direction from the west (28%) followed by southwest (17%) (Figure 4-46; MetOceanWorks, 2025).

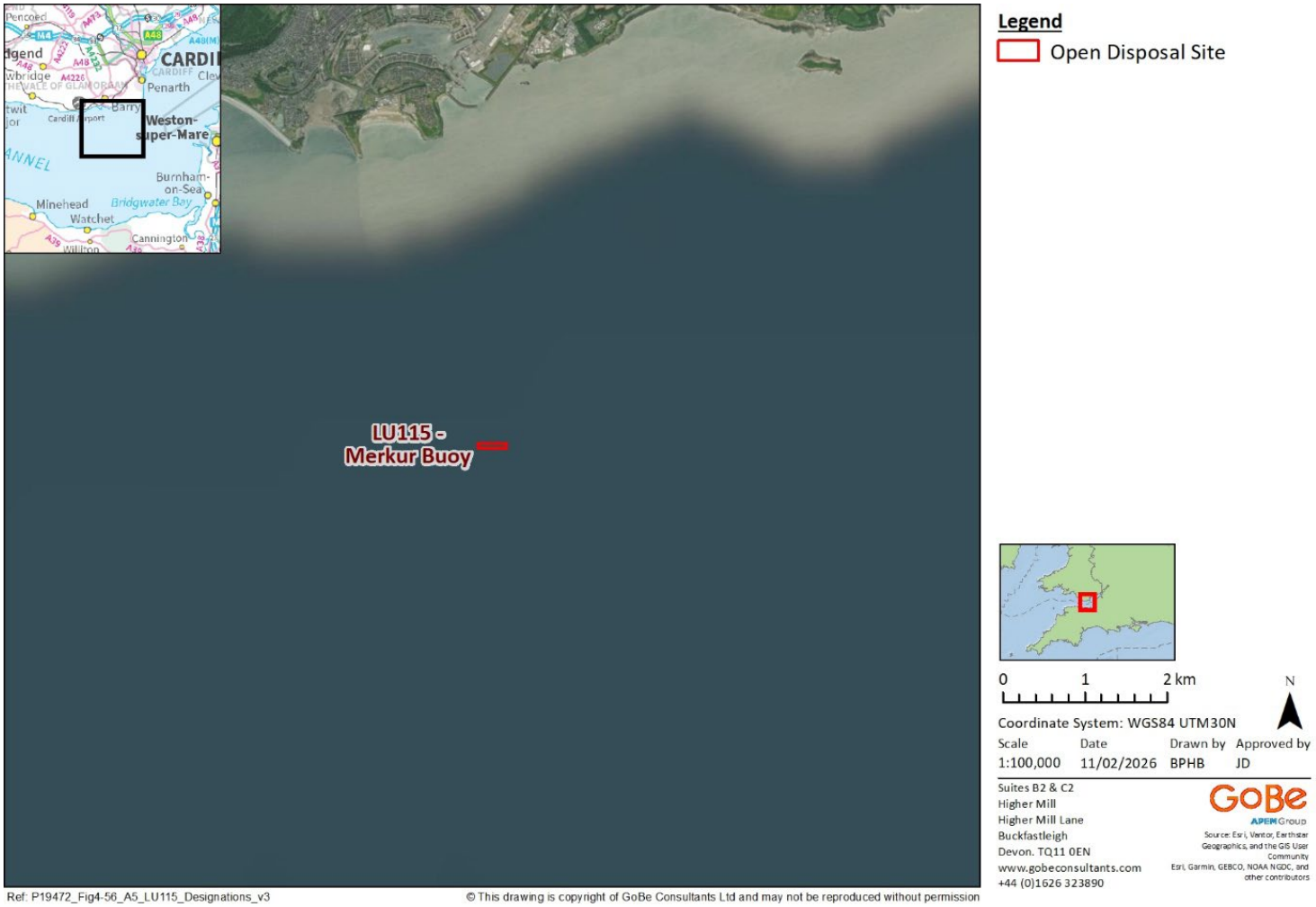



Figure 4-44: Map showing the Merkur Buoy (LU115) location.

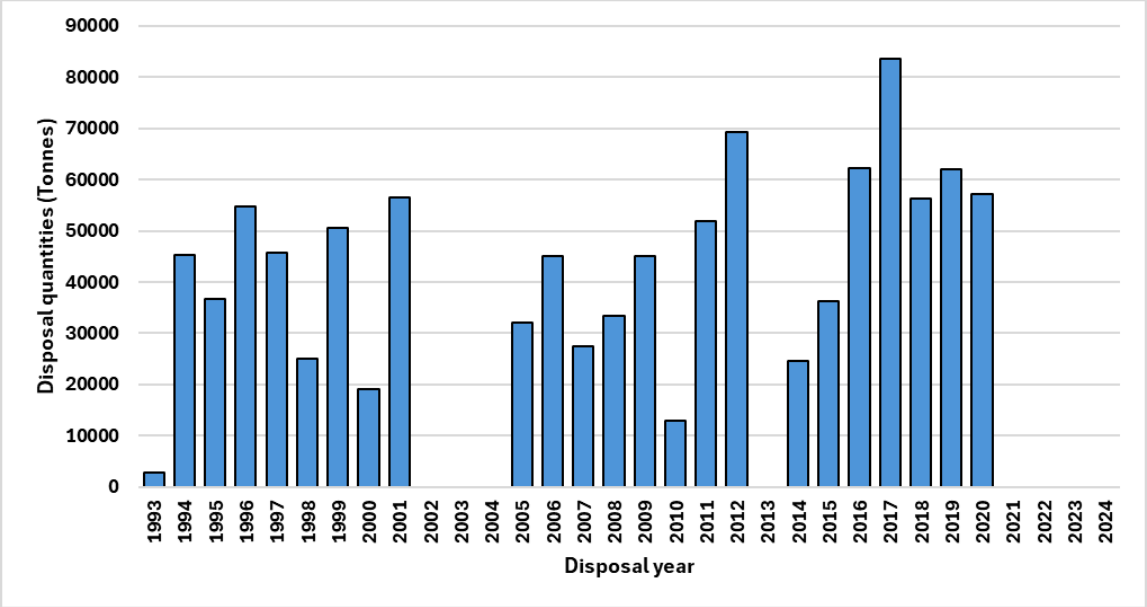



Figure 4-45: Bar graph representing the annual disposal quantities (tonnes) at Merkur Buoy (LU115) between 1993 and 2024.

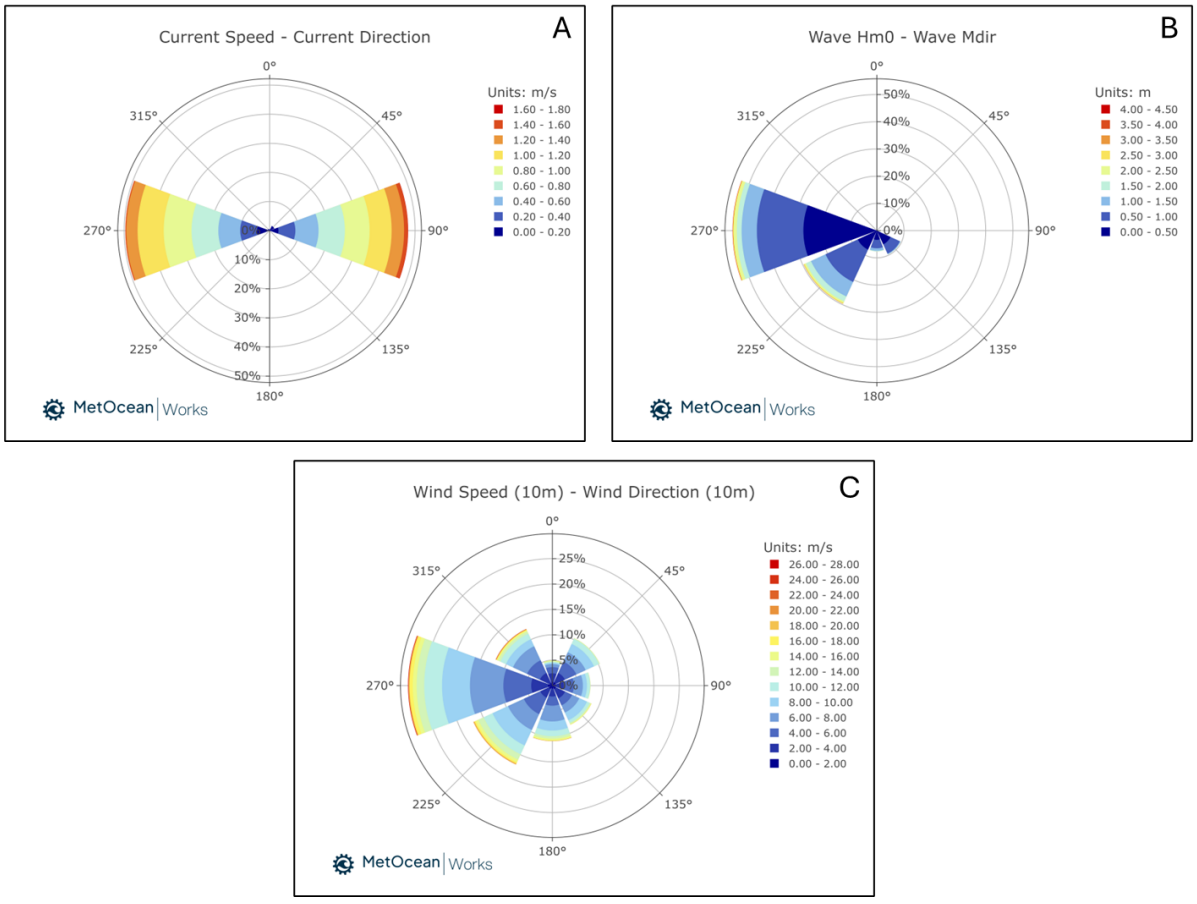



Figure 4-46: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Merkur Buoy (LU115) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.77 The tidal excursion ellipse is between 20 km and 25 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.14 (Appendix D).

## Modelling results

4.3.78 The dispersal of disposed material was carried out for sand (33%), silt (33%) and clay (33%). The total volume simulated corresponds to 105,330 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 5437 mm.

4.3.79 The modelling results simulated at Merkur Buoy (LU115) can be summarised as:

- The sediment plume is shown to fully disperse after 81 days and 83.5 days when the deposition of dredged material occurs in summer and winter, respectively (Figure 4-47);
- The bed thickness increased to a maximum of 2.3 m for both summer and winter simulations (Figure 4-47);
- The maximum SSC is observed directly after deposition with values comprised between 10 mg/L and 25 mg/L for both winter and summer simulations (Figure 4-47);
- The sediment plume disperses to a maximum of, approximately, 20 km both upstream and downstream of the site in the Severn Estuary for both summer and winter simulations (data not shown); and
- No retention of disposed dredged material is observed at Merkur Buoy (LU115).

4.3.80 Comparison of bathymetric survey data between 2020 and 2022 was carried out by ABPmer (2023b) within Merkur Buoy (LU115) and across the wider area. The results indicate very little variation in bed elevation, which can be summarised as follows:

- Within the disposal site bed level changes less than 0.2 m are observed with the maximum observed at the southern end of the spoil ground (less than 0.4 m); and
- Outside and in the vicinity of the disposal site, the average bed level change recorded across the two transect profiles is less than 0.1 m.

4.3.81 The bathymetric survey correlates with evidence from the modelling results that Merkur Buoy (LU115) is highly dispersive (ABPmer, 2023b). It is important to mention that the modelling results are shown for one disposal event, whereas the observations of very little variation in bed elevation observed between 2020 and 2022 may be the result of multiple disposals of dredged sediment as well as natural variations due to hydrodynamic regime (i.e., action of river discharge, tide and wave regime).

4.3.82 The modelling results are similar for both simulations when disposed dredged material is released during summer and winter. The results show that the highest SSC is often correlated to spring tidal periods (Figure 4-47). Consequently, it can be concluded that the main factor of dispersal is the tidal current at Merkur Buoy (LU115).

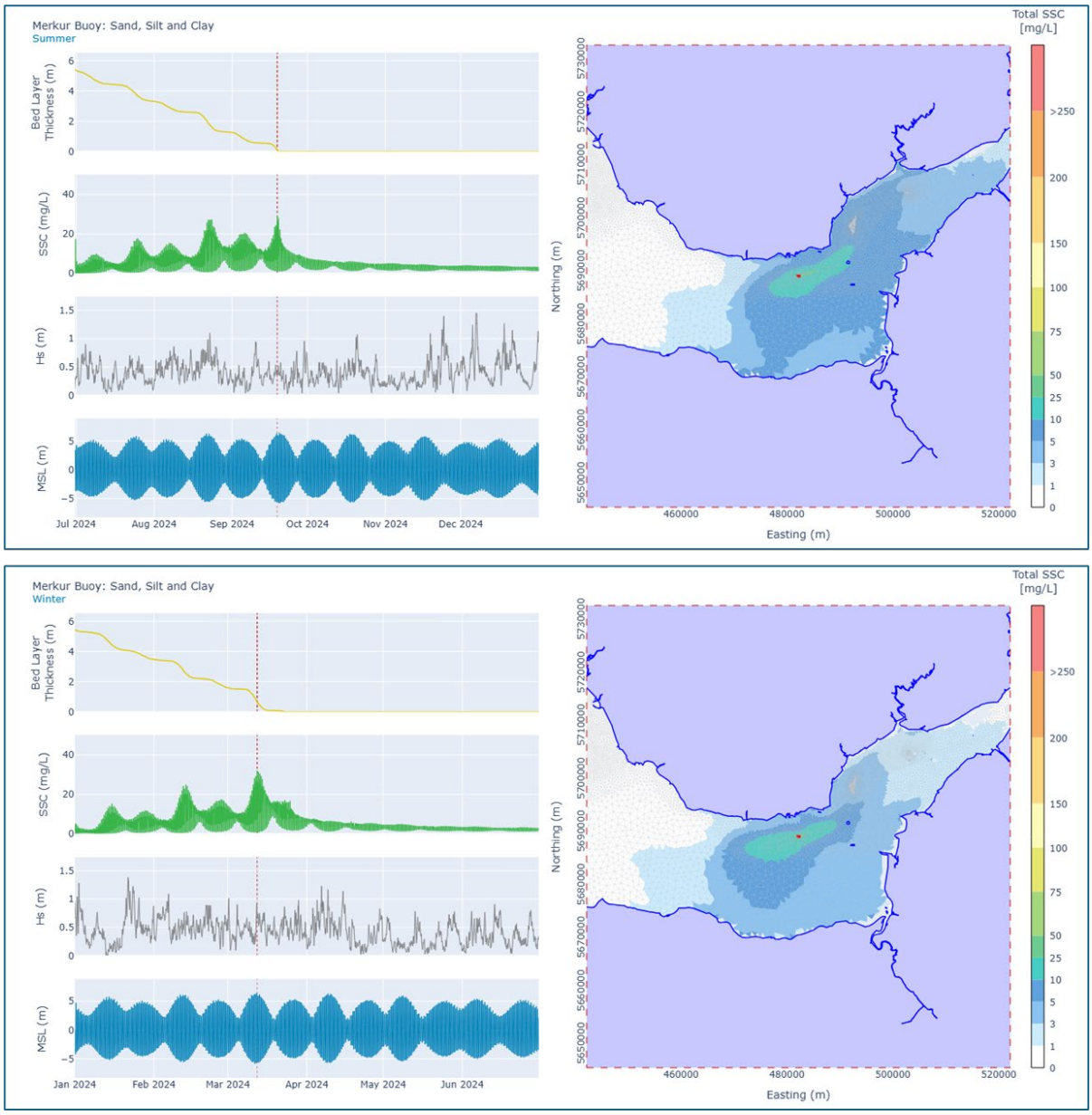



Figure 4-47: Illustration showing the maximum SSC simulated at Merkur Buoy (LU115) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Swansea Bay (Outer) (LU130)

### Site characterisation

4.3.83 Swansea Bay (Outer) (LU130) is a non-beneficial use site located within the Bristol Channel, approximately 3.5 km off the south coast of Wales (Figure 4-48). The first disposal return was received in 1985 (4,000 tonnes) and the total of disposal from 1985 to 2024 reaches 39,764,146 tonnes, which makes it the largest disposal site in terms of disposed volume (Figure 4-49). It is important to mention that during the period 1985 and 2004, the disposal returns represent only 1.2% (i.e., 480,672 tonnes) of the total disposed volume (Figure 4-49). Between 2005 and 2024, Swansea Bay (Outer) (LU130) has received a yearly average of 1,694,174 tonnes, with a maximum of 3,188320 tonnes in 2005 and a minimum of 636,181 tonnes in 2024 (Figure 4-49).

4.3.84 Two Marine Licences (DML 1946 and DML 1947) were granted in 2020 for a period of 10 years. DML 1946 was granted for a total amount of disposal of 3,100,000 tonnes, whereas DML 1947 was granted for a maximum deposit of 999,999 tonnes. Both Marine Licences were granted for the disposal of sand, silt and clay.

4.3.85 The oceanographic features at this site are presented in Figure 4-50 and can be summarised as:

- The tidal range varies between 8.7 m and 4.3 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated west to east with a tidal ellipse excursion comprised between 10 km and 15 km (Figure 4-50; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.84 m/s and the neap peak flow at 0.38 m/s with a residual current towards the east (Figure 4-50; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 65% of the data, however in extreme conditions wave height can reach 9.04 m (Figure 4-50; MetOceanWorks, 2025). The waves are mostly coming from the southwest (62%) followed by south (12%) (Figure 4-50; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 75% of the data, with a main direction from the southwest (20%) followed by west (19%) (Figure 4-50; MetOceanWorks, 2025).




Figure 4-48: Map showing the Swansea Bay (Outer) (LU130) location.

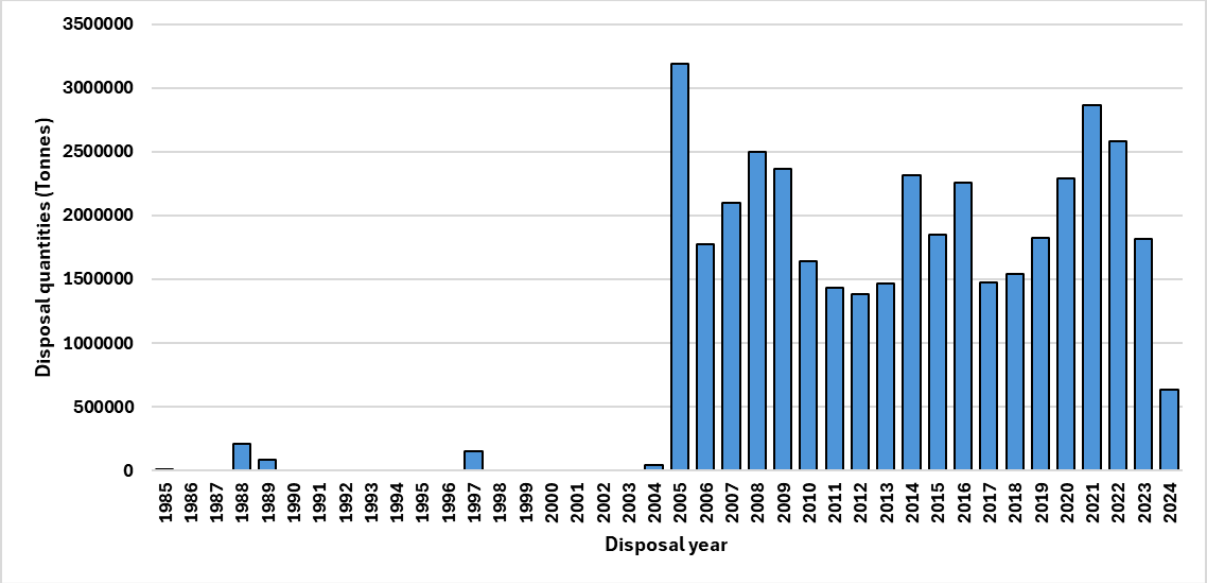



Figure 4-49: Bar graph representing the annual disposal quantities (tonnes) at Swansea Bay (Outer) (LU130) between 1985 and 2024.

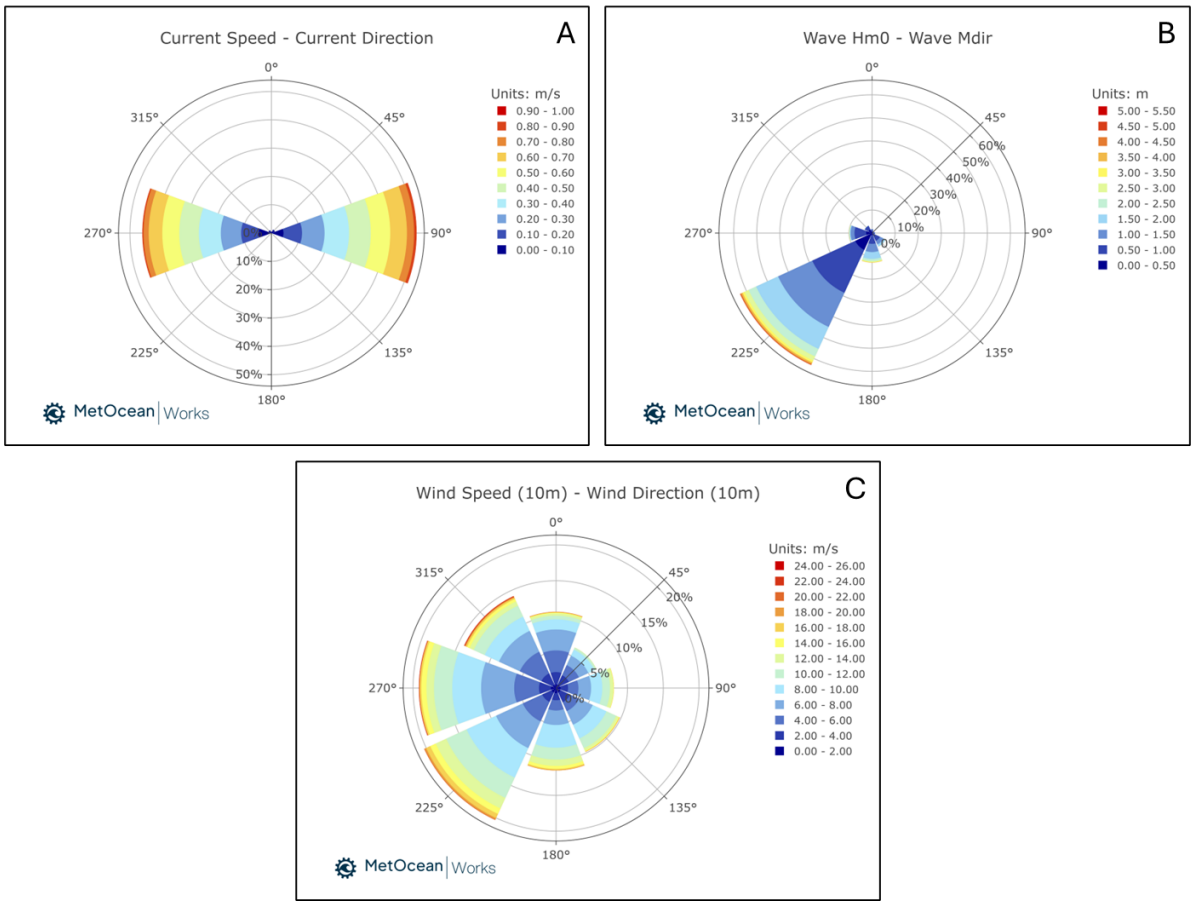



Figure 4-50: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Swansea Bay (Outer) (LU130) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.86 The tidal excursion ellipse is between 10 km and 15 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.15 (Appendix D).

## Modelling results

4.3.87 The dispersal of disposed material was carried out for sand (33%), silt (33%) and clay (33%). The total volume simulated corresponds to 303,330 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 49 mm.

4.3.88 The modelling results simulated at Swansea Bay (Outer) (LU130) can be summarised as:

- The sediment plume is shown to fully disperse after 50.9 days and 27.2 days when the deposition of dredged material occurs in summer and winter, respectively (Figure 4-51);
- The bed thickness increased to a maximum of 0.05 m for both summer and winter simulations (Figure 4-51);
- The maximum SSC is predicted after 7 days with values comprised between 100 mg/L and 150 mg/L in summer (Figure 4-51);
- The maximum SSC is predicted after 3 days with values > 250 mg/L in winter (Figure 4-51);
- The sediment plume disperses to a maximum of, approximately, 30 km west and 50 km southeast, when disposed of dredged material occurred during winter;
- The sediment plume disperses to a maximum of, approximately, 20 km west and 40 km southeast, when disposed of dredged material occurred during winter; and
- No retention of disposed dredged material is observed at Swansea Bay (Outer) (LU130).

4.3.89 The SSC variations are shown to be correlated with spring tidal events and are further enhanced when $H_s$ exceeds 2 m (Figure 4-51). At Swansea Bay (Outer) (LU130), the sediment plume is shown to disperse more eastward than westward (Figure 4-51). This can be explained by the coupled impact of residual tidal flow directed eastward and waves predominately originating from the southwest (paragraph 4.3.81 and Figure 4-50).

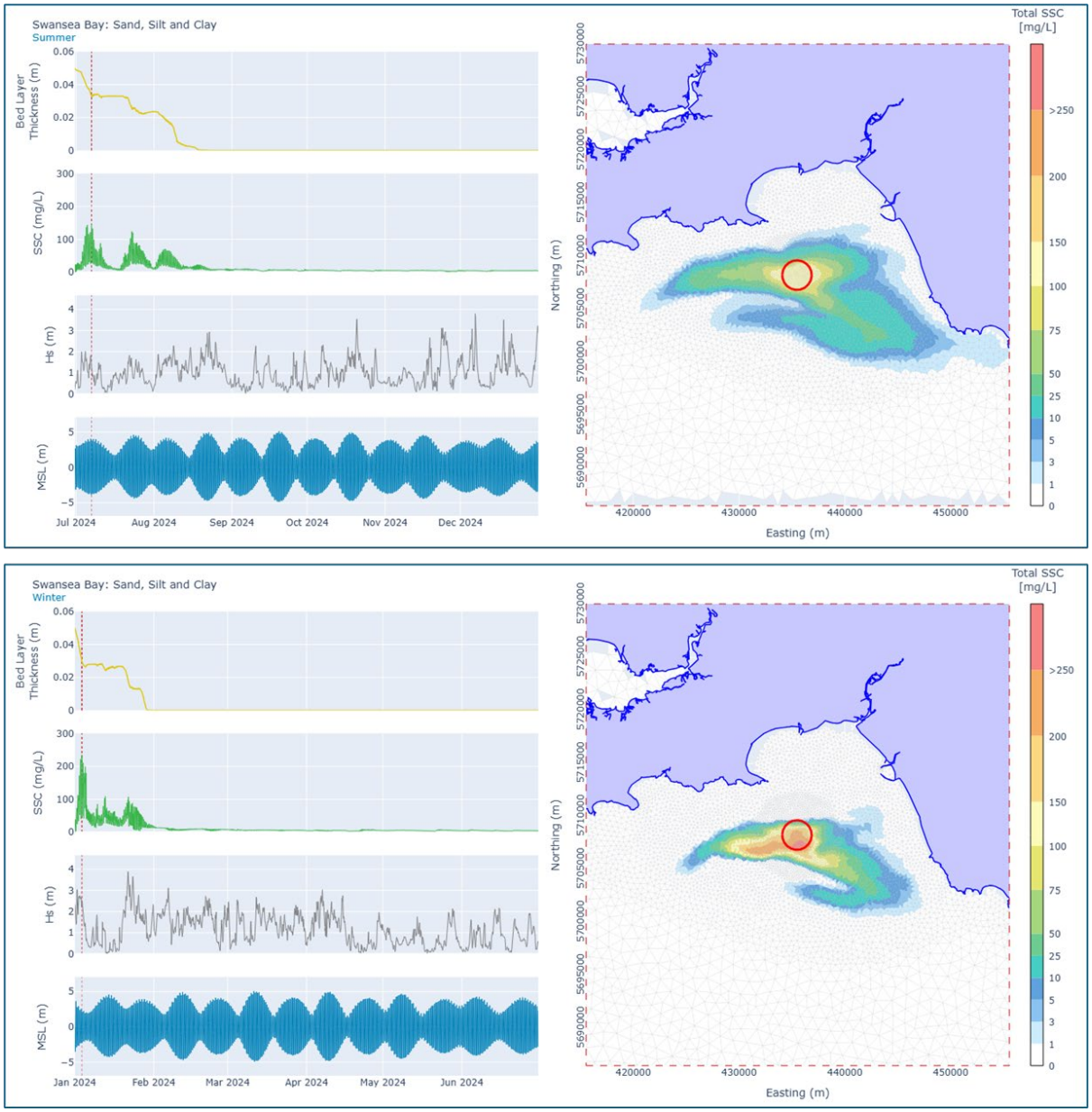



Figure 4-51: Illustration showing the maximum SSC simulated at Swansea Bay (Outer) (LU130) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Newport (LU140)

### Site characterisation

4.3.90 Newport (LU140) site is located within the Severn Estuary, approximately 5 km off the south coast of Wales (Figure 4-71). The first disposal return was received in 1990 (6950 tonnes) and the total of disposal between 1990 to 2024 reaches 3,420,867 tonnes (Figure 4-53). It is important to mention that during the period 1990 and 2007, the disposal returns represent only 1.4% (i.e., 45,858 tonnes) of the total disposed volume (Figure 4-53). Between 2008 and 2024, Newport (LU140) has received a yearly average of 198,529 tonnes, with a maximum of 312,063 tonnes in 2019 and a minimum of 14,627 tonnes in 2022. The site is mostly used as non-beneficial use, however maintenance dredged disposal was disposed in 2000 (1800 tonnes) (Figure 4-53).

4.3.91 The Marine Licence DML 1950 was granted in 2023 for a period of 7 years and includes a total amount of disposal of 499,999 tonnes for sand, silt and clay.

4.3.92 The oceanographic features at this site are presented in Figure 4-54 and can be summarised as:

- The tidal range varies between 11.7 m and 6 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated southwest to northeast with a tidal ellipse excursion comprised between 15 km and 20 km (Figure 4-54; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 1.74 m/s and the neap peak flow at 0.78 m/s (Figure 4-54; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 92% of the data, however in extreme conditions wave height can reach 3.1 m (Figure 4-54; MetOceanWorks, 2025). The waves are mostly coming from the southwest (41%) followed by west (19%) (Figure 4-54; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 81% of the data, with a main direction from the west (26%) followed by southwest (20%) (Figure 4-54; MetOceanWorks, 2025).




Figure 4-52: Map showing the Newport (LU140) location.

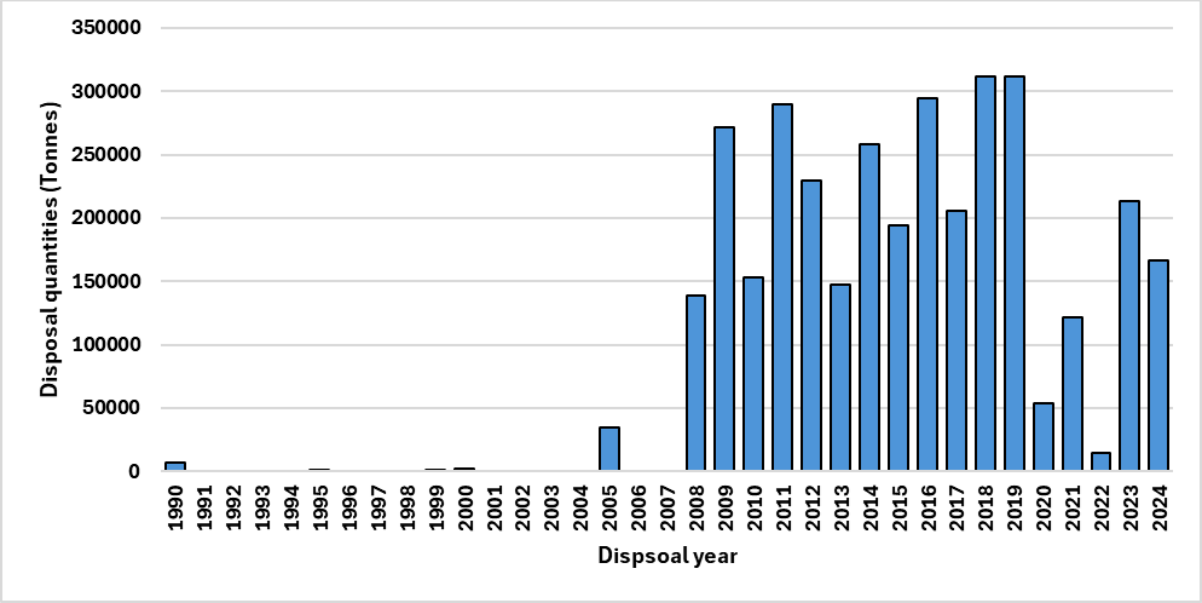



Figure 4-53: Bar graph representing the annual disposal quantities (tonnes) at Newport (LU140) between 1990 and 2024.

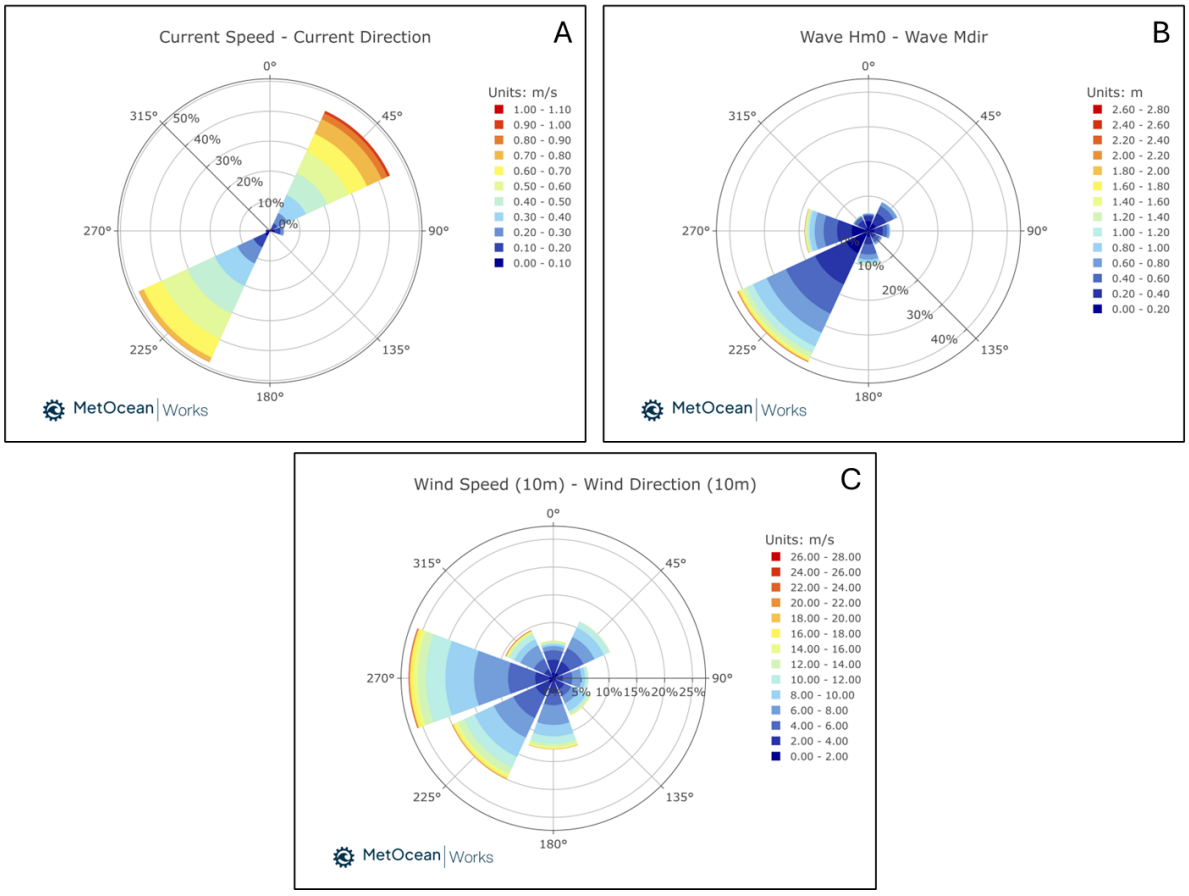



Figure 4-54: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Newport (LU140) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.93 The tidal excursion ellipse is between 15 km and 20 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.16 (Appendix D).

## Modelling results

4.3.94 The dispersal of disposed material was carried out for sand (33%), silt (33%) and clay (33%). The total volume simulated corresponds to 527,280 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 1108 mm.

4.3.95 The modelling results simulated at Newport (LU140) can be summarised as:

- The sediment plume is shown to fully disperse after 64.7 days and 69.7 days when the deposition of dredged material occurs in summer and winter, respectively (Figure 4-55);
- The bed thickness increased to a maximum of 1.1 m for both summer and winter simulations (Figure 4-55);
- The maximum SSC is predicted after 22 days with values comprised between 200 mg/L and 250 mg/L in summer (Figure 4-55);
- The maximum SSC is predicted directly after deposition with values > 250 mg/L in winter (Figure 4-55);
- The sediment plume disperses to a maximum of, approximately, 20 km downstream of the site in the Severn Estuary for both summer and winter simulations, whereas the sediment plume disperses, approximately, 30 km and 40 km upstream for summer and winter simulations, respectively (data not shown); and
- No retention of disposed dredged material is observed at Newport (LU140).

4.3.96 Comparison of bathymetric survey data between 2020 and 2022 was carried out by ABPmer (2023c) within Newport (LU140) and across the wider area. The results indicate very little variation in bed elevation, which can be summarised as follows:

- The majority of the bed elevation changes are related to natural variation (i.e., shifting of the flank of the wider Middle Ground sandbank system, moving across the site from the southeast);
- Within the disposal site bed level changes are typically up to ± 0.5 to 1. The average shallowing across the whole site is calculated at 0.32 m between the two survey periods; and
- Outside and in the vicinity of the disposal site, bed level changes are shown to be less than ± 0.5 m.

4.3.97 The bathymetric survey correlates with evidence from the modelling results that Newport (LU140) is highly dispersive (ABPmer, 2023c). It is important to mention that the modelling results are shown for one disposal event, whereas the observations of very little variation in bed elevation observed between 2020 and 2022 may be the result of multiple disposals of dredged sediment as well as natural variations due to hydrodynamic regime (i.e., movement of the Middle Grounds sandbank system).

4.3.98 At Newport (LU140), the SSC variations are shown to be correlated with spring tidal events (Figure 4-55). However, the highest SSC is predicted directly after sediment deposition when $H_s$ reaching 1 m for the winter simulation (Figure 4-55). Consequently, disposed dredged material at Newport (LU140) is mostly impacted by tidal current, but can be enhanced during storm events when $H_s$ reach values above 1 m.

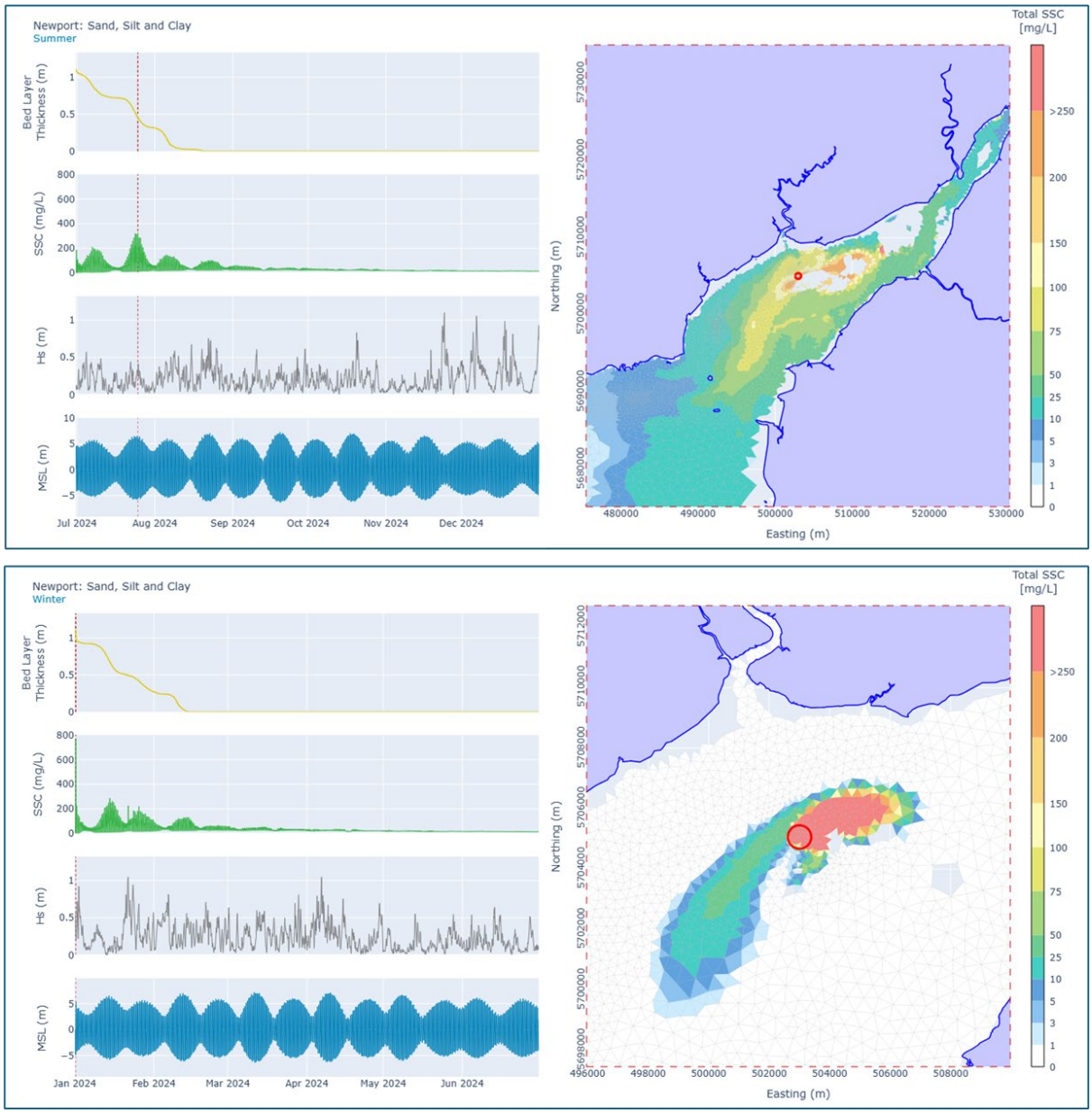



Figure 4-55: Illustration showing the maximum SSC simulated at Newport (LU140) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Milford Haven Two (LU168)

### Site characterisation

4.3.99 Milford Haven Two (LU168) is located within the Celtic Sea, approximately 10 km off the south coast of Wales (Figure 4-56). The site received disposal returns from capital dredged material in 1997 (94,444 tonnes) and 1998 (21,3472 tonnes) (Figure 4-57). The site has also been used as beneficial use, with the disposal of dredged material of 900 tonnes in 2006 and of 450 tonnes in 2007 (Figure 4-57). Since 2008, Milford Haven Two (LU168) did not receive disposal returns (Figure 4-57).

4.3.100 The Marine Licence DML 2166 was granted in 2024 for a period of 8 years and includes a maximum amount of disposal of 60,000 $m^3$ over a consecutive 5-year period for particle size > 0.25 mm (i.e., equivalent to medium sand).

4.3.101 The oceanographic features at this site are presented in Figure 4-58 and can be summarised as:

- The tidal range varies between 7.5 m and 3.1 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated northwest to southeast with a tidal ellipse excursion comprised between 10 km and 15 km (Figure 4-58; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.96 m/s and the neap peak flow at 0.5 m/s with a residual current towards the northwest (Figure 4-58; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 58% of the data, however in extreme conditions wave height can reach 9.24 m (Figure 4-58; MetOceanWorks, 2025). The waves are mostly coming from the southwest (47%) followed by west (35%) (Figure 4-58; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 75% of the data, with a main direction from the southwest and west (20% for each direction) (Figure 4-58; MetOceanWorks, 2025).

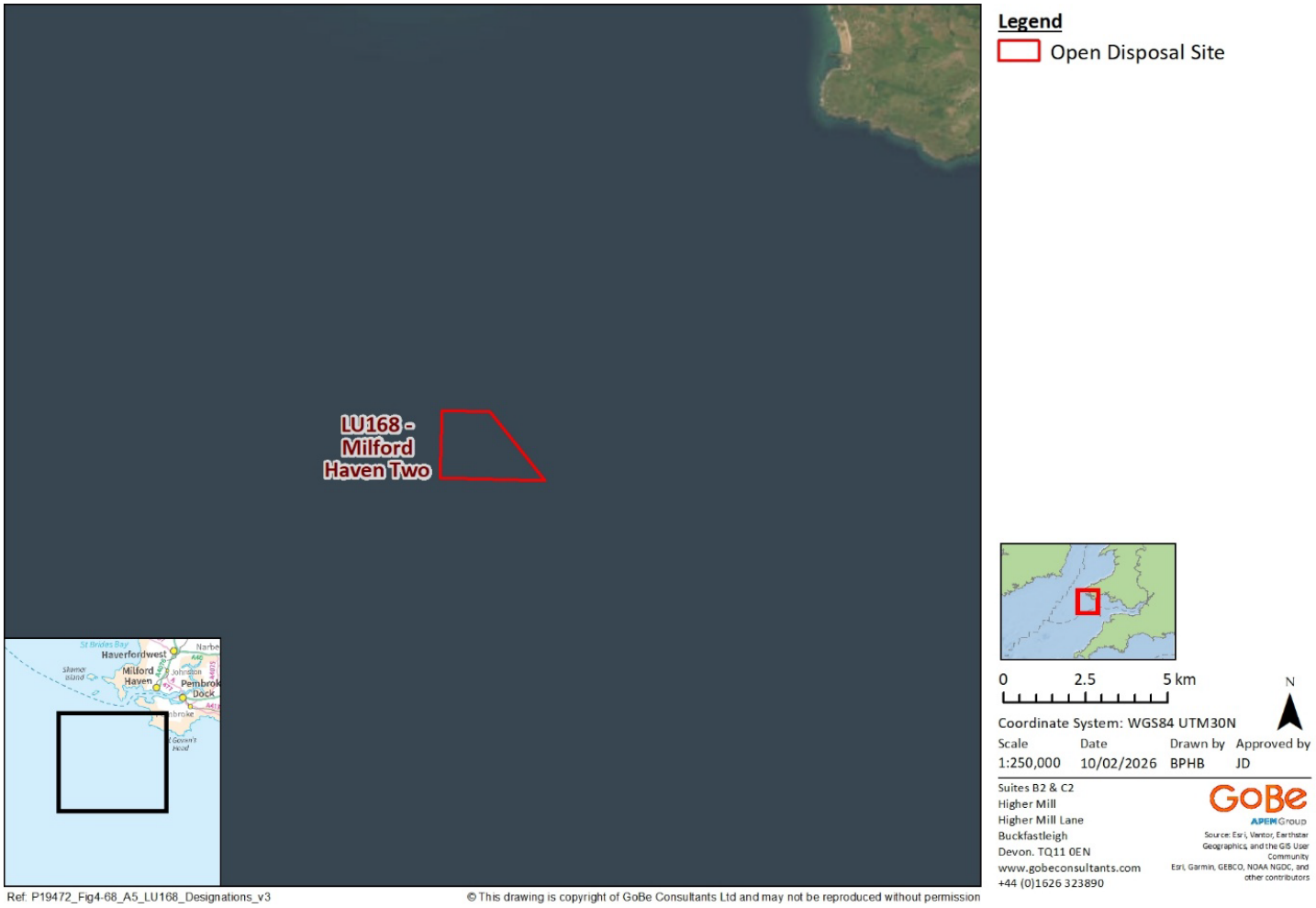



Figure 4-56: Map showing the Milford Haven Two (LU168) location.

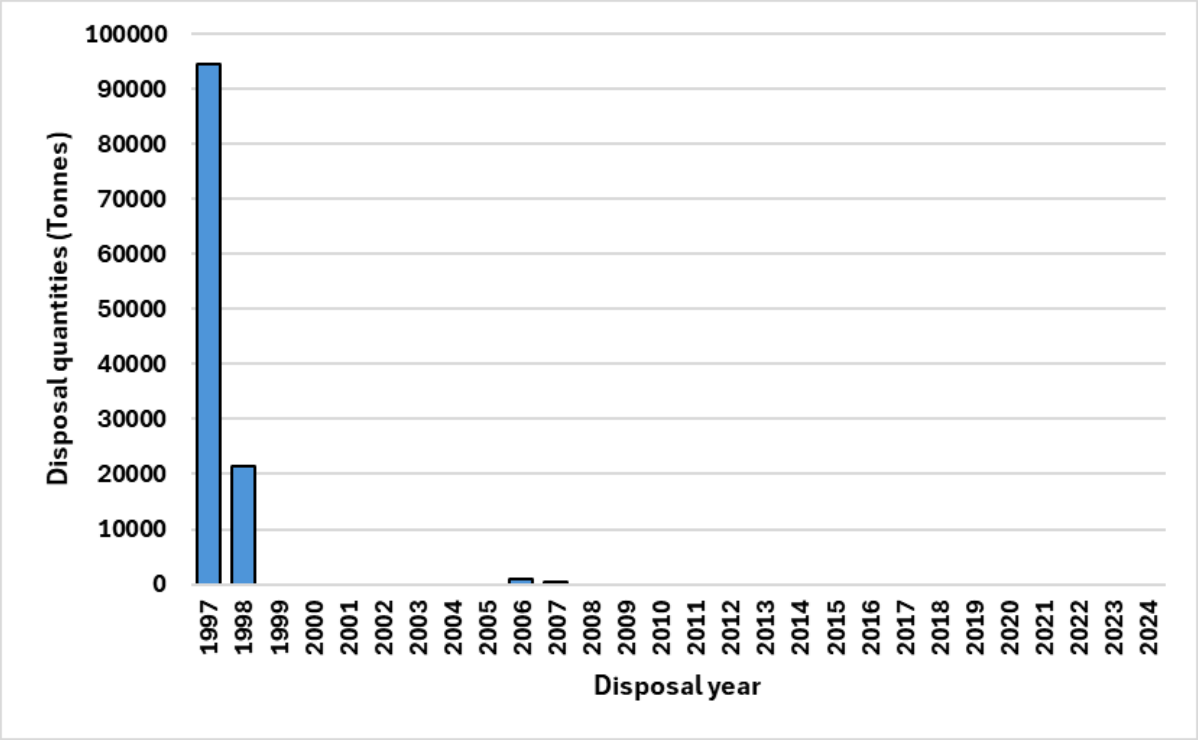



Figure 4-57: Bar graph representing the annual disposal quantities (tonnes) at Milford Haven Two (LU168) between 1997 and 2024.

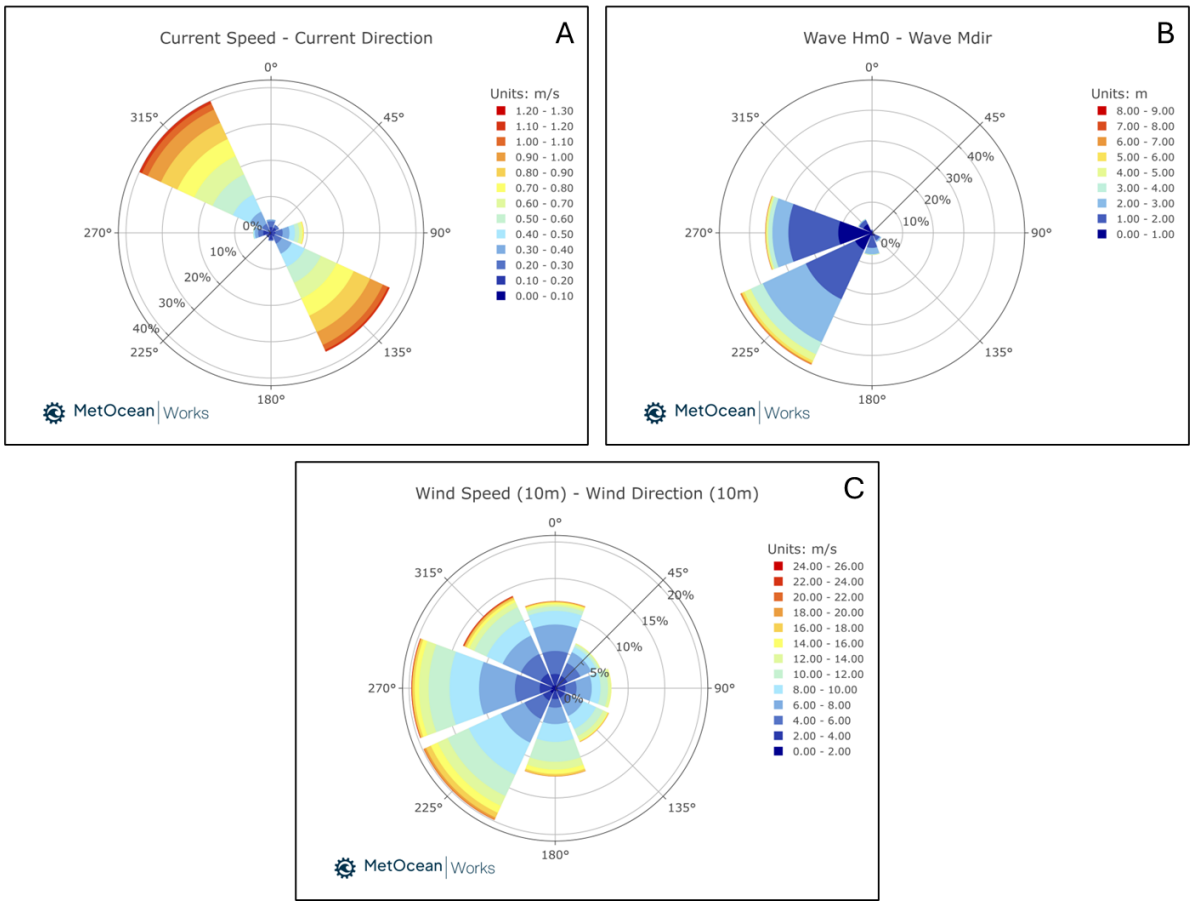



Figure 4-58: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Milford Haven Two (LU168) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.102 The tidal excursion ellipse is between 10 km and 15 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.17 (Appendix D).

## Modelling results

4.3.103 The dispersal of disposed material was carried out for sand (100%). The total volume simulated corresponds to 11,830 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 3 mm.

4.3.104 The modelling results simulated at Milford Haven Two (LU168) can be summarised as:

- The sediment plume is shown to fully disperse after 5.8 days and 4.1 days when the deposition of dredged material occurs in summer and winter, respectively (Figure 4-59);
- No significant increase of bed layer thickness is simulated (i.e., increased in order of 25 mm) (Figure 4-59); and

- No sediment plume is observed in summer (Figure 4-59);
- The maximum SSC is observed directly after deposition with values comprised between 5 mg/L and 10 mg/L in winter (Figure 4-59); and
- No retention of disposed dredged material is observed at Milford Haven Two (LU168).

4.3.105 At Milford Haven Two (LU168), the type of sediment simulated is sand, which is known to settle faster than fine sediment (i.e., like silt as per results shown for Milford Haven Three (LU169) (Figure 4-63). Consequently, the formation of sediment plume is unlikely to occur except during storm events with $H_s$ exceeding 4 m (Figure 4-59).

4.3.106 As the model did not simulate any retention or the generation of a sediment plume, it is suggested than sediment at Milford Haven Two (LU168) could be transported by saltation instead than being in suspension.

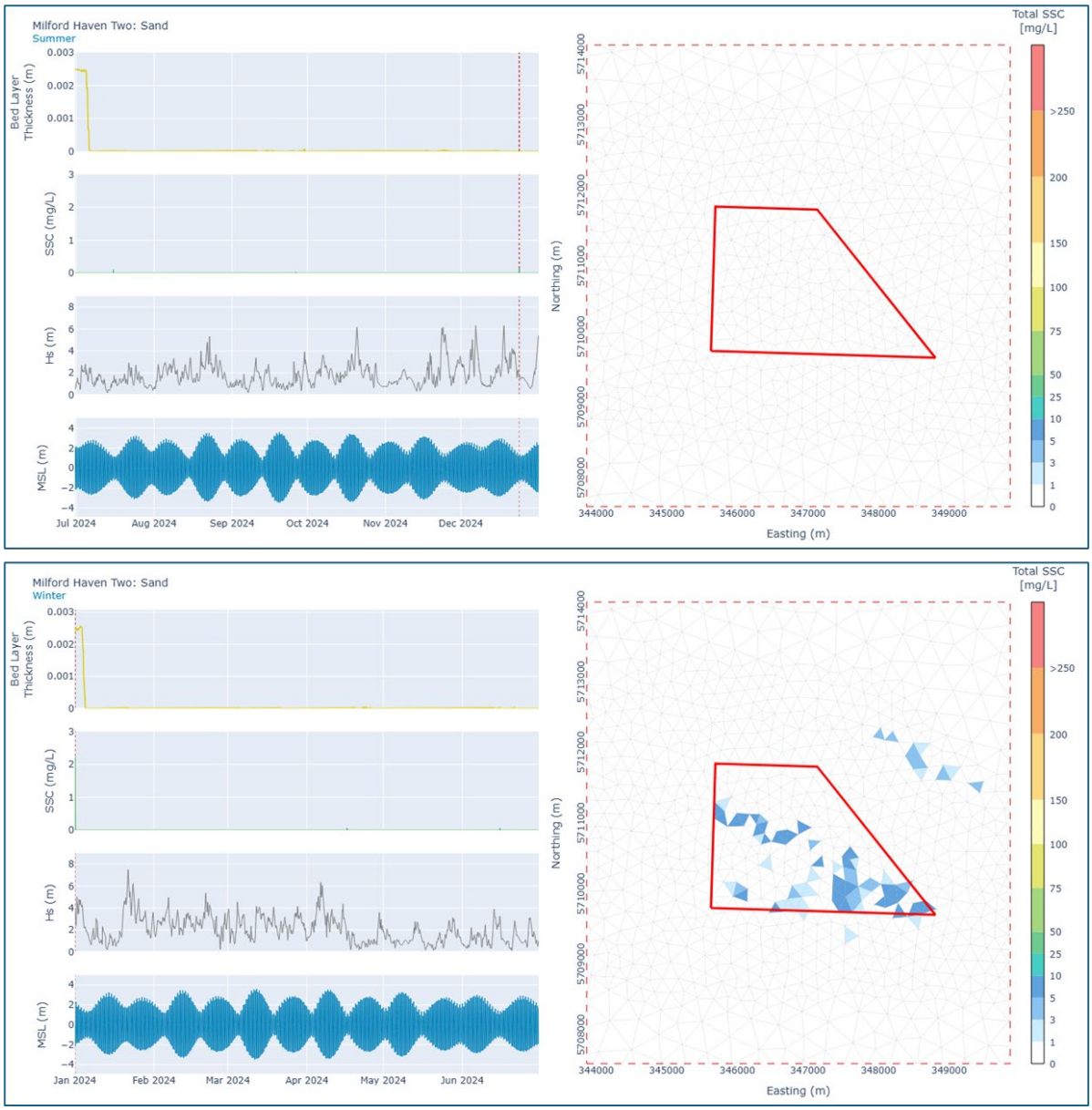



Figure 4-59: Illustration showing the maximum SSC simulated at Milford Haven Two (LU168) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Milford Haven Three (LU169)

### Site characterisation

4.3.107 Milford Haven Three (LU169) is located within the Celtic Sea, approximately 25 km off the south coast of Wales (Figure 4-60). The site has received both maintenance and capital dredging material between 2002 and 2024. The disposal returns quantities vary through time, with a maximum of 111,160 tonnes in 2008 and a minimum of 1503 (2002) (Figure 4-61).

4.3.108 The Marine Licence DML 2166 was granted in 2024 for a period of 8 years and includes a maximum amount of disposal of 400,000 $m^3$ over a consecutive 5-year period for sand and silt.

4.3.109 The oceanographic features at this site are presented in Figure 4-62 and can be summarised as follow:

- The tidal range varies between 5.2 m and 2.5 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated northwest to southeast with a tidal ellipse excursion comprised between 10 km and 15 km (Figure 4-62; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.95 m/s and the neap peak flow at 0.46 m/s with a residual current towards the northwest (Figure 4-62; ABPmer *et al.*, 2008; MetOceanWorks, 2025);
- The significant wave height ($H_m0$) is shown to be less than 1.5 m for 59% of the data, however in extreme conditions wave height can reach 12.1 m (Figure 4-62; MetOceanWorks, 2025). The waves are mostly coming from the southwest (41%) followed by west (31%) (Figure 4-62; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 75% of the data, with a main direction from the southwest and west (20% for each direction) (Figure 4-62; MetOceanWorks, 2025).

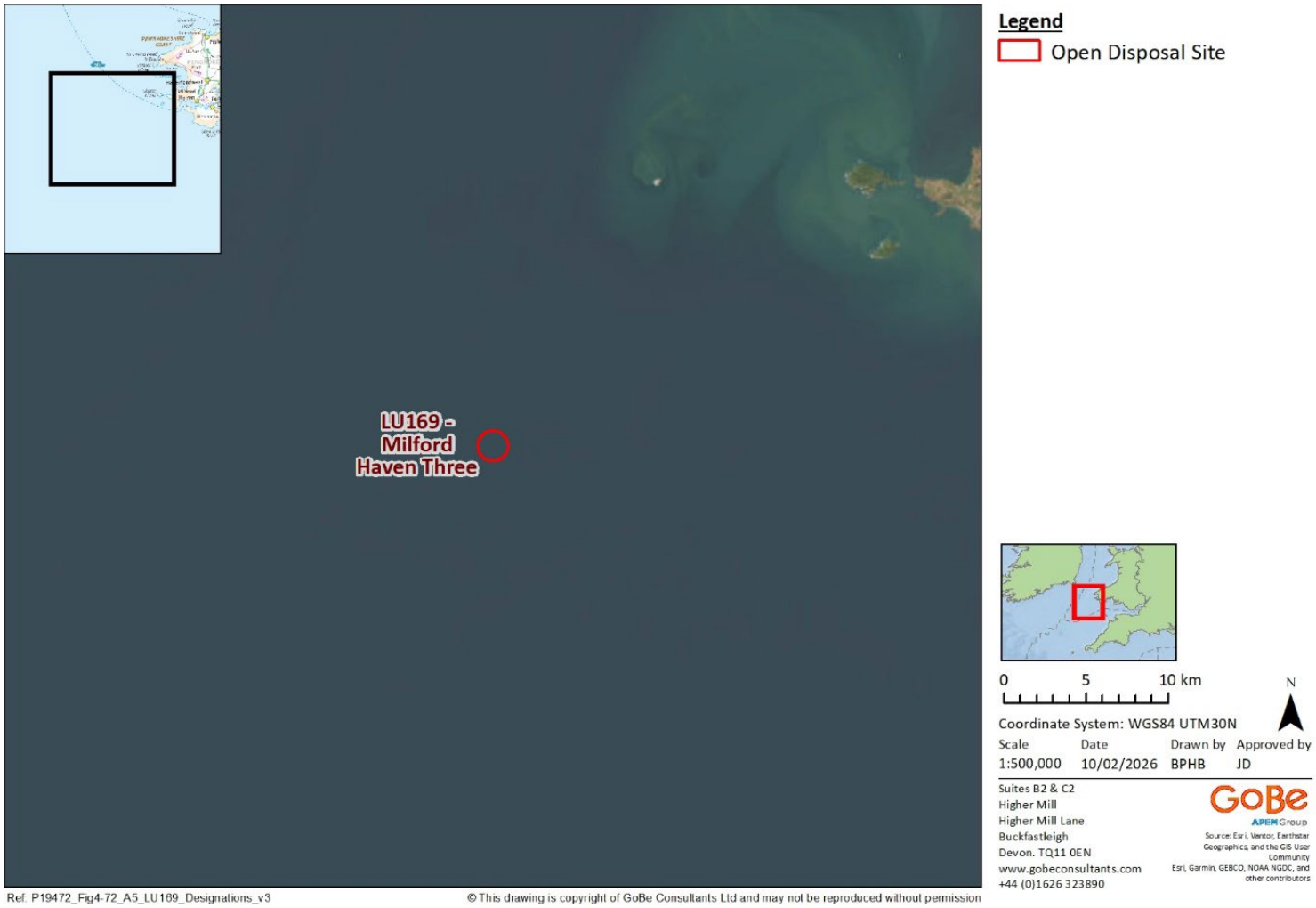



Figure 4-60: Map showing the Milford Haven Three (LU169) location.

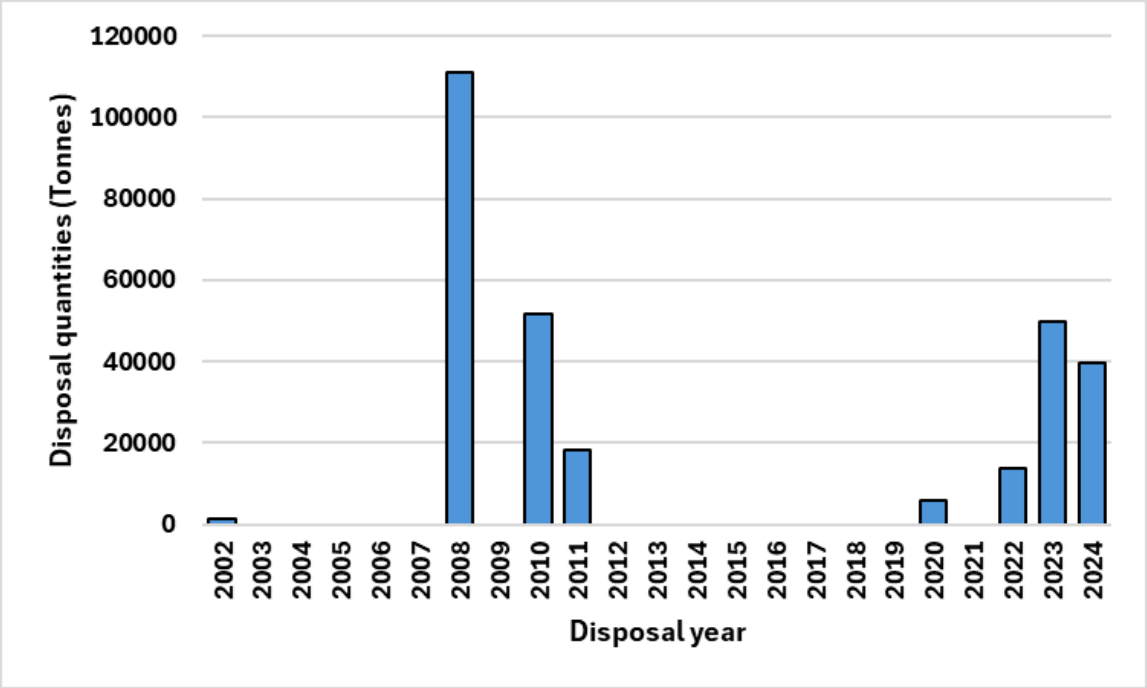



Figure 4-61: Bar graph representing the annual disposal quantities (tonnes) at Milford Haven Three (LU169) between 2002 and 2024.

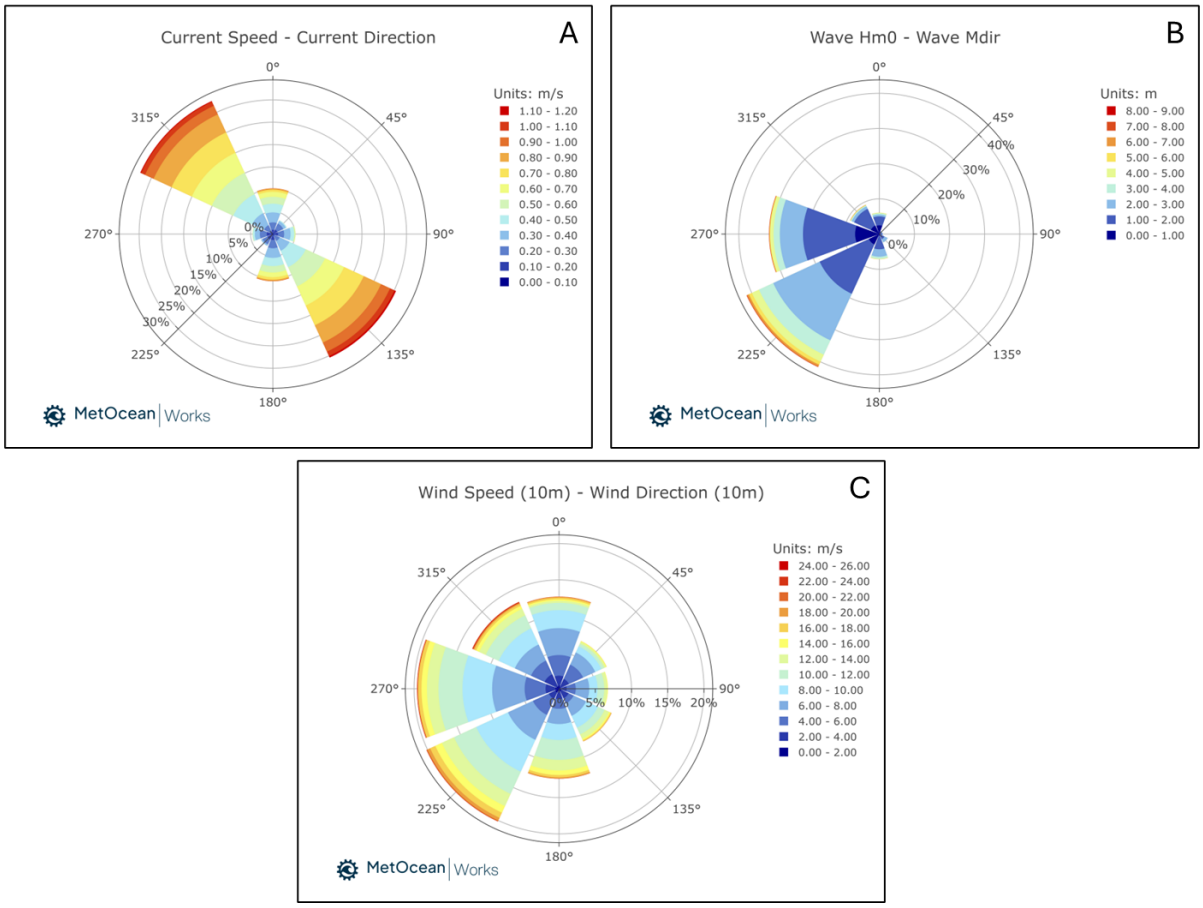



Figure 4-62: Hindcast model data showing the tidal current speed and direction (Panel A), wave height and direction (Panel B) and wind speed and direction (Panel C) at Milford Haven Three (LU169) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.110 The tidal excursion ellipse is between 10 km and 15 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.18 (Appendix D).

## Modelling results

4.3.111 The dispersal of disposed material was carried out for sand (50%) and silt (50%). The total volume simulated corresponds to 80,870 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 30 mm.

4.3.112 The modelling results simulated at Milford Haven Three (LU169) can be summarised as:

- The sediment plume is shown to fully disperse after 36.4 days and 26.4 days when the deposition of dredged material occurs in summer and winter, respectively (Figure 4-63);
- The bed thickness increased to a maximum of 0.03 m for both summer and winter simulations (Figure 4-63);

- The maximum SSC is predicted to be comprised between 5 mg/L and 10 mg/L for after 10 days summer (Figure 4-63);
- The maximum SSC is predicted after 15 days in winter with values comprised between 5 mg/L and 10 mg/L (Figure 4-63); and
- No retention of disposed dredged material is observed at Milford Haven Three (LU169).

4.3.113 The sediment plume extends in four directions, summarised in Table 4-5 below:

Table 4-5: Direction and distance of sediment plume extension at Milford Haven Three (LU169) for both summer and winter simulations.

| Direction | Maximum distance travelled (km) | |
|---|---|---|
| | Summer simulation | Winter simulation |
| Northwest | 27 | 27 |
| Northeast | 20 | 17 |
| South | 10 | 10 |
| West | 27 | 25 |

4.3.114 The simulation of disposed dredged material at Milford Haven Three (LU169) considered two types of sediment; sand and silt. It is expected that sand settle faster than silt. Furthermore, sand is more likely to be transported by saltation at the seabed instead of being in suspension except during storm events as shown at Milford Haven Two (LU168) (paragraphs 4.3.99 and 4.3.100).

4.3.115 The sediment plume extent (Table 4-5) is explained by a combined action of tidal and wave regime. The residual tidal current is directed north-westerly, which results in the sediment plume extending towards the northwest (Table 4-5 and Figure 4-62). As the main wave direction is coming from the southwest, it influenced the sediment dispersal towards the northeast (Table 4-5 and Figure 4-62).

4.3.116 The SSC variations show a close correlation with tidal regime, with an increase of SSC occurring during spring tide periods (Figure 4-63). Also, results show that an increase of SSC can be high when spring tide and Hs exceeding 6 m occur at the same time (as shown for the second SSC peak during the winter simulation in Figure 4-63).

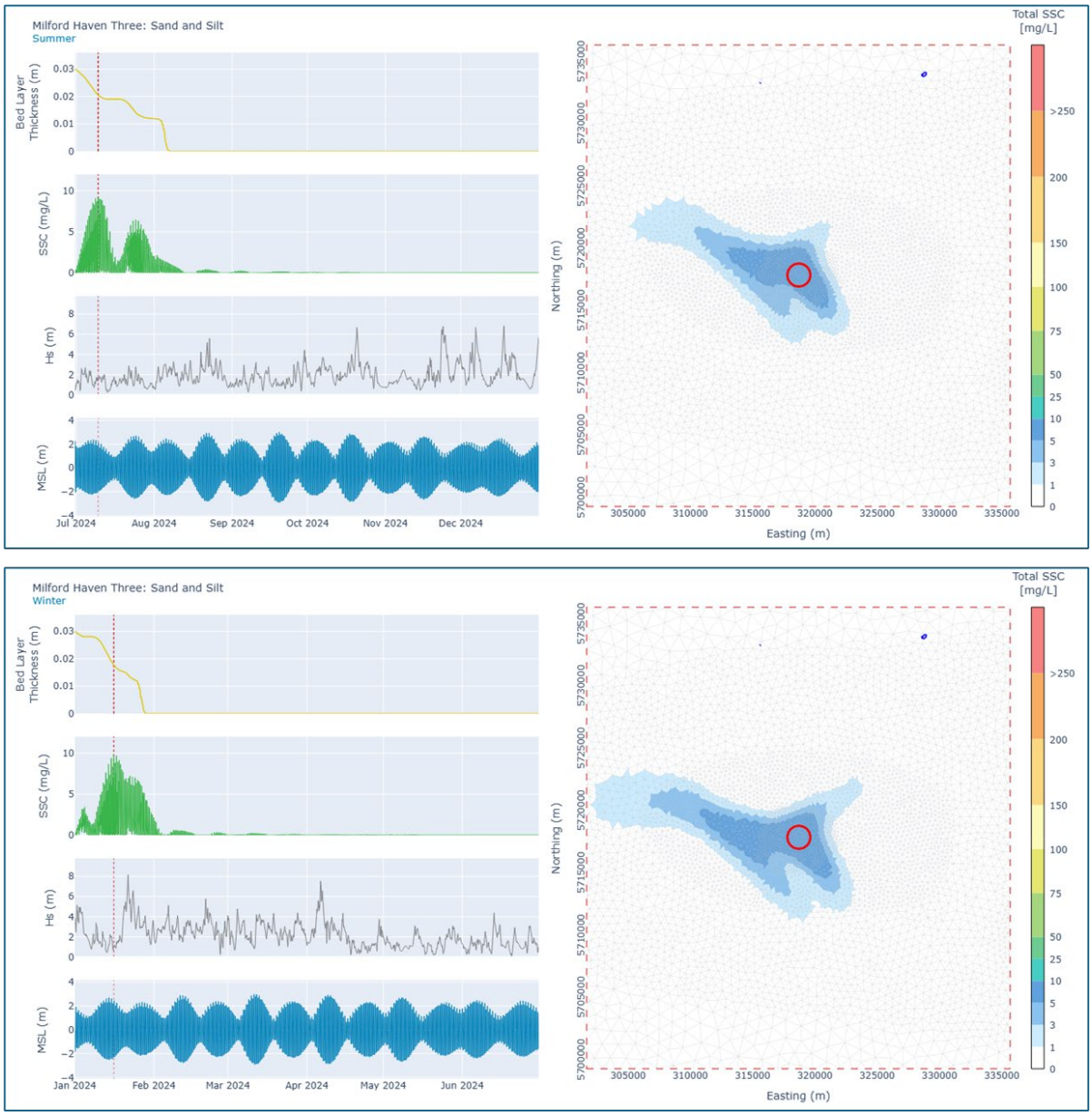



Figure 4-63: Illustration showing the maximum SSC simulated at Milford Haven Three (LU169) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

## Neyland (Off Milford Haven) (LU190)

### Site characterisation

4.3.117 Neyland (Off Milford Haven) (LU190) is a beneficial use site located within the Cleddau Estuary (Figure 4-64). The first disposal return was received in 2001 (1842 tonnes) and the total of disposal between 2001 to 2024 reaches 52,199 tonnes (Figure 4-65). Between 2001 and 2013, the disposal returns represent only 11% (i.e., 6,011 tonnes) of the total disposed volume (Figure 4-65). Between 2014 and 2024, Neyland (Off Milford Haven) (LU190) has received a yearly average of 4,199 tonnes, with a maximum of 6,132 tonnes in 2021 and a minimum of 1,050 tonnes in 2015 (Figure 4-65).

4.3.118 The Marine Licence DML 1743 was granted in 2020 for a period of 9 years and includes a total amount of disposal of 49,500 tonnes (i.e., 5,500 tonnes per year) for sand, silt and clay.

4.3.119 It is supposed that the sediment dispersal will be a combined effect of tidal current and river flow, however waves are not expected to influence the dispersal of disposed dredged material. Consequently, the wave regime was not characterised for Neyland (Off Milford Haven) (LU190). Furthermore, it has been shown than the flow speeds are primarily dominated by tidal currents than river flow velocity (NRW, 2015).

4.3.120 The oceanographic features at this site can be summarised as:

- The tidal range varies between 5.8 m and 3.1 m during spring and neap tides respectively (ABPmer *et al.*, 2008). The tidal regime is shown to be orientated west to east (Figure 4-66; ABPmer *et al.*, 2008; MetOceanWorks, 2025). The spring peak flow is on average simulated at 0.78 m/s and the neap peak flow at 0.31 m/s with a residual current towards the west (ABPmer *et al.*, 2008; MetOceanWorks, 2025); and
- The wind regime is shown to be less than 10 m/s for 76% of the data, with a main direction from the southwest (20%) and west (18%) (Figure 4-66; MetOceanWorks, 2025).




Figure 4-64: Map showing the Neyland (Off Milford Haven) (LU190) location.

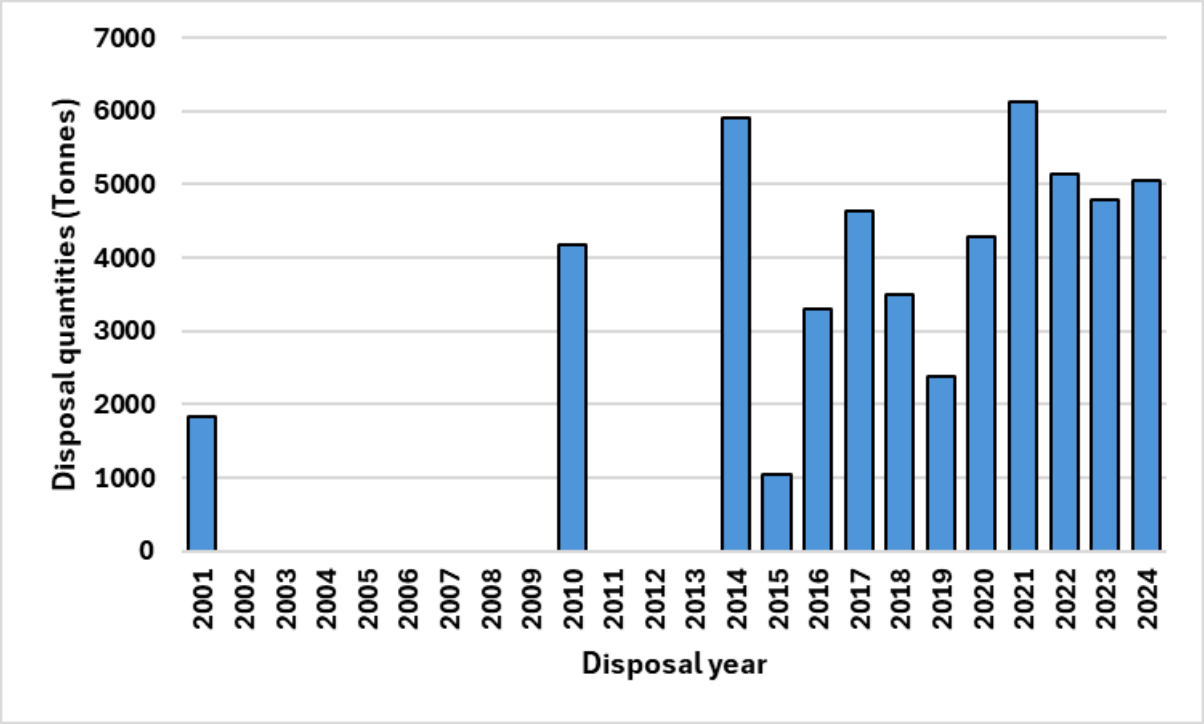
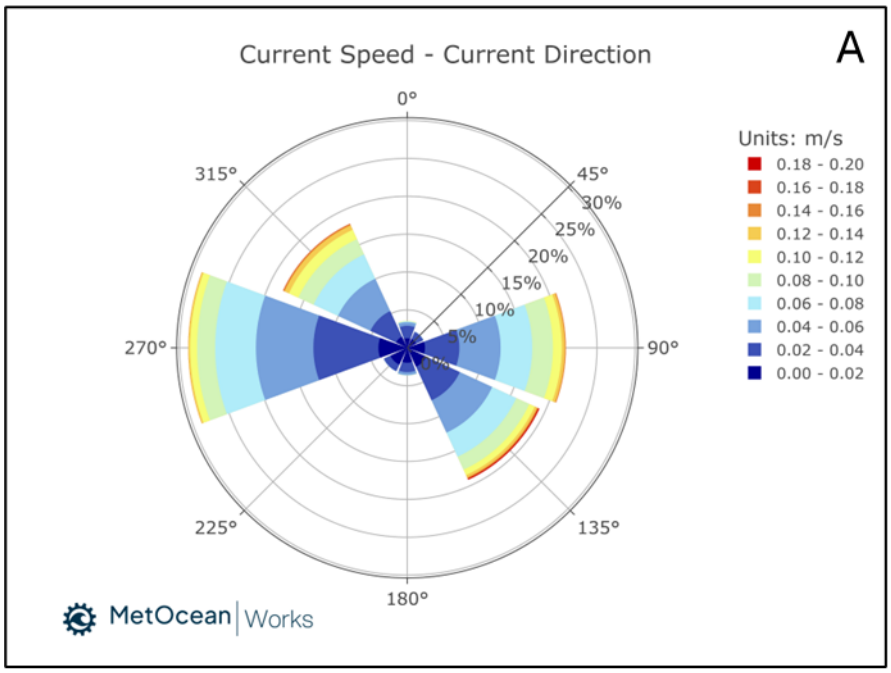



Figure 4-65: Bar graph representing the annual disposal quantities (tonnes) at Neyland (Off Milford Haven) (LU190) between 2001 and 2024.



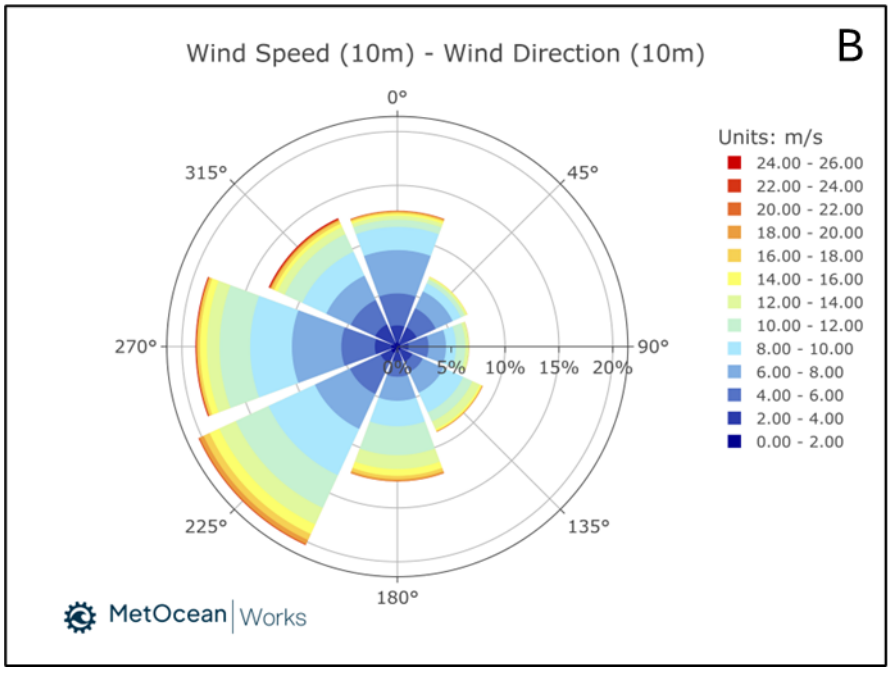




Figure 4-66: Hindcast model data showing the tidal current speed and direction (Panel A), and wind speed and direction (Panel B) at Neyland (Off Milford Haven) (LU190) (MetOceanWorks, 2025).

## Potentially sensitive receptors

4.3.121 The tidal excursion ellipse is between 7 km and 8 km (ABPmer *et al.*, 2008), consequently the designated sites and associated designated receptors identified are presented in section D.19 (Appendix D).

## Modelling results

4.3.122 The dispersal of disposed material was carried out for sand (33%), silt (33%) and clay (33%). The total volume simulated corresponds to 6,510 $m^3$. Furthermore, the material was disposed evenly within the disposal site, which lead to a starting bed thickness of 49 mm.

4.3.123 The modelling results simulated at Neyland (Off Milford Haven) (LU190) can be summarised as:

- The sediment plume does not fully disperse after six months (only 7% of material remained within the disposal site) for both simulations when disposed dredged material are released in summer and winter (Figure 4-67);
- The bed thickness increased to a maximum of 0.05 m for both summer and winter simulations (Figure 4-67;
- The maximum SSC is predicted to reach values comprised between 10 mg/L and 25 mg/L after 50 days in summer (Figure 4-67);
- The maximum SSC is predicted to reach values comprised between 5 mg/L and 10 mg/L after 41 days in winter (Figure 4-67);
- The sediment plume disperses to a maximum of, approximately, 15 km in both upstream and downstream directions for both simulations in winter and summer (data not shown); and
- Neyland (Off Milford Haven) (LU190) shows a retention of disposed dredged material of 7% for both winter and summer simulations.

4.3.124 The SSC is correlated with the tidal regime, with maximum concentrations typically simulated at the same time as the spring tide, which might induce sediment re-suspension (Figure 4-67). Silt and clay are expected to be the main sediment present within the sediment plume, whereas the sand is more likely to be transported by saltation[22].

[22] Saltation is defined as the transport of particle (i.e., sand) by water, which occurs when loose materials are removed from the seabed and carried by fluid by jumping or bouncing.

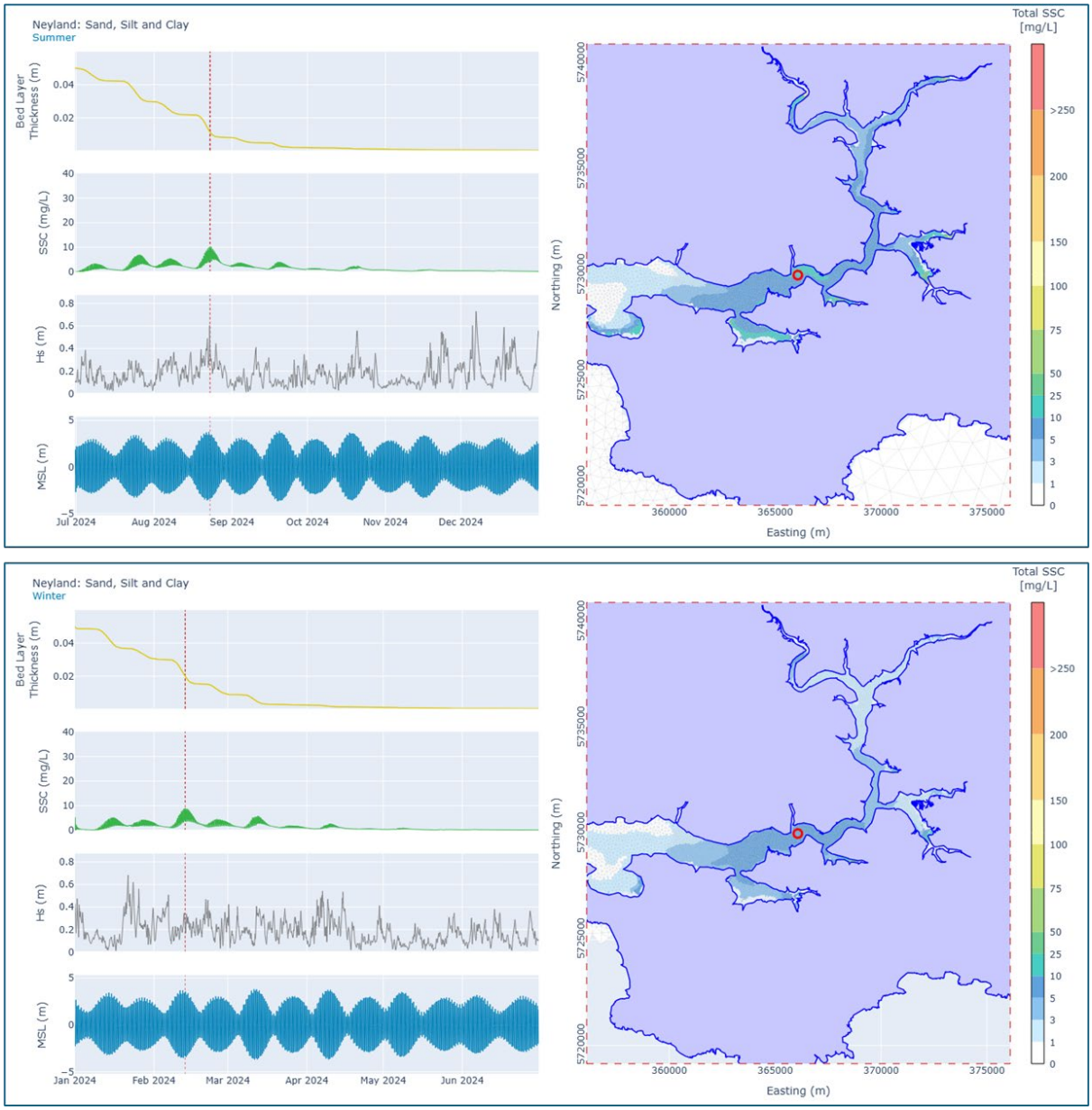



Figure 4-67: Illustration showing the maximum SSC simulated at Neyland (Off Milford Haven) (LU169) when disposed dredged material are released in summer (top panel) and winter (bottom panel).

# 5 Discussion

## 5.1 Summary of findings

5.1.1 The findings for each site are summarised in Table 5-1 which also provides the confidence of these findings and the evidence gaps related to each disposal site.

5.1.2 The key findings are based on averaged oceanographic conditions (i.e., average tidal current, mean significant wave height and average wind speed). Storm events (i.e., greater wave heights and wind speed) will have a greater influence on the dispersal of disposed dredged material and will potentially impact all sediment types (i.e., gravel, sand, mud and silt).

Table 5-1: Summary table showing the key results for each disposal site review alongside the confidence in the assessment and any evidence gaps / suggestions for further investigation.

| Site | Key characteristics | Confidence | Evidence gaps |
|---|---|---|---|
| Tanybwlch Beach (IS012) | ▪ Net sediment transport orientated northward; and<br>▪ Potential impact of harbour pier to retain coarse sediment from disposed dredged material (i.e., gravel and coarse sand). | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from complex interactions, which could benefit from being considered in future modelling assessment. |
| Aberystwyth South (IS013) | ▪ Net sediment transport orientated northward; and<br>▪ Disposal site shows a very slow net loss of sediment. | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from complex interactions, which could benefit from being considered in future modelling assessment. |
| Spending Harbour (IS016) | ▪ Net sediment transport orientated northward; and<br>▪ Disposal site located within Aeron River which might influence the sediment transport offshore. | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from complex interactions, which could benefit from future modelling assessment. |

| | | | |
|---|---|---|---|
| New South Beach (IS021) | ▪ Net sediment transport orientated northward; and<br>▪ Potential impact of new breakwater on disposed material retention. | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from complex interactions, which could benefit from being considered in future modelling assessment. |
| Shell Lagoon, Llanbedr (IS018) | ▪ Sediment transport influenced by both northward longshore drift and southward drift due to wave refraction; and<br>▪ Disposal dredged material composed of silt and sand with high potential of dispersal. | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from complex interactions, which could benefit from being considered in future modelling assessment. |
| Traeth Crugan 1 (IS023) | ▪ Net sediment transport orientated eastward; and<br>Potential increase of accretion phenomenon occurring 2.3 km east. | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from complex interactions, which could benefit from being considered in future modelling assessment. |
| Traeth Crugan 2 (IS024) | ▪ Net sediment transport orientated eastward; and<br>▪ Potential increase of accretion phenomenon occurring 3 km east. | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from |

| | | | |
|---|---|---|---|
| | | | complex interactions, which could benefit from being considered in future modelling assessment. |
| Dolau Beach (IS014) | ▪ Net sediment transport orientated south-eastward; and<br>▪ Disposed dredged material expected to be transported towards New Quay Harbour. | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from complex interactions, which could benefit from being considered in future modelling assessment. |
| Cei Bach Beach A (IS019) | ▪ Net sediment transport orientated north-eastward; and<br>▪ Disposed dredged material expected to remain within New Quay Bay. | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from complex interactions, which could benefit from being considered in future modelling assessment. |
| Cei Bach Beach A (IS022) | ▪ Net sediment transport orientated north-eastward; and<br>▪ Disposed dredged material expected to remain within New Quay Bay. | Based on expert opinion from disposal site characterisation and existing knowledge of the area. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Due to the coastal location of the site, sediment behaviour (e.g. dispersal, settlement and re-suspension) results from complex interactions, which could benefit from being considered in future modelling assessment. |

| | | | |
|---|---|---|---|
| New Quay Track (IS015) | ▪ High dispersion; and<br>▪ Main factors of dispersal are both tide and wave regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Accurate bathymetry data could benefit future modelling studies. |
| Deganwy Beneficial Use (IS035) | ▪ High retainment; and<br>▪ Main factor of dispersal is the wave regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Accurate bathymetry data could benefit future modelling studies. |
| Conwy Beneficial Use (IS065) | ▪ High retainment; and<br>▪ Main factor of dispersal is the wave regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Accurate bathymetry data could benefit future modelling studies. |
| Conwy Beneficial Use (IS066) | ▪ High retainment; and<br>▪ Main factor of dispersal is the wave regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Accurate bathymetry data could benefit future modelling studies. |
| Holyhead North (IS043) | ▪ High retainment; and<br>▪ Main factor of dispersal is the tidal regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions. |
| Broughton (IS099) | ▪ High retainment; and<br>▪ Main factor of dispersal is the tidal regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Accurate bathymetry data could benefit future modelling studies. |
| Mostyn Deep (IS102) | ▪ High retainment; and<br>▪ Main factors of dispersal are both tide and wave regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions. |
| Mostyn Breakwater (IS103) | ▪ High retainment; and<br>▪ Main factors of dispersal are both tide and wave regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions. |

| | | | |
|---|---|---|---|
| Cardiff Grounds (LU110) | ▪ High dispersion; and<br>▪ Main factor of dispersal is the tidal regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions. |
| Merkur Buoy (LU115) | ▪ High dispersion; and<br>▪ Main factor of dispersal is the tidal regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions. |
| Swansea Bay (Outer) (LU130) | ▪ High dispersion; and<br>▪ Main factors of dispersal are both tide and wave regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions. |
| Newport (LU140) | ▪ High dispersion; and<br>▪ Main factor of dispersal is the tidal regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions. |
| Milford Haven Two (LU168) | ▪ High dispersion; and<br>▪ Main factor of dispersal is the tidal regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions. |
| Milford Haven Three (LU169) | ▪ High dispersion; and<br>▪ Main factor of dispersal is the tidal regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions. |
| Neyland (Off Milford Haven) LU190 | ▪ High dispersion; and<br>▪ Main factor of dispersal is the tidal regime. | Based on modelling results and expert opinion from disposal site characterisation. | ▪ In-situ data would help validate sediment dispersal predictions; and<br>▪ Accurate bathymetry data could benefit future modelling studies. |

## 5.2 Concluding remarks

5.2.1 This review does not provide any details on management measures for each disposal site, such as favourable periods of disposal (i.e., winter or summer and ebb or flood tide) to avoid impact on designated features (e.g., mammals, birds and/or fishes) or preferential types of sediment to be disposed to avoid any change of substrata. It is the role of NRW (and PEDW), through the regulatory process, to work with operators to understand opportunities and provide recommendations on disposal period and type, according to the disposal site considered, in order to limit the potential impact on sensitive receptors.

5.2.2 For the purpose of this report, the disposal sites located in coastal areas have been characterised without modelled sediment dispersal. In coastal areas, sediment transport is a highly complex phenomenon involving hydrodynamic regimes (i.e., tides, waves and wind) coupled with the influence of coastal shape (i.e., headlands and human infrastructure), river inputs, and coastal erosion due to climate change (i.e., sea level rise and storm increase) (Brown and Davies, 2009). Further investigations could be undertaken to understand and simulate (i.e., via the use of numerical models) sediment transport at disposal sites located on the coast.

5.2.3 The report conclusions (Table 5-1) are based on desk-based studies and numerical modelling results. Future characterisation reviews could be supported by in-situ data. For example, measures of bed level changes at disposal sites, directly and during several months after the disposed of dredged material to evaluate the recovery period. Also, due to the complexity of coastal processes, the deployment of wave buoys and Acoustic Doppler Current Profilers (ADCP) close to the coast could help to characterise the sediment transport and potential dispersal when dredged materials are disposed within sites located on the coast.

5.2.4 The conclusions related to retention are based on a 6 months' simulation (Appendix D). It is important to mention that the retention of the disposal sites could be overestimated, and retention values presented in this report could change (i.e., decrease) if simulations were carried out over a longer period.

5.2.5 The dispersal and SSC values provided in this report serve as an indication for future assessments to understand the impact of wave and tidal regime on the disposed dredge material at each disposal site. It is important to understand that the period of release (e.g., ebb vs flood; before or after a storm; spring vs ebb) can greatly influence the quantitative values of the results presented in this report for SSC (i.e., both maximum and time of observation).

5.2.6 The simulated quantities and types of disposed dredged material at each disposal site are site-specific and based upon marine licences granted (Appendix D). This method allows models to be as realistic as possible and to provide the most accurate results per site. However, this approach does not allow the comparison of disposal sites against each other. For example, Milford Haven Two (LU168) and Milford Haven Three (LU169) present similar tidal, wind and wave regimes, however the modelling results show different sediment plumes due to different sediment type used in each simulation.

# 6 References

ABPmer (2018). SEASTATES Metocean Data and Statistics Interactive Map. Available online at: www.seastates.net [Accessed: January 2026].

ABPmer, Met Office and POL (2008). Atlas of UK Marine Renewable Energy Resources: Atlas Pages. A Strategic Environmental Assessment Report, March 2008. BP Marine Environmental Research Ltd. Produced for BERR. Available online at: Explore the ABPmer UK Renewables Atlas (renewables-atlas.info) [Accessed: January 2026].

ABPmer (2022), 'Mostyn Energy Park Extension, Environmental Statement, Chapter 6: Physical Processes'. ABPmer Report No. R.4052 Chp 6.

ABPmer (2023a), 'ABP South Wales Marine Licence: LU110'. ABPmer Report No. R.4236TN.

ABPmer (2023b), 'ABP South Wales Marine Licence: LU115'. ABPmer Report No. R.4235TN.

ABPmer (2023c), 'ABP South Wales Marine Licence: LU140'. ABPmer Report No. R.4237TN.

Boon, A.R. and van Dalfsen, J. (2022), 'Long-term changes in the macrobenthic assemblages at a harbour sediment disposal site in the southern North Sea', Marine Environmental Research, 178: 105663.

Brooks, A.J., Roberts, H., Trigg, C. (2022). 'Advice on Physical Processes for Small-scale Marine and Coastal Projects'. NRW Evidence Report No: 624, 48pp, Natural Resources Wales, Cardiff.

Brown, J.M. and Davies, A.G. (2009). 'Methods for medium-term prediction of the net sediment transport by waves and currents in complex coastal regions', Continental shelf research, 29: 1502-1514.Centre for Environment, Fisheries and Aquaculture Science (Cefas) (2026). 'Cefas Wavenet data'. Available at: www.cefas.co.uk/cefas-data-hub/wavenet [Accessed: January 2026].

Ceredigion County Council (2025). 'Flood protection work concludes on Aberaeron Coastal Defence Scheme', https://www.ceredigion.gov.uk/resident/news/2025/flood-protection-work-concludes-on-aberaeron-coastal-defence-scheme/ [Accessed: January 2026].

Clarke, C. and Rees, J. (2020), 'Welsh Disposal Site Review'. Cefas Project Report for Welsh Government. 79pp.

Cross, A. V., Stratford, A., Johnstone, I., and Lindley, P. J. (2023). 'Declining territory occupancy and productivity in a Welsh Red-billed Chough *Pyrrhocorax pyrrhocorax* population'. Bird Study, 70(4): 201–214.

Dauvin, J-C., Baux, N. and Lesourd, S. (2022), 'Benthic impact assessment of a dredge sediment disposal in a dynamic resilient environment', Marine Pollution Bulletin, 179: 113668.

De Montaudouin, X., Blanchet, H., Gouillieux, B., Humbert, S., Latry, L., Crovetto, L. and Lavesque, n. (2023), 'Benthic community impacts from sediment dredging and disposal: A comparison of sampling gear', Marine Pollution Bulletin, 194(A): 115278.

Donazar-Aramendia, I., Sanchez-Moyano, J.E., Garcia-Asencio, I., Miro, J.M., Megina, C. and Garcia-Gomez, J.C. (2020), 'Environmental consequences of dredged-material disposal in a recurrent marine dumping area near to Guadalquivir estuary, Spain', Marine Pollution Bulletin, 161: 111736.

Environment Agency (2025). Bathing water profile explorer. Available at: https://environment.data.gov.uk/wales/bathing-waters/data/bathing-water-profile/ukl1402-38800/2023:1 [Accessed: January 2026].

Evans, P.G.H. and Waggitt, J.J. (2023). 'Modelled Distribution and Abundance of Cetaceans and Seabirds in Wales and Surrounding Waters'. NRW Evidence Report, Report No: 646, 354 pp. Natural Resources Wales, Bangor.

Fernandes E.H., da Silva P.D., Gonçalves G.A. and Möller O.O. (2021), 'Dispersion Plumes in Open Ocean Disposal Sites of Dredged Sediment', Water, 13(6):808.

Gundlach, J., Herbst, M., Alex, A.S., Zorndt, A., Jordan, C., Visscher, J. and Schlurmann, T. (2024), 'Simulating the near-field dynamic plume behaviour of disposed fine sediments', Frontiers in Marine Sciences, 11: 1416521.

Heinanen, S. and Skov, H. (2015). 'The identification of discrete and persistent areas of relatively high harbour porpoise density in the wider UK marine area', JNCC Report No.544 JNCC, Peterborough.

JNCC (2025), 'Marine Protected Area Mapper'. JNCC Resource Hub. Available online at: MPA Mapper | Advisor to Government on Nature Conservation | JNCC [Accessed: January 2026].

Li, C., Zhang, Y-H., Wu, X-X., Jiand, U-S., Li, W-T. and Shang, P-D. (2023), 'Changes in survival and growth in response to different combinations of turbidity and duration in eelgrass Zostera marina plants', Estuarine, Coastal and Shelf Science, 249: 107108.

Lohrer, A.M., Lam-Gordillo, O., Douglas, E.J., Bulmer, R.H. and MacDonald, I.T. (2025), 'Enhanced benthic biodiversity and primary productivity with reduced turbidity in a coastal receiving environment', Limnology and Oceanography, 70: 2393-2404.

London Convention (1972), 'Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter'.

London Protocol (1996), 'Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter'.

Luxon, D. (2026. 'Ceredigion to foot the bill for dredging Aberaeron harbour entrance', Cambrian news, https://www.cambrian-news.co.uk/news/ceredigion-to-foot-the-bill-for-dredging-aberaeron-harbour-entrance-867486 [Accessed: January 2026].

MEMG (2003), 'Group Co-ordinating Sea Disposal Monitoring. Final Report of the Dredging and Dredged Material Disposal Monitoring Task Team', Sciences Series, Aquatic Environment Monitoring Report, CEFAS, Lowestoft, (55): 52pp.

MetOceanWorks Ltd (2025), MetOceanAtlas. Base map provided via Leaflet. Available at: https://metoceanatlas.com/ [Accessed: January 2026].

Miller, D.C., Muir, C.L., and Hauser, O.A. (2002). 'Detrimental effects of sedimentation on marine benthos: what can be learned from natural processes and rates?' Ecological Engineering, 19: 211-232.

Natural Resources Wales (2015). 'Marine Character Areas, MCA 21: MILFORD HAVEN'

Natural Resources Wales (2025a). 'Ardal Cadwraeth Arbennig Bae Ceredigion/ Cardigan Bay Special Area of Conservation: Advice provided by Natural Resources Wales in fulfilment of Regulation 37(3) of the Conservation of Habitats and Species Regulations 2017'.

Natural Resources Wales (2025b). 'Ardal Cadwraeth Arbennig Pen Llŷn a'r Sarnau / Llŷn Peninsula and the Sarnau Special Area of Conservation: Advice provided by Natural Resources Wales in fulfilment of Regulation 37(3) of the Conservation of Habitats and Species Regulations 2017'.

O'Brien, S.H., Win, I., Bingham, C.J. and Reid, J.B. (2015). 'An assessment of the numbers and distributions of wintering waterbirds using Bae Ceredigion/Cardigan Bay area of search (2010)'. JNCC Report No 555. Joint Nature Conservation Committee (JNCC), Peterborough.

Ortega, J.C.G., Figueiredo, B.R.S., da Garca, W.J., Agostinho, A.A. and Bini, L.M. (2020). 'Negative effect of turbidity on prey capture for both visual and non-visual aquatic predators', Journal o Animal Ecology, 89(11): 2389-2742.

OSPAR (1992), 'Convention for the Protection of the Marine Environment of the North-East Atlantic'.

OSPAR (2009), JAMP assessment of the environmental impact of dumping wastes at sea. OSPAR Commission 2009: Biodiversity Series.

OSPAR (2024), OSPAR Guidelines for the Management of Dredged Material at Sea. OSPAR Commission Agreement 2014-06. Update 2024.

Robinson, J.E., Newell, R.C., Seiderer, L.J. and Simpson, N.M. (2005), 'Impacts of aggregate dredging on sediment composition and associated benthic fauna at an offshore dredge site in the southern North Sea', Marine Environmental Research, 60(1): 51-68.

Royal Haskoning (2011a), 'West of Wales Shoreline Management Plan 2: Policy Development Coastal Area C (PDZ9)'. Reference: 9T9001/RSection4CACv4/303908/PBor.

Royal Haskoning (2011b), 'West of Wales Shoreline Management Plan 2: Policy Development Coastal Area C (PDZ8)'. Reference: 9T9001/RSection4CACv4/303908/PBor.

Royal Haskoning (2011c), 'West of Wales Shoreline Management Plan 2: Policy Development Coastal Area D (PDZ12)'. Reference: 9T9001/RSection4CACv4/303908/PBor.

Royal Haskoning (2011d), 'West of Wales Shoreline Management Plan 2: Policy Development Coastal Area D (PDZ13)'. Reference: 9T9001/RSection4CACv4/303908/PBor.

Royal Haskoning (2011e), 'West of Wales Shoreline Management Plan 2: Policy Development Coastal Area C (PDZ7)'. Reference: 9T9001/RSection4CACv4/303908/PBor.

Sanchez-Moyano, J.E., Estacio, F.J., Garcia-Adiego, E.M. and Garcia-Gomez, J.C. (2004), 'Dredging impact on the benthic community of an unaltered inlet in southern Spain', Helgoland Marine Research, 58: 32-39.

Van Dalfsen, J.A. and Lewis, W.E. (2006), 'Ecologisch herstel Verdiepte Loswal (in Dutch)'. TNOrapport 2006-DH-R0312/B, 41 pp. Den Helder, The Netherlands.

Viitak, M., Nolasco, R., Villacieros-Robineau, N., Silva, P.A., Castro, C.G. and Dubert, J. (2025), 'The role of driving forces in sediment transport processes in an upwelling-driven continental shelf', Ocean Modelling, 198: 102620.

Ware, A., Bolam, S.G. and Rees, H.L. (2010), 'Impact and recovery associated with the deposition of capital dredgings at UK disposal sites: Lessons for future licensing and monitoring', Marine Pollution Bulletin, 60(1): 79-90.

Welsh Government (2019), 'Welsh National Marine Plan'. https://www.gov.wales/sites/default/files/publications/2019-11/welsh-national-marine-plan-document_0.pdf [Accessed: January 2026].

Welsh Government (2023), 'Management of Marine Disposal Sites'. https://www.gov.wales/sites/default/files/publications/2023-05/management-marine-disposal-sites.pdf [Accessed: January 2026].

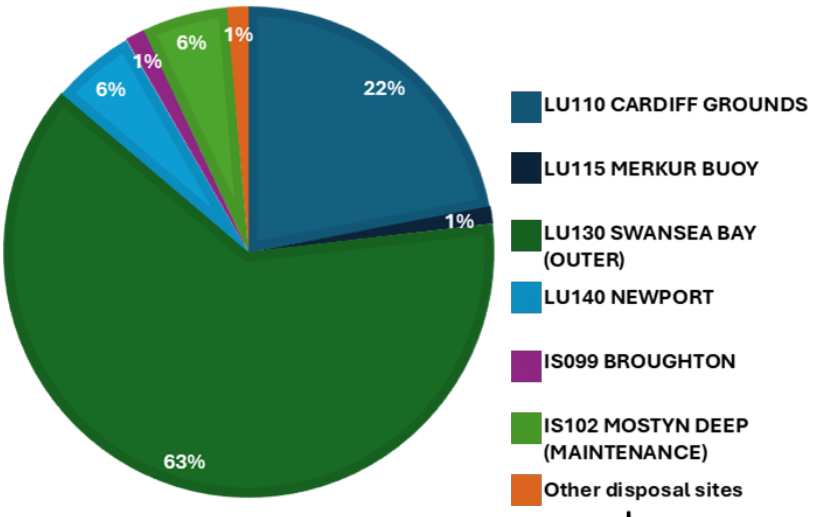
Welsh Government (2025), 'Marine Licenced Disposal Sites', Map viewer. Available online at: https://datamap.gov.wales/layers/geonode:cefas_disposal_sites [Accessed: January 2026].

Wiltshire, K.H. (2021), 'Analysis of near-shore turbidity data for the Adelaide metropolitan region: influence of harbour dredging and potential impacts on benthic habitats', SARDI Publication No. F2023/000317-1, SARDI Research Report Series No. 1195.

Zimmerman, L.E., Jutte, P.C. and Van Dolah, R.F. (2003), 'An environmental assessment of the Charleston Ocean Dredged Material Disposal Site and surrounding areas after partial completion of the Charleston Harbor Deepening Project. Marine Pollution Bulletin, 46: 1408-1419.

# A Contribution of disposal sites to the total disposed material between 2005 and 2024

A.1.1 The figure below shows the contribution (in %) of the disposal sites on the total disposed material between 2005 and 2004. The contribution of disposal sites, which represents less than 1% (labelled "Other disposal sites" in orange on the figure), are detailed in the table beneath the figure.




| ID code | Site name | Contribution (in %) |
|---|---|---|
| IS014 | Dolau Beach | 0.01 |
| IS018 | Shell Lagoon, Llanbedr | 0.01 |
| IS035 | DEGANWYBENEFICIAL USE | 0.09 |
| IS043 | Holyhead North | 0.21 |
| IS065 | CONWY BENEFICIAL USE | 0.48 |
| IS103 | Mostyn Breakwater | 0.01 |
| LU169 | MILFORD HAVEN THREE | 0.47 |
| LU190 | NEYLAND (OFF MILFORD HAVEN) | 0.08 |

A.1.2 Finally, the disposal sites, which have not contributed to the total disposal or have a negligible contribution (i.e., less than 0.0001%), are not shown on the figure and listed below:

| ID code | Site name |
|---|---|
| IS012 | Tanybwlch beach |
| IS013 | Aberystwyth South Beach |
| IS015 | NEW QUAY TRACK |
| IS016 | Spending Harbour |
| IS019 | Cei Bach Beach A |
| IS021 | New South Beach |
| IS022 | Cei Bach Beach B |
| IS023 | Traeth Crugan 1 |
| IS024 | Traeth Crugan 2 |
| IS066 | CONWY BENEFICIAL USE |
| LU168 | MILFORD HAVEN TWO |

# B Annual disposal volume for disposal sites included in this review

B.1.1 Only open disposal sites which have contributed to the total disposal of material between 1985 and 2024 are presented in the table below[23].

B.1.2 The first record of disposal for each waste type at each site is listed in bold typeface. Blank cells represent years prior to the first disposal return at a site, and "-" is used to represent a year when the site was open but no returns were received, suggesting that no disposal activity was undertaken at that site that year. The type of material disposed is presented in black for maintenance dredging, in red for capital dredging, in blue when returns received were for both capital and maintenance dredging, and finally in green for fish waste.

[23] More information about Dredge sediment in Welsh waters can be found here: Further information about dredge sediments in Welsh waters

| ID code | Site name | Disposal quantity (wet tonnes) per year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| IS013 | Aberystwyth South Beach | | | | | | | | | | |
| IS014 | Dolau Beach | | | | | | | | | | |
| IS015 | NEW QUAY TRACK | | | | | | | | | | |
| IS018 | Shell Lagoon, Llanbedr | | | | | | | | | | |
| IS035 | DEGANWY BENEFICIAL USE | | | | | | | | | | |
| IS043 | Holyhead North | | | | | | | | | | |
| IS065 | CONWY BENEFICIAL USE | | | | | | | | | | |
| IS099 | BROUGHTON | | | | | | | | | | |
| IS102 | MOSTYN DEEP | | | | | | | | | | |
| IS103 | Mostyn Breakwater | | | | | | | | | | |
| LU110 | CARDIFF GROUNDS | | | | 6240 | 56640 | 15600 | 39920 | 20183 | 7670 | 34350 |
| LU115 | MERKUR BUOY | | | | | | | | | 2860 | 45393 |
| LU130 | SWANSEA BAY (OUTER) | 4000 | - | - | 205400 | 82620 | - | - | - | - | - |
| LU140 | NEWPORT | | | | | | 6950 | - | - | - | - |
| LU168 | MILFORD HAVEN TWO | | | | | | | | | | |
| LU169 | MILFORD HAVEN THREE | | | | | | | | | | |
| LU190 | NEYLAND (OFF MILFORD HAVEN) | | | | | | | | | | |

| ID code | Site name | Disposal quantity (wet tonnes) per year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
| IS013 | Aberystwyth South Beach | | | | | | | | | | |
| IS014 | Dolau Beach | | | | | | | | | | |
| IS015 | NEW QUAY TRACK | | | | | | | | | | |
| IS018 | Shell Lagoon, Llanbedr | | | | | | | | | | |
| IS035 | DEGANWY BENEFICIAL USE | | | | | | | | | | |
| IS043 | Holyhead North | | | | | | | | | | |
| IS065 | CONWY BENEFICIAL USE | | | | | | | | | | |
| IS099 | BROUGHTON | | | | | | | | | | |
| IS102 | MOSTYN DEEP | | | | | | | | | | |
| IS103 | Mostyn Breakwater | | | | | | | | | | |
| LU110 | CARDIFF GROUNDS | - | 11604 | 49490 | - | - | 16428 | 11233 | - | 67800 | 251209 |
| LU115 | MERKUR BUOY | 36777 | 54828 | 45640 | 25017 | 50490 | 19032 | 56449 | - | - | - |
| LU130 | SWANSEA BAY (OUTER) | - | - | 147889 | - | - | - | - | - | - | 40763 |
| LU140 | NEWPORT | 1120 | - | - | - | 1520 | 1800 | - | - | - | - |
| LU168 | MILFORD HAVEN TWO | | | **94444** | 21342 | - | - | - | - | - | - |
| LU169 | MILFORD HAVEN THREE | | | | | | | | **1503** | - | - |
| LU190 | NEYLAND (OFF MILFORD HAVEN) | | | | | | | **1842** | - | - | - |

| ID code | Site name | Disposal quantity (wet tonnes) per year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| IS013 | Aberystwyth South Beach | | | | | | | | | | |
| IS014 | Dolau Beach | | | | | | | | | | |
| IS015 | NEW QUAY TRACK | | | | | | | | | **927** | 848 |
| IS018 | Shell Lagoon, Llanbedr | | | | | | | | | | |
| IS035 | DEGANWY BENEFICIAL USE | | | | | **3800** | 8529 | - | 6948 | 11441 | - |
| IS043 | Holyhead North | | | | | | | | | | |
| IS065 | CONWY BENEFICIAL USE | | | | | **23900** | 10500 | - | 35188 | - | 36324 |
| IS099 | BROUGHTON | | | | | | **4884** | - | 733778 | 6920 | 12423 |
| IS102 | MOSTYN DEEP | **294964** | 443986 | 185180 | 79508 | 178950 | 734250 | 357322 | - | 662120 | 275830 |
| IS103 | Mostyn Breakwater | | | | | | | | | | |
| LU110 | CARDIFF GROUNDS | 549147 | 494887 | 376544 | 15460 | 16748 | 444954 | 1022874 | 874282 | 887999 | 520103 |
| LU115 | MERKUR BUOY | 32136 | 45015 | 27468 | 33496 | 45091 | 12883 | 51785 | 69347 | | 24532 |
| LU130 | SWANSEA BAY (OUTER) | 3188920 | 1771653 | 2097350 | 2497042 | 2362779 | 1639550 | 1431124 | 1383986 | 1466431 | 2313193 |
| LU140 | NEWPORT | 34468 | - | - | 138656 | 271811 | 152956 | 290046 | 229236 | 147702 | 257705 |
| LU168 | MILFORD HAVEN TWO | - | 900 | 450 | - | - | - | - | - | - | - |
| LU169 | MILFORD HAVEN THREE | - | - | - | 111160 | - | 51865 | 18425 | - | - | - |
| LU190 | NEYLAND (OFF MILFORD HAVEN) | - | - | - | - | - | 4169 | - | - | - | 5910 |

| ID code | Site name | Disposal quantity (wet tonnes) per year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| IS013 | Aberystwyth South Beach | | | | | | | | **1985** | - | - |
| IS014 | Dolau Beach | | | | | | | | **4990** | - | - |
| IS015 | NEW QUAY TRACK | 805 | 301 | 165 | - | - | - | - | - | - | - |
| IS018 | Shell Lagoon, Llanbedr | | | | | | **4000** | - | - | - | - |
| IS035 | DEGANWY BENEFICIAL USE | 6969 | - | 6276 | 4850 | - | - | - | - | 6732 | 3400 |
| IS043 | Holyhead North | | | | | **34070** | - | 98770 | - | - | - |
| IS065 | CONWY BENEFICIAL USE | 11370 | 39537 | 22897 | 9230 | 28036 | 23623 | 23838 | 17280 | 12572 | 4572 |
| IS099 | BROUGHTON | 10523 | 10853 | 13124 | 14404 | 14147 | 4229 | - | - | - | - |
| IS102 | MOSTYN DEEP | 69970 | 21348 | 6172 | - | 79221 | 123416 | - | - | 5860 | 5625 |
| IS103 | Mostyn Breakwater | | | | | | | | | | **3715** |
| LU110 | CARDIFF GROUNDS | 516954 | 785318 | 760730 | 594506 | 574277 | 779423 | 649948 | 1049761 | 1653859 | 1181611 |
| LU115 | MERKUR BUOY | 36251 | 62121 | 83530 | 56263 | 61899.5 | 57129.8 | - | - | - | - |
| LU130 | SWANSEA BAY (OUTER) | 1849880 | 2256269 | 1471064 | 1540328 | 1823311 | 2288077 | 2865366 | 2584863 | 1816107 | 636181 |
| LU140 | NEWPORT | 194412 | 294577 | 205263 | 311590 | 312063 | 53788 | 121583.8 | 14627 | 212907.5 | 166085.8 |
| LU168 | MILFORD HAVEN TWO | - | - | - | - | - | - | - | - | - | - |
| LU169 | MILFORD HAVEN THREE | - | - | - | - | - | 5930 | - | 13782 | 49657 | 39651 |
| LU190 | NEYLAND (OFF MILFORD HAVEN) | 1050 | 3300 | 4630 | 3500 | 2385 | 4295 | 6132 | 5146 | 4790 | 5050 |

B.1.3 The sites not presented in the table above, as no contribution was recorded, are listed below:

- Tanybwlch beach (IS012);
- Spending Harbour (IS016);
- Cei Bach Beach A (IS019);
- New South Beach IS021);
- Cei Bach Beach B (IS022);
- Traeth Crugan 1 (IS023);
- Traeth Crugan 2 (IS024); and
- Conwy Beneficial Use (IS066).

# C Disposal site selection

## C.1 Open disposal sites included in this review

C.1.1 The table below lists the open disposal sites included in this review (with in red sites use in the modelling study and in blue site not modelled) with site specific parameters of interest:

| ID code | Site name | Location | Disposal site type | Area ($km^2$) | Closest distance to the coast (km) | Closest Harbour/port |
|---|---|---|---|---|---|---|
| IS012 | Tanybwlch beach | Cardigan Bay | Beneficial use | 0.007 | 0 | Aberystwyth Harbour |
| IS013 | Aberystwyth South Beach | Cardigan Bay | Beneficial use | 0.0053 | 0 | Aberystwyth Harbour |
| IS014 | Dolau Beach | Cardigan Bay | Beneficial use | 0.0051 | 0 | New Quay Harbour |
| IS015 | New Quay Track | Cardigan Bay | Non-beneficial use | 0.0012 | 0.007 | New Quay Harbour |
| IS016 | Spending Harbour | Cardigan Bay | Beneficial use | 0.0003 | 0 | Aberaeron Harbour |
| IS018 | Shell Lagoon, Llanbedr | Tremadog Bay | Beneficial use | 0.0043 | 0 | Llanbedr Harbour |
| IS019 | Cei Bach Beach A | New Quay Bay | Beneficial use | 0.0309 | 0 | New Quay Harbour |
| IS021 | New South Beach | Cardigan Bay | Beneficial use | 0.0029 | 0 | Aberaeron Harbour |
| IS022 | Cei Bach Beach B | New Quay Bay | Beneficial use | 0.0199 | 0 | New Quay Harbour |
| IS023 | Traeth Crugan 1 | Tremadog Bay | Beneficial use | 0.0095 | 0 | Pwllheli Harbour |
| IS024 | Traeth Crugan 2 | Tremadog Bay | Beneficial use | 0.0014 | 0 | Pwllheli harbour |
| IS035 | Deganwy Beneficial Use | Conwy River | Beneficial use | 0.0003 | 0.06 | Deganwy Marina |
| IS043 | Holyhead North | Irish Sea | Non-beneficial use | 28.4864 | 4.94 | Port of Holyhead |
| IS065 | Conwy Beneficial Use | Conwy River | Beneficial use | 0.0003 | 0.05 | Conwy Marina |
| IS066 | Conwy Beneficial Use | Conwy River | Beneficial use | 0.0003 | 0.007 | Conwy Marina |

| | | | | | | |
|---|---|---|---|---|---|---|
| IS099 | Broughton | Dee River | Beneficial use | 0.0073 | 0 | N/A |
| IS102 | Mostyn Deep | Dee Estuary | Beneficial use | 0.661 | 0.79 | Port of Mostyn Docks |
| IS103 | Mostyn Breakwater | Dee Estuary | Beneficial use | 0.0176 | 0.09 | Port of Mostyn Docks |
| LU110 | Cardiff Grounds | Severn estuary | Non-beneficial use | 2.1217 | 2.73 | Port of Cardiff |
| LU115 | Merkur Buoy | Bristol Channel | Non-beneficial use | 0.0193 | 3.73 | Port of Barry |
| LU130 | Swansea Bay (OUTER) | Bristol Channel | Non-beneficial use | 6.0624 | 4.56 | Port of Swansea |
| LU140 | Newport | Severn Estuary | Non-beneficial use | 0.4747 | 3.9 | Port of Newport |
| LU168 | Milford Haven Two | Celtic Sea | Non-beneficial use | 4.7296 | 13.71 | Port of Milford |
| LU169 | Milford Haven Three | Celtic Sea | Non-beneficial use | 2.6956 | 24.9 | Port of Milford |
| LU190 | Neyland (Off Milford Haven) | Cleddau Estuary | Beneficial use | 0.1301 | 0.17 | Pembroke Port |

## C.2 Open disposal sites excluded in this review

C.2.1 The table below lists the open disposal sites excluded in this review:

| ID code | Site name |
|---|---|
| IS067 | Awel Y Mor |
| IS068 | Mona OWF (Wales) |
| LU163 | Erebus OWF Cable Site 5 |
| LU164 | Erebus OWF Cable Site 4 |
| LU165 | Erebus OWF Cable Site 3 |
| LU166 | Erebus OWF Cable Site 2 |
| LU167 | Erebus OWF Cable Site 1 |

# C.3 Closed disposal sites

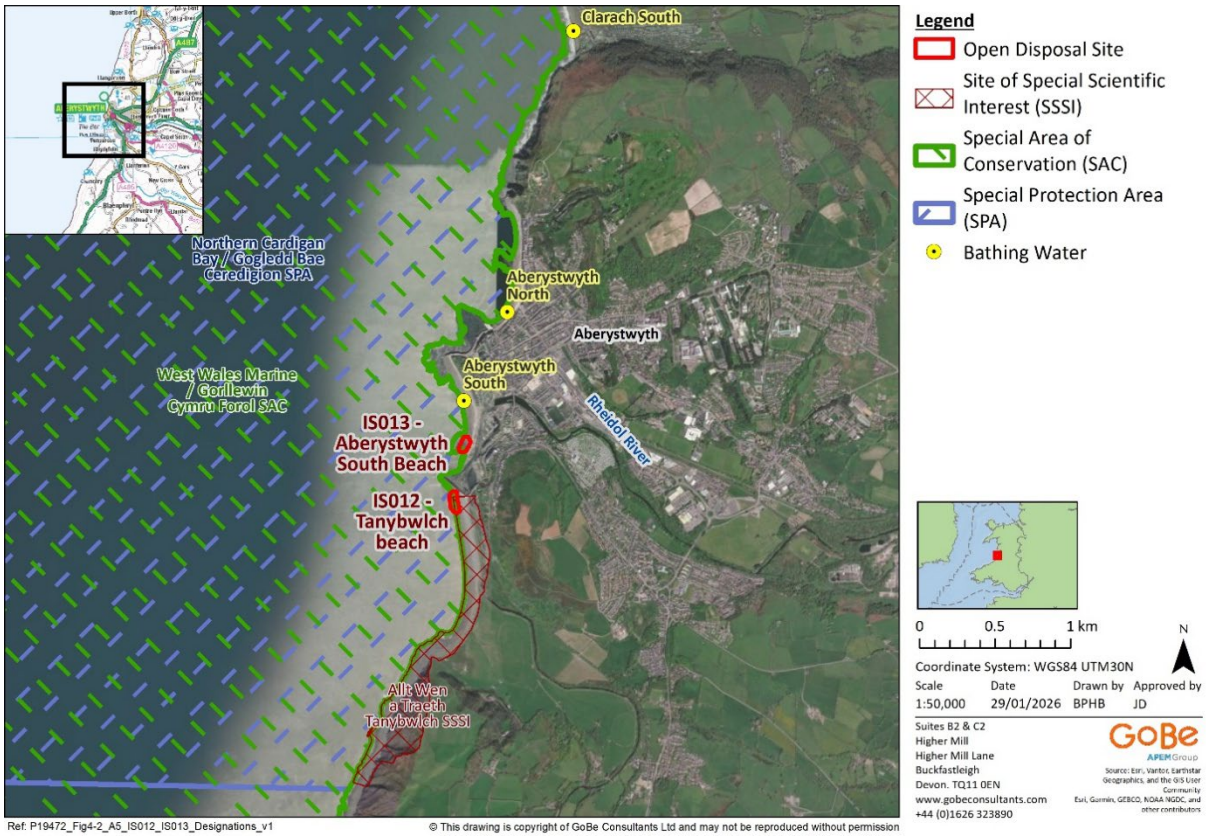
C.3.1 The table below lists the closed disposal sites excluded in this review:

| ID code | Site name |
|---|---|
| LU200 | Uskmouth |
| LU065 | Bristol holm deep |
| LU111 | Cardiff outfall temporary depo |
| LU050 | Bristol channel (rough weather) |
| LU160 | Bristol channel |
| LU120 | Swansea bay (inner) |
| LU150 | Mumbles head |
| LU125 | Monkstone cill |
| LU145 | Burry port |
| LU040 | Milford haven industrial |
| LU170 | Milford haven |
| IS010 | Fishguard |
| IS020 | Tremadoc bay |
| IS030 | Menai strait |
| IS040 | Holyhead deep |
| IS042 | Holyhead east |
| IS041 | Holyhead south |
| IS050 | Point lynas |
| IS055 | Conwy Bay |
| IS060 | Puffin island |
| IS100 | Dee Estuary |
| IS070 | Liverpool Bay (sludge) |
| IS080 | Liverpool Bay (industrial) |
| IS071 | Liverpool Bay (sludge) B |
| LU180 | St Anns head |
| IS101 | Mostyn deep |
| MH001 | Herbrandston marine, Milford Haven |
| LU200 | Uskmouth |

# D Sensitivity sites and receptors

## D.1 Tanybwlch beach (IS012) and Aberystwyth South Beach (IS013)

D.1.1 Map showing the designated sites in the vicinity of IS012 and IS013 are presented in the figure below:




D.1.2 Designated features in the vicinity of IS012 and IS013 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| West Wales Marine SAC | ▪ Harbour porpoise (*Phocoena Phocoena*) | IS012: 0<br>IS013: 0 |
| Northern Cardigan Bay SPA | ▪ Red-throated diver (*Gavia stellata*) | IS012: 0<br>IS013: 0 |
| Allt Wen a Traeth Tanybwlch SSSI | ▪ Sand influenced biogenic reefs<br>▪ Sand hopper (*Pectenogammarus planicrurus*) | IS012: 0<br>IS013: 0.2 |
| Aberystwyth South bathing water | N/A | IS012: 0.5<br>IS013: 0.3 |

| | | |
|---|---|---|
| Aberystwyth North bathing water | N/A | IS012: 1.2<br>IS013: 1 |
| Clarach South bathing water | N/A | IS012: 3<br>IS013: 2.8 |

# D.2 Spending Harbour (IS016) and New South Beach (IS021)

D.2.1 Map showing the designated sites in the vicinity of IS016 and IS021 are presented in the figure below:

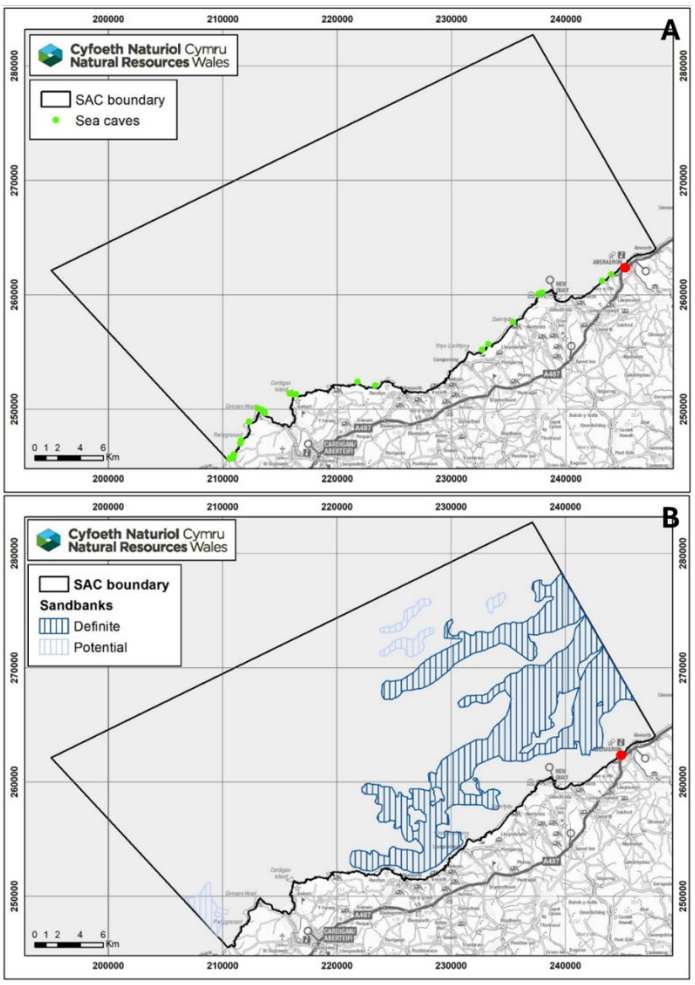



D.2.2 Designated features in the vicinity of IS016 and IS021 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| West Wales Marine SAC | ▪ Harbour porpoise (*Phocoena Phocoena*) | IS016: 0.3<br>IS021: 0 |
| Cardigan Bay SAC | ▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Reefs;<br>▪ Submerged or partially submerged sea caves; | IS016: 0.3<br>IS021: 0 |

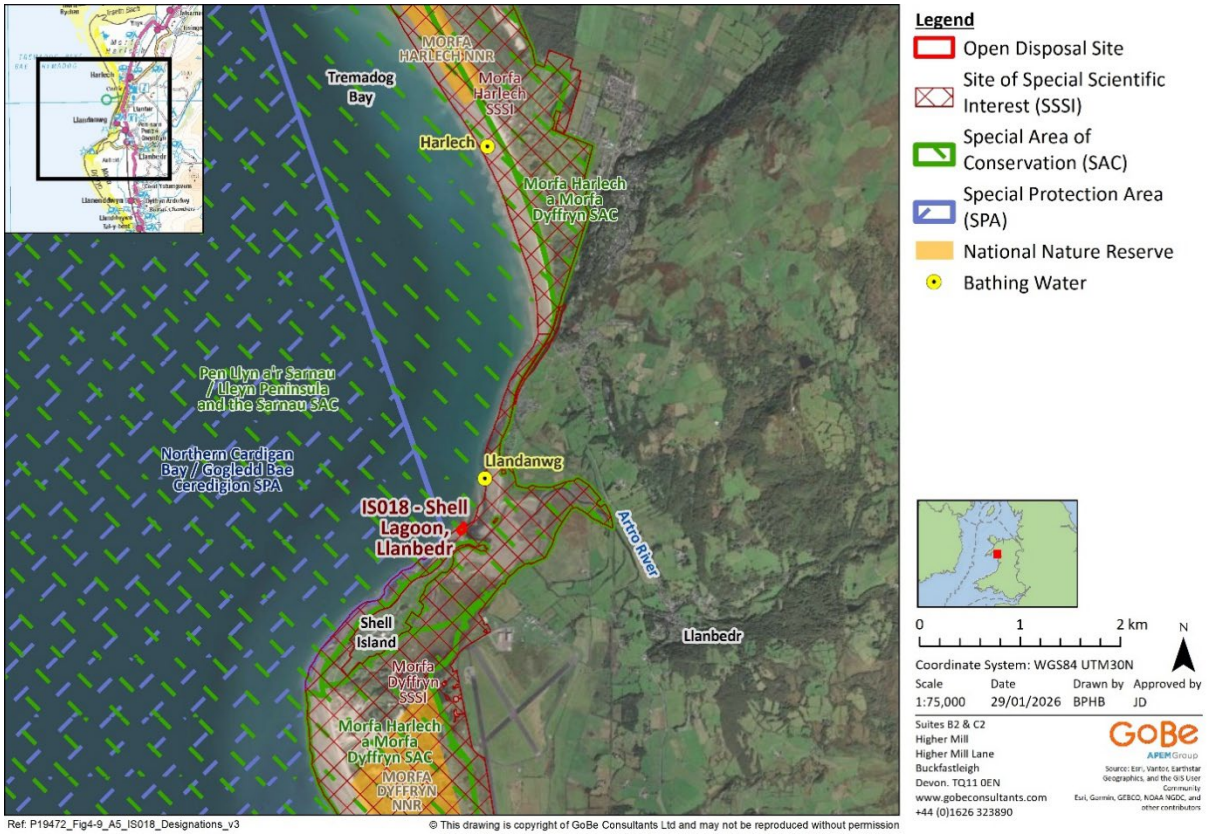
| | | |
|---|---|---|
| | ▪ Bottlenose dolphin (*Tursiops truncatus*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ River lamprey (*Lampetra Fluviatilis*); and<br>▪ Grey seal (*Halichoerus grypus*). | |
| Aberarth - Carreg Wylan SSSI | ▪ Zonation of intertidal communities, honeycomb worm reefs and overhangs and caves;<br>▪ Maritime cliff crevice and ledge;<br>▪ Maritime and wild thyme grassland and coastal heathland;<br>▪ Rare and uncommon plant species;<br>▪ Bottlenose dolphin (*Tursiops truncatus*);<br>▪ Kittiwake (*Rissa tridactyla*);<br>▪ Red-billed chough (*Pyrrhocorax pyrrhocorax*);<br>▪ Lesser black-backed gull (*Larus fucus*);<br>▪ Rare and uncommon invertebrates species;<br>▪ Caledonian structures exposed in the sea cliffs and foreshore; and<br>▪ Pleistocene / Quaternary sedimentary profiles exposed in the sea cliffs and foreshore. | IS016: 0.3<br>IS021: 0 |

D.2.3 Map showing the location of sea caves (Panel A) and subtidal sandbanks (Panel B) within Cardigan Bay SAC. The red dots represent the location of the disposal sites (From NRW, 2025a):



# D.3 Shell Lagoon, Llanbedr (IS018)

D.3.1 Map showing the designated sites in the vicinity of IS018 are presented in the figure below:



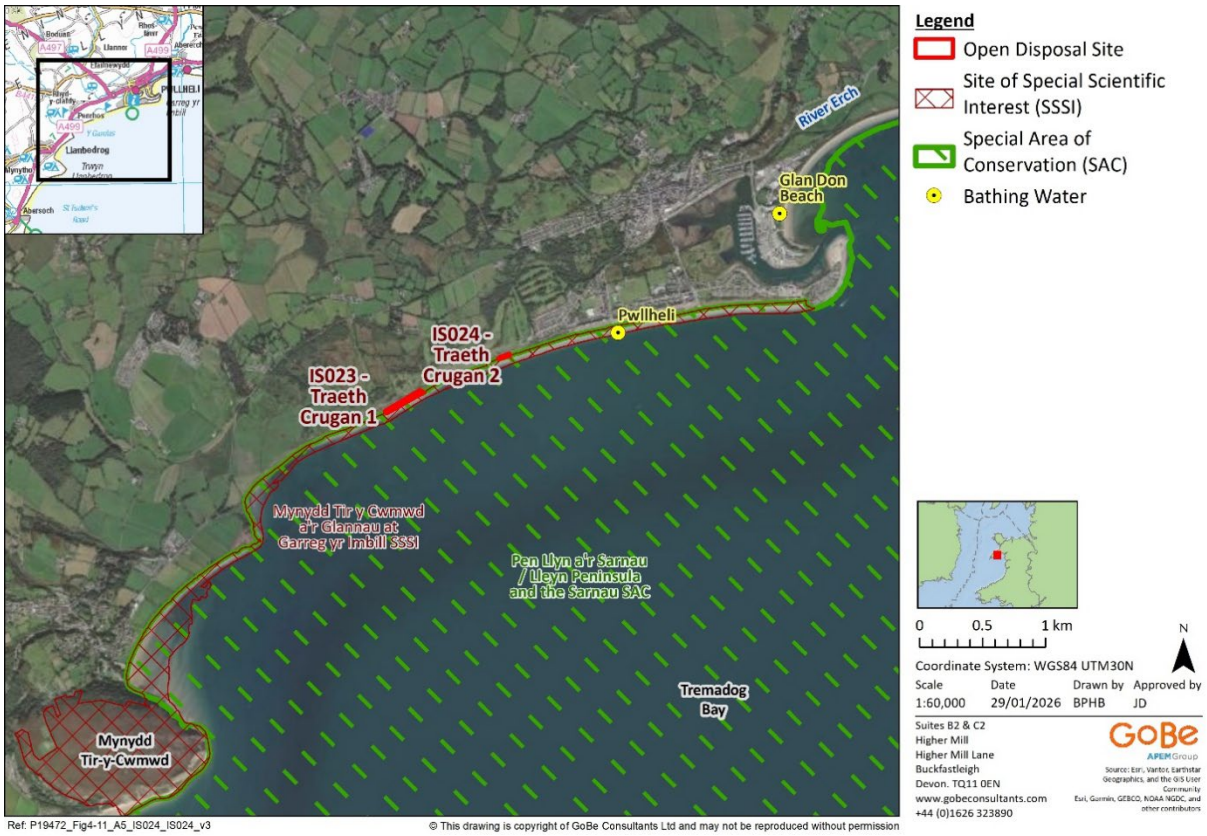

D.3.2 Designated features in the vicinity of IS018 are listed in the table below:

| Designated site | Designated features | Distance from disposal site (km) |
|---|---|---|
| Pen Llyn a'r Sarnau / Llŷn Peninsula and the Sarnau SAC | ▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Estuaries;<br>▪ Coastal lagoons;<br>▪ submerged or partially submerged sea caves;<br>▪ mudflats and sandflats not covered by seawater at low tide<br>▪ Large shallow inlets and bays; and<br>▪ Reefs | 0 |
| Morfa Harlech a Morfa Dyffryn SAC | ▪ Dunes system ; and<br>▪ Petalworth (*Petalophyllum ralfsii*) | 2.25 |
| MORFA DYFFRYN National Nature Reserve (NNR) | ▪ Sand dunes | 3.1 |
| Northern Cardigan Bay SPA | ▪ Red-throated diver (*Gavia stellata*) | 0.4 |

| | | |
|---|---|---|
| Morfa Dyffryn SSSI | ▪ Sand dunes | 0 |
| Morfa Harlech SSSI | ▪ Sand dunes | 1.1 |
| Llandanwyg bathing water | N/A | 0.5 |
| Harlech bathing water | N/A | 3.7 |

# D.4 Traeth Crugan 1 (IS023) and Traeth Crugan 2 (IS024)

D.4.1 Map showing the designated sites in the vicinity of IS023 and IS024 are presented in the figure below:



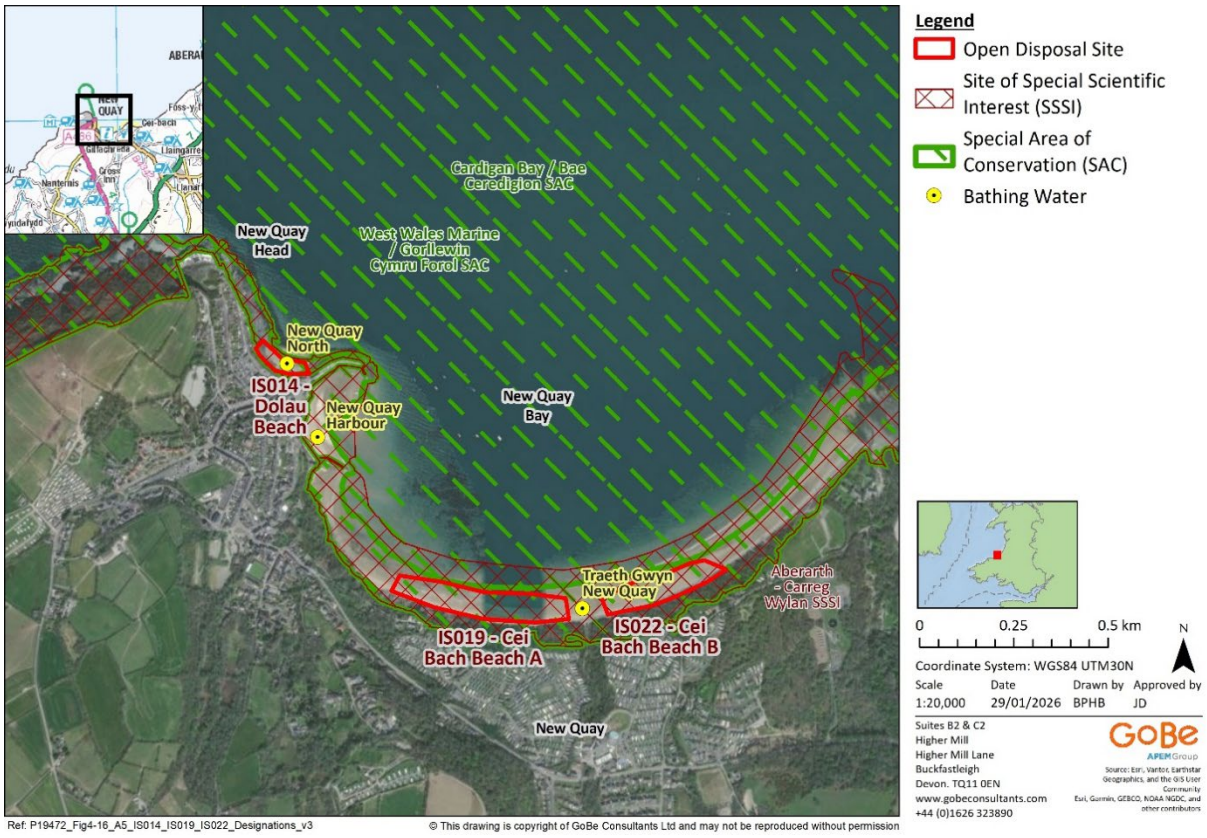

D.4.2 Designated features in the vicinity of IS023 and IS024 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Pen Llyn a'r Sarnau / Llŷn Peninsula and the Sarnau SAC | ▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Estuaries; | IS023: 0<br>IS024: 0 |

| | | |
|---|---|---|
| | ▪ Coastal lagoons;<br>▪ submerged or partially submerged sea caves;<br>▪ mudflats and sandflats not covered by seawater at low tide<br>▪ Large shallow inlets and bays; and<br>▪ Reefs | |
| Mynydd Tir y Cwmwd a'r Glannau at Garreg yr Imbill SSSI | ▪ Caves and overhangs;<br>▪ Muddy gravel;<br>▪ Soft piddock bored substrata; and<br>▪ Sand hopper (*Pectenogammarus planicrurus*) | IS023: 0<br>IS024: 0 |
| Glan Don Beach bathing water | N/A | IS023: 3<br>IS024: 3.7 |
| Pwllheli bathing water | N/A | IS023: 0.7<br>IS024: 1.4 |

# D.5 Dolau Beach (IS014), Cei Bach Beach A (IS019) and Cei Bach Beach B (IS022)

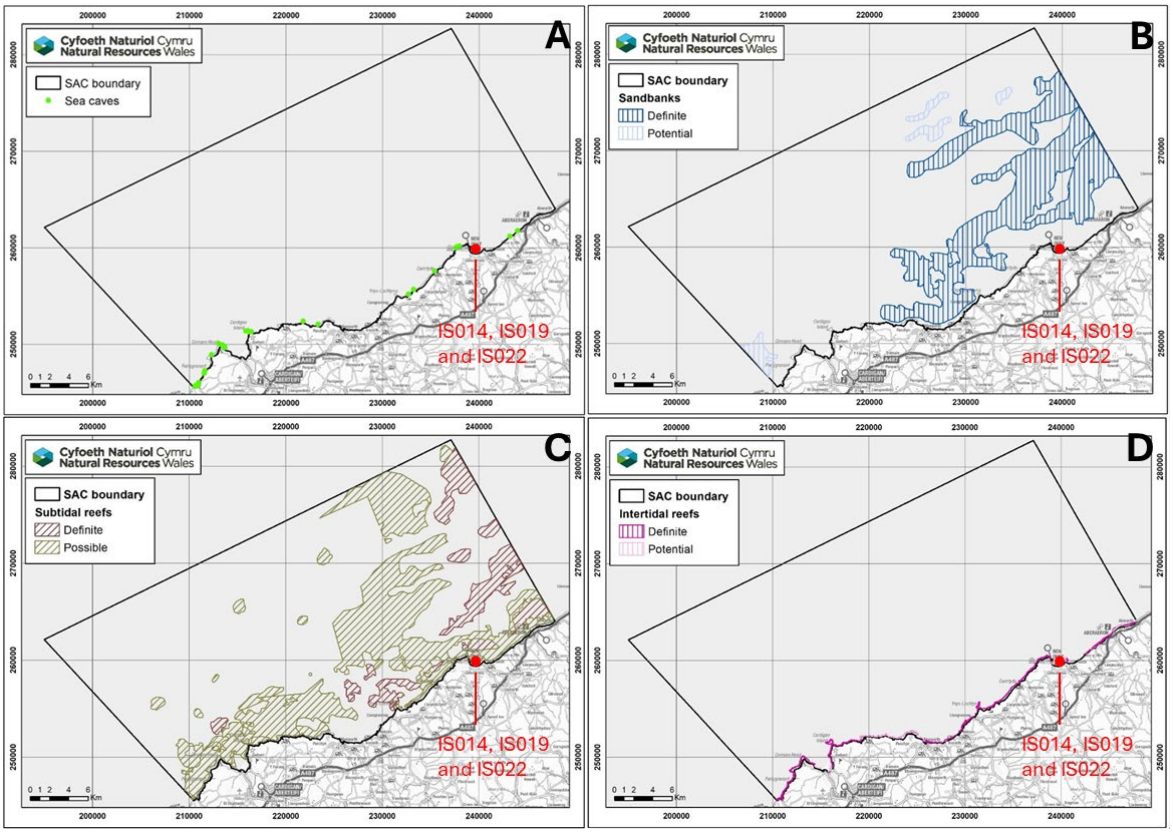
D.5.1 Map showing the designated sites in the vicinity of IS014, IS019 and IS022 are presented in the figure below:



D.5.2 Designated features in the vicinity of IS014, IS019 and IS022 are listed in the table below:

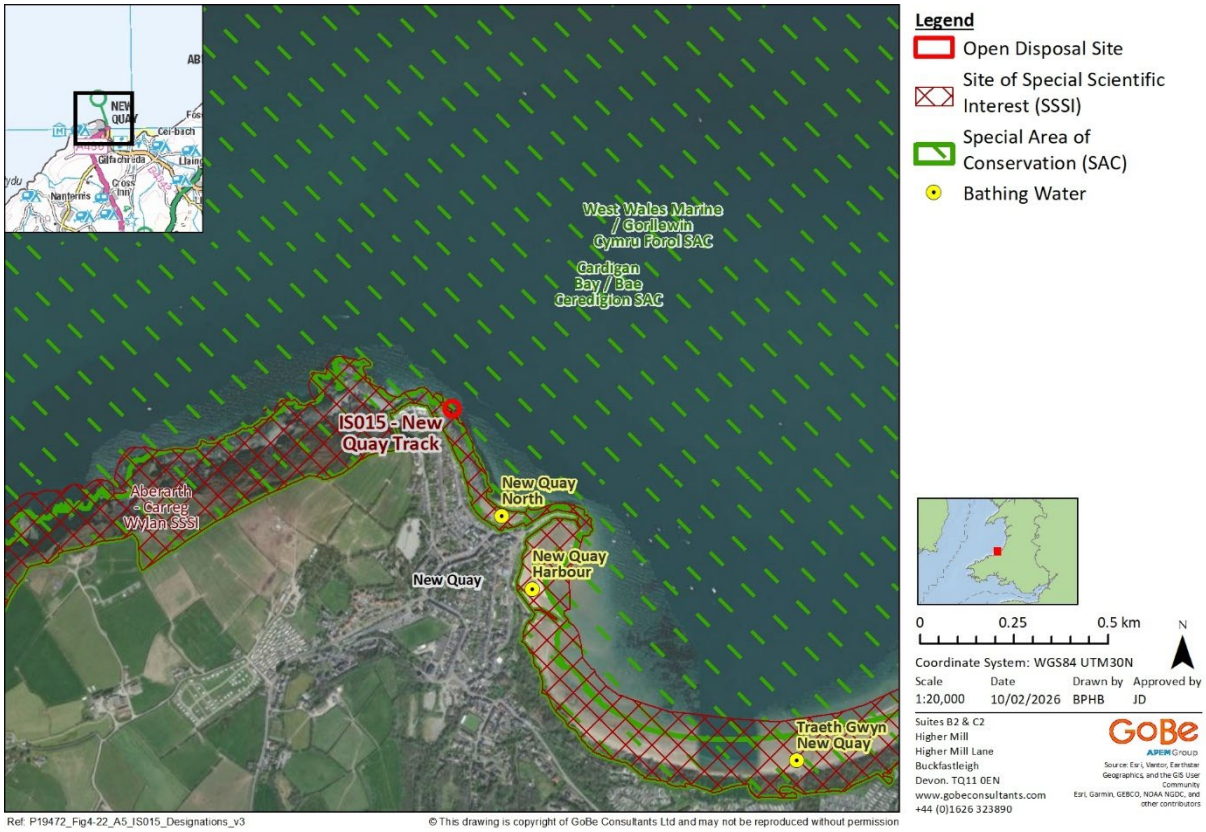
| Designated site | Designated features | | Distance from disposal sites (km) |
|---|---|---|---|
| Cardigan Bay SAC | ▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Reefs;<br>▪ Submerged or partially submerged sea caves;<br>▪ Bottlenose dolphin (*Tursiops truncatus*); | ▪ Sea lamprey (*Petromyzon marinus*);<br>▪ River lamprey (*Lampetra Fluviatilis*); and<br>▪ Grey seal (*Halichoerus grypus*). | IS014: 0<br>IS019: 0<br>IS022: 0 |
| West Wales Marine SAC | ▪ Harbour porpoise (*Phocoena Phocoena*) | | IS014: 0<br>IS019: 0<br>IS022: 0 |
| Aberarth - Carreg Wylan SSSI | ▪ Zonation of intertidal communities, honeycomb worm reefs and overhangs and caves;<br>▪ Maritime cliff crevice and ledge;<br>▪ Maritime and wild thyme grassland and coastal heathland;<br>▪ Rare and uncommon plant species;<br>▪ Bottlenose dolphin (*Tursiops truncatus*);<br>▪ Kittiwake (*Rissa tridactyla*), Red-billed chough (*Pyrrhocorax pyrrhocorax*), Lesser black-backed gull (*Larus fucus*);<br>▪ Rare and uncommon invertebrates species;<br>▪ Caledonian structures exposed in the sea cliffs and foreshore; and<br>▪ Pleistocene / Quaternary sedimentary profiles exposed in the sea cliffs and foreshore. | | IS014: 0<br>IS019: 0<br>IS022: 0 |
| Traeth Gwyn New Quay bathing water | N/A | | IS014: 0.8<br>IS019: 0<br>IS022: 0 |
| New Quay North bathing water | N/A | | IS014: 0<br>IS019: 0.6<br>IS022: 0.8 |
| New Quay Harbour bathing water | N/A | | IS014: 0.3<br>IS019: 0.3<br>IS022: 0.5 |

D.5.3 Map showing the location of sea caves (Panel A), subtidal sandbanks (Panel B), subtidal reefs (Panel C) and intertidal reefs (Panel D) within Cardigan Bay SAC. The red dots represent the location of the disposal sites (NRW, 2025a):



# D.6 New Quay Track (IS015)

D.6.1 Map showing the designated sites in the vicinity of IS015 are presented in the figure below:



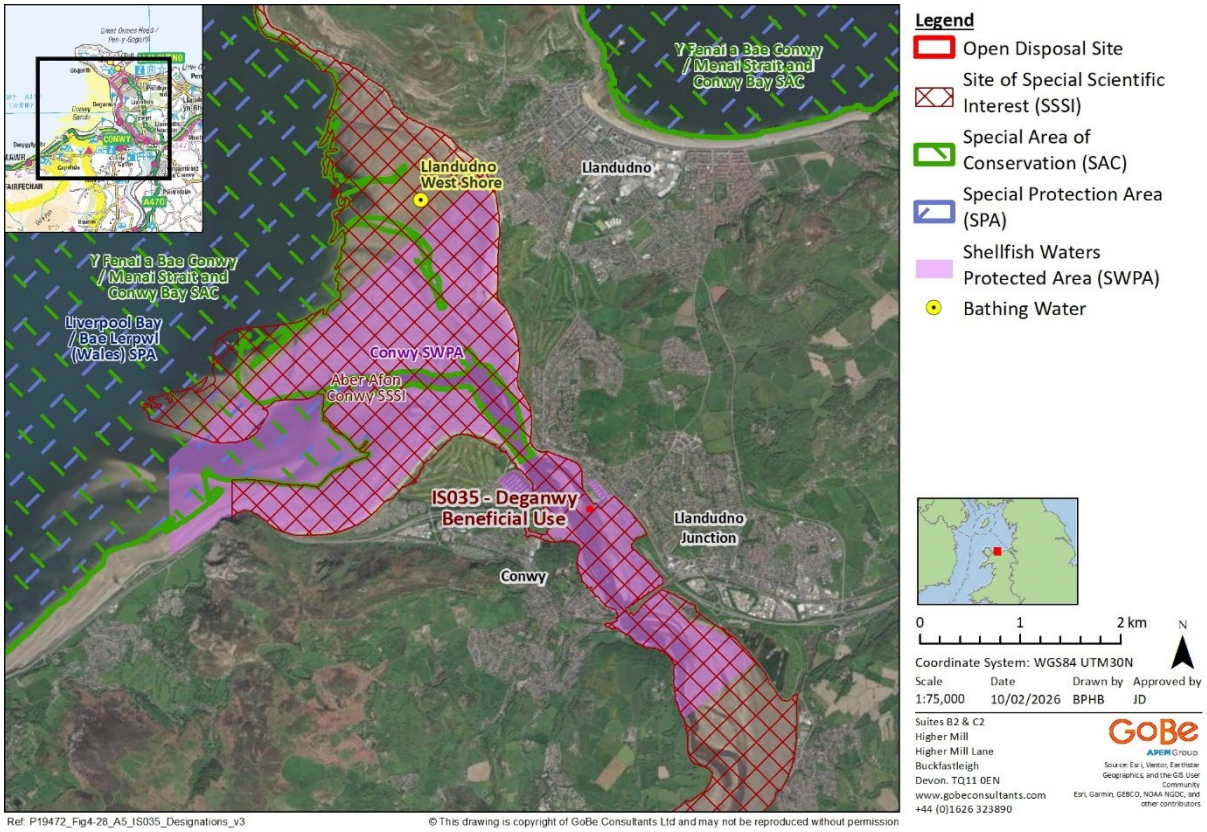

D.6.2 Designated features in the vicinity of IS015 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Cardigan Bay SAC | ▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Reefs;<br>▪ Submerged or partially submerged sea caves;<br>▪ Bottlenose dolphin (*Tursiops truncatus*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ River lamprey (*Lampetra Fluviatilis*); and<br>▪ Grey seal (*Halichoerus grypus*). | 0 |
| West Wales Marine SAC | ▪ Harbour porpoise (*Phocoena Phocoena*) | 0 |
| Aberarth - Carreg Wylan SSSI | ▪ Zonation of intertidal communities, honeycomb worm reefs and overhangs and caves;<br>▪ Maritime cliff crevice and ledge;<br>▪ Maritime and wild thyme grassland and coastal heathland;<br>▪ Rare and uncommon plant species; | 0 |

| | | |
|---|---|---|
| | ▪ Bottlenose dolphin (*Tursiops truncatus*);<br>▪ Kittiwake (*Rissa tridactyla*), Red-billed chough (*Pyrrhocorax pyrrhocorax*) and Lesser black-backed gull (*Larus fucus*);<br>▪ Rare and uncommon invertebrates species;<br>▪ Caledonian structures exposed in the sea cliffs and foreshore; and<br>▪ Pleistocene / Quaternary sedimentary profiles exposed in the sea cliffs and foreshore. | |
| Traeth Gwyn New Quay bathing water | N/A | 1.3 |
| New Quay North bathing water | N/A | 0.35 |
| New Quay Harbour bathing water | N/A | 0.55 |

# D.7 Deganwy Beneficial Use (IS035)

D.7.1 Map showing the designated sites in the vicinity of IS035 are presented in the figure below:



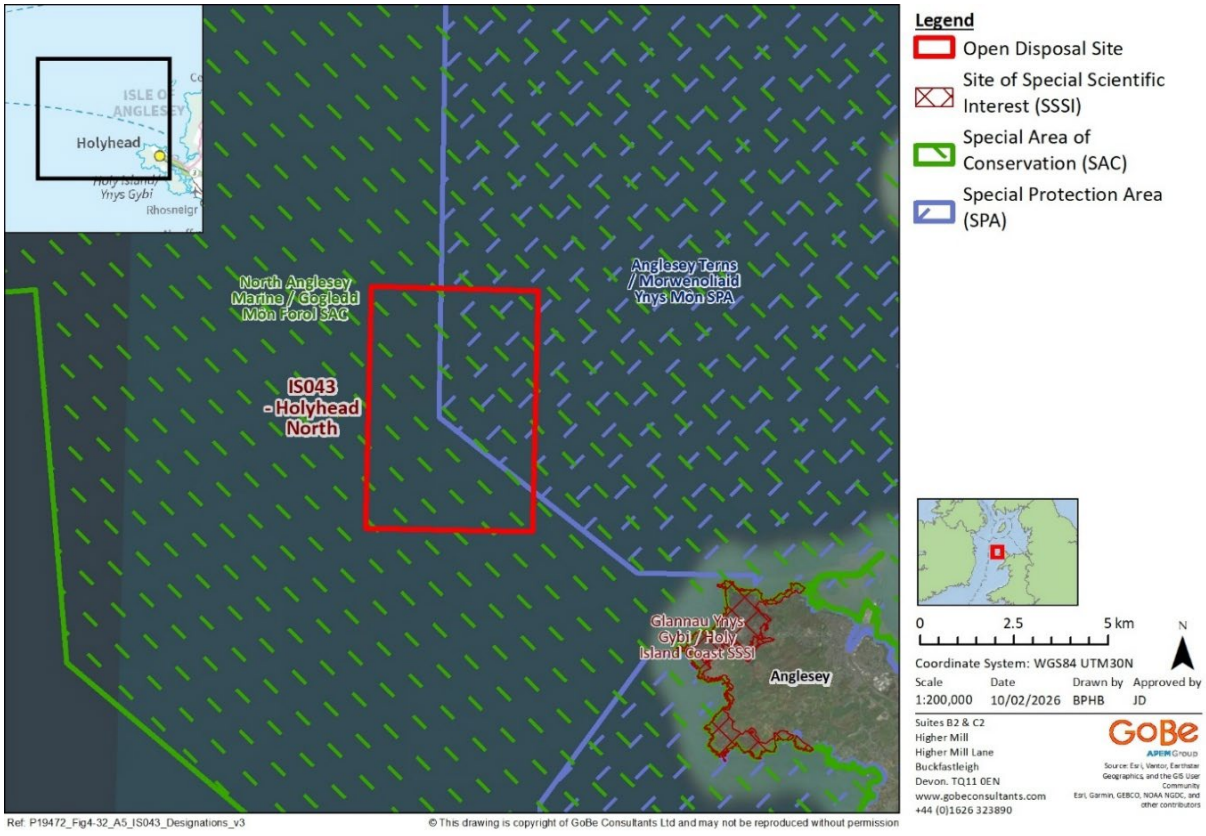

D.7.2 Designated features in the vicinity of IS035 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Menai Strait and Conwy Bay SAC | ▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Reefs;<br>▪ Sandbanks which are slightly covered by seawater all the time;<br>▪ Large shallow inlets and bays; and<br>▪ Submerged or partially submerged sea caves. | 0.7 |
| Liverpool Bay SPA | ▪ Red-throated diver (*Gavia stella*);<br>▪ Little gul (*Hydrocoloeus minutus*);<br>▪ Common scoter (*Melanitta nigra*);<br>▪ Water bird assemblage;<br>▪ Little tern (*Sternula albifrons*); and<br>▪ Common tern (*Sterna Hirundo*). | 2.25 |
| Aber Afon Conwy SSSI | ▪ Estuaries habitat;<br>▪ Rockpools; and | 0 |

| | | |
|---|---|---|
| | ▪ Soft piddock bored substrata. | |
| Llandudno West Shore bathing water | N/A | 3.75 |
| Conwy SWPA | ▪ Population of mussels (*Mytilus edulis*); and<br>▪ Population of cockles (*Cerastoderma edule*). | 0 |

# D.8 Holyhead North (IS043)

D.8.1 Map showing the designated sites in the vicinity of IS043 are presented in the figure below:



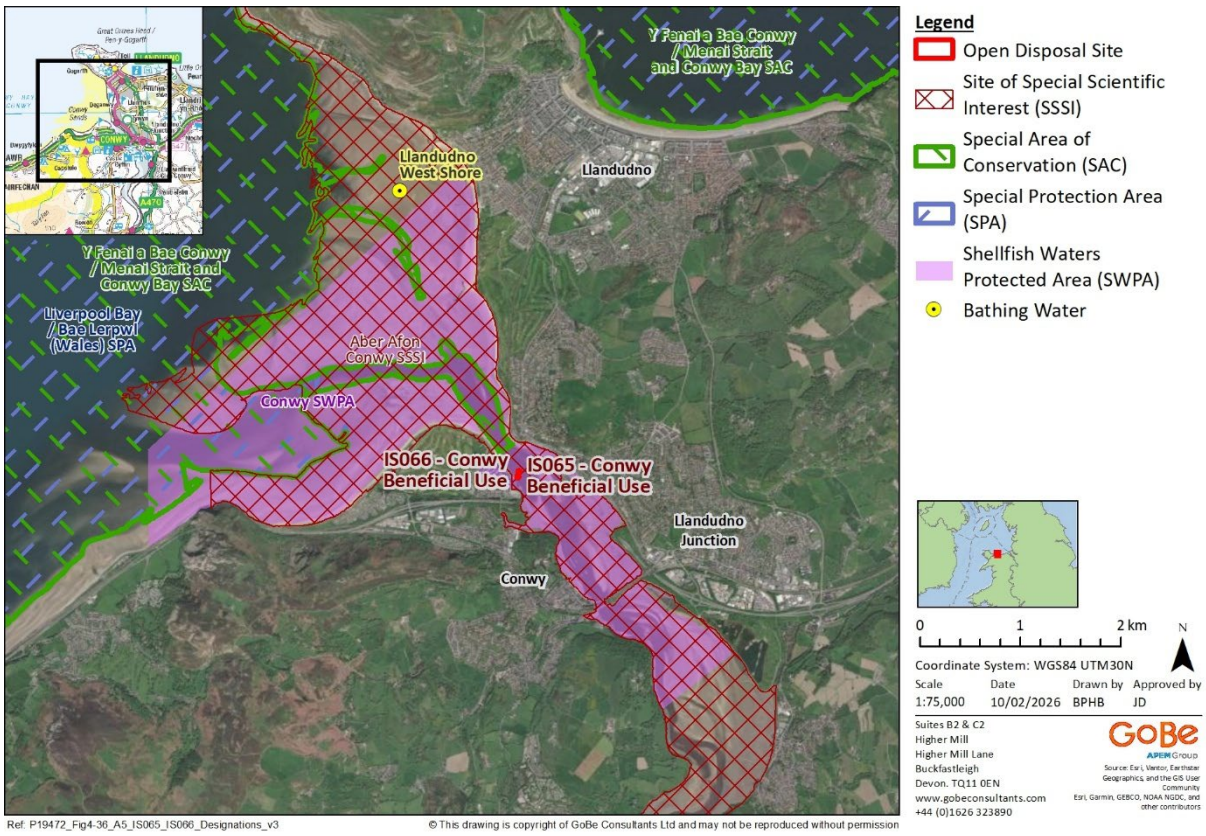

D.8.2 Designated features in the vicinity of IS043 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Anglesey Marine/Gogledd Mon Forol SAC | ▪ Harbour porpoise (Phocoena Phocoena) | 0 |
| Anglesey terns/Morwenoliaid Ynys Mon SPA | ▪ Arctic tern (*Sterna paradisaea*);<br>▪ Common Tern (*Sterna hirundo*);<br>▪ Roseate Tern (*Sterna dougallii*); and | 0 |

| | | |
|---|---|---|
| | ▪ Sandwich Tern (*Thalasseus sandvicensis*). | |
| Holy Island Coast SSSI | ▪ Intertidal habitats;<br>▪ Caves and overhangs;<br>▪ Rockpools; and<br>▪ Ponderus horny sponge (*Stryphus ponderus*). | 5 |

# D.9 Conwy Beneficial Use (IS065 and IS066)

D.9.1 Map showing the designated sites in the vicinity of IS065 and ISO66 are presented in the figure below:



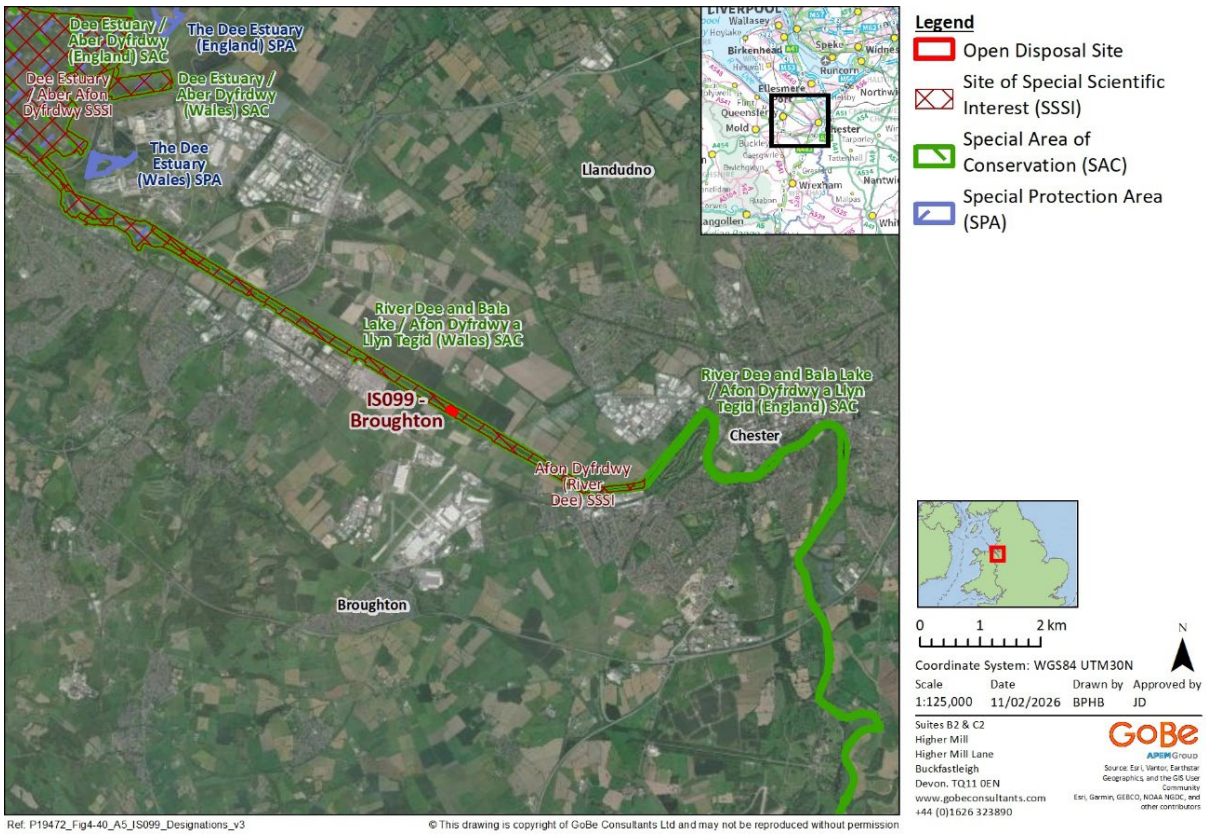

D.9.2 Designated features in the vicinity of IS065 and ISO66 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Menai Strait and Conwy Bay SAC | ▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Reefs;<br>▪ Sandbanks which are slightly covered by seawater all the time;<br>▪ Large shallow inlets and bays; and<br>▪ Submerged or partially submerged sea caves. | 0.25 |

| | | |
|---|---|---|
| Liverpool Bay SPA | ▪ Red-throated diver (*Gavia stella*);<br>▪ Little gul (*Hydrocoloeus minutus*);<br>▪ Common scoter (*Melanitta nigra*);<br>▪ Water bird assemblage;<br>▪ Little tern (*Sternula albifrons*); and<br>▪ Common tern (*Sterna Hirundo*). | 1.8 |
| Aber Afon Conwy SSSI | ▪ Estuaries habitat;<br>▪ Rockpools; and<br>▪ Soft piddock bored substrata. | 0 |
| Llandudno West Shore bathing water | N/A | 3.30 |
| Conwy SWPA | ▪ Population of mussels (*Mytilus edulis*); and<br>▪ Population of cockles (*Cerastoderma edule*). | 0 |

# D.10 Broughton (IS099)

D.10.1 Map showing the designated sites in the vicinity of IS099 are presented in the figure below:



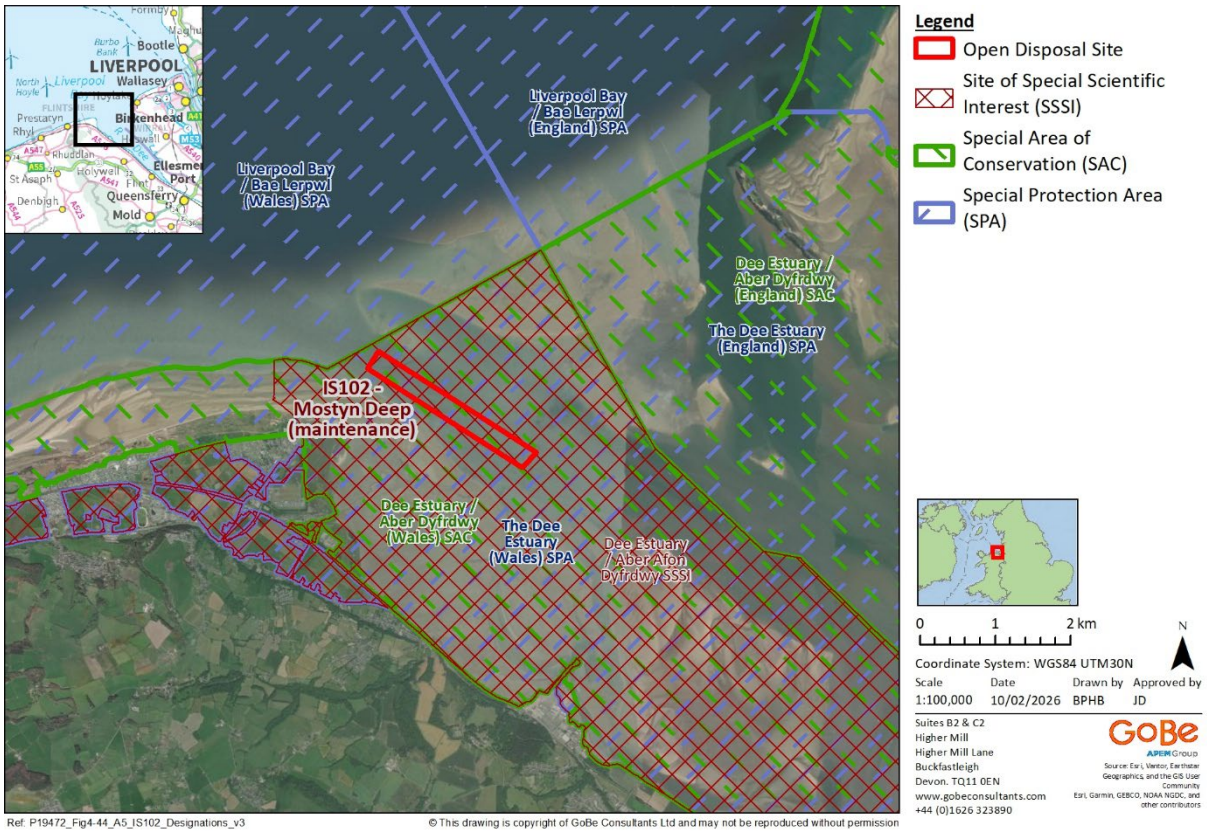

D.10.2 Designated features in the vicinity of IS099 are listed in the table below:

| Designated site | Designated features | | Distance from disposal sites (km) |
|---|---|---|---|
| River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid SAC | ▪ Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation;<br>▪ Atlantic salmon (*Salmo salar*);<br>▪ Floating water-plantain (*Luronium natans*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ Brook lamprey (*Lampetra planeri*);<br>▪ River lamprey (*Lampetra fluviatilis*);<br>▪ Bullhead (*Cottus gobio*); and<br>▪ Otter (*Lutra lutra*). | | 0 |
| Dee Estuary / Aber Dyfrdwy SAC | ▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Salicornia and other annuals colonizing mud and sand;<br>▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);<br>▪ Estuaries;<br>▪ Annual vegetation of drift lines;<br>▪ Vegetated sea cliffs of the Atlantic and Baltic coasts;<br>▪ Embryonic shifting dunes;<br>▪ Shifting dunes along the shoreline with Ammophila arenaria (white dunes);<br>▪ Humid dune slacks;<br>▪ Fixed coastal dunes with herbaceous vegetation (grey dunes);<br>▪ River lamprey (Lampetra fluviatilis);<br>▪ Sea lamprey (Petromyzon marinus); and<br>▪ Petalworth (Petalophyllum ralfsii). | | 4.5 |
| The Dee Estuary SPA | ▪ Waterbird assemblage;<br>▪ Northern pintail (Anas acuta);<br>▪ Eurasian Teal (Anas crecca);<br>▪ Dunlin (Calidris alpina);<br>▪ Red knot (Calidris canutas);<br>▪ Eurasian oystercatcher (Haematopus ostralegus); | ▪ Grey plover (Pluvialis squatarola);<br>▪ Little tern (Sternula albifrons);<br>▪ Common tern (Sterna Hirundo);<br>▪ Sandwich tern (Thalasseus sandvicensis);<br>▪ Common Shelduck (Tadorna tadorna);<br>▪ Common redshank (Tringa tetanus). and | 4.5 |

| | | | |
|---|---|---|---|
| | ▪ Bar-tailed godwit (Limosa lapponica);<br>▪ Black-tailed godwit (Limosa limosa); | ▪ Eurasian curlew (Numenius Arquata). | |
| Afon Dyfrdwy (River Dee) SSSI | ▪ Salt marshes;<br>▪ River lamprey (Lampetra fluviatilis);<br>▪ European smelt (Osmerus eperlanus); | ▪ Atlantic salmon (Salmo salar); and<br>▪ Otter (Lutra lutra). | 0 |
| Dee Estuary / Aber Afon Dyfrdwy SSSI | ▪ Northern pintail (Anas acuta);<br>▪ Eurasian Teal (Anas crecca);<br>▪ Eurasian widgeon (Anas Penelope);<br>▪ Dunlin (Calidris alpina);<br>▪ Red knot (Calidris canutas);<br>▪ Common ringed plover (Charadrius hiaticula);<br>▪ Common oystercatcher (Haematopus ostralegus);<br>▪ Bar-tailed godwit (Limosa lapponica);<br>▪ Black-tailed godwit (Limosa limosa);<br>▪ Eurasian curlew (Numenius Arquata);<br>▪ Great cormorant (Phalacrocorax carbo);<br>▪ Grey plover (Pluvialis squatarola);<br>▪ Great crested grebe (Podiceps cristatus);<br>▪ Common tern (Sterna Hirundo); | ▪ Sandwich tern (Thalasseus sandvicensis);<br>▪ Common Shelduck (Tadorna tadorna);<br>▪ Common redshank (Tringa tetanus);<br>▪ Salt marsh;<br>▪ River lamprey (Lampetra fluviatilis);<br>▪ European smelt (Osmerus eperlanus);<br>▪ Sea lamprey (Petromyzon marinus);<br>▪ Estuaries;<br>▪ Moderately exposed sand;<br>▪ Rockpools;<br>▪ Sand influenced biogenic reefs;<br>▪ Soft piddock bored substrata;<br>▪ Thumbnail crab (Thia scutellata); and<br>▪ Bristleworm (Ophelia bicornis). | 4.5 |

# D.11 Mostyn Deep (IS102)

D.11.1 Map showing the designated sites in the vicinity of IS102 are presented in the figure below:



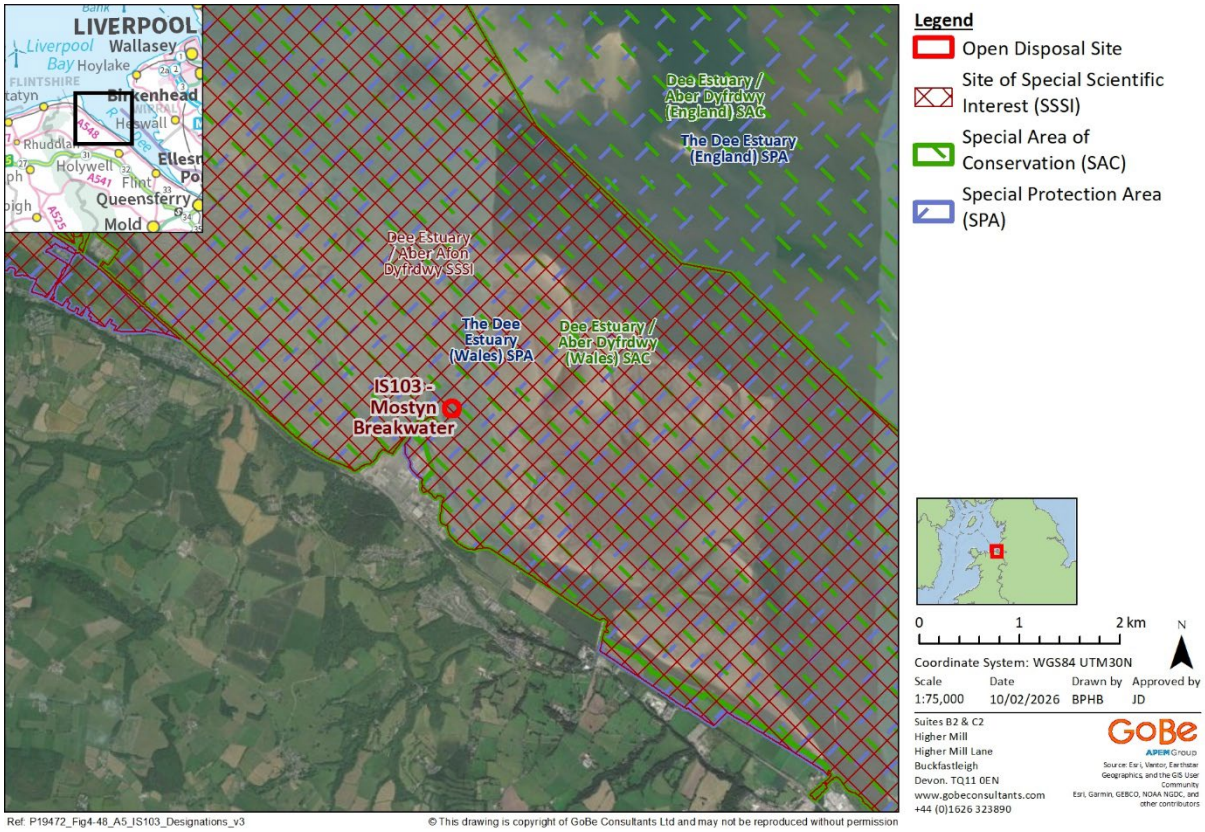

D.11.2 Designated features in the vicinity of IS102 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Dee Estuary / Aber Dyfrdwy SAC | ▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Salicornia and other annuals colonizing mud and sand;<br>▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);<br>▪ Estuaries;<br>▪ Annual vegetation of drift lines;<br>▪ Vegetated sea cliffs of the Atlantic and Baltic coasts;<br>▪ Embryonic shifting dunes;<br>▪ Shifting dunes along the shoreline with Ammophila arenaria (white dunes);<br>▪ Humid dune slacks;<br>▪ Fixed coastal dunes with herbaceous vegetation (grey dunes); | 0 |

| | | |
|---|---|---|
| | ▪ River lamprey (*Lampetra fluviatilis*);<br>▪ Sea lamprey (*Petromyzon marinus*); and<br>▪ Petalworth (*Petalophyllum ralfsii*). | |
| The Dee Estuary SPA | ▪ Waterbird assemblage;<br>▪ Northern pintail (*Anas acuta*);<br>▪ Eurasian Teal (*Anas crecca*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Red knot (*Calidris canutas*);<br>▪ Eurasian oystercatcher (*Haematopus ostralegus*);<br>▪ Bar-tailed godwit (*Limosa lapponica*);<br>▪ Black-tailed godwit (*Limosa limosa*);<br>▪ Eurasian curlew (*Numenius Arquata*);<br>▪ Grey plover (*Pluvialis squatarola*);<br>▪ Little tern (*Sternula albifrons*);<br>▪ Common tern (*Sterna Hirundo*);<br>▪ Sandwich tern (*Thalasseus sandvicensis*);<br>▪ Common Shelduck (*Tadorna tadorna*); and<br>▪ Common redshank (*Tringa tetanus*). | 0 |
| Dee Estuary / Aber Afon Dyfrdwy SSSI | ▪ Northern pintail (*Anas acuta*);<br>▪ Eurasian Teal (*Anas crecca*);<br>▪ Eurasian widgeon (*Anas Penelope*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Red knot (*Calidris canutas*);<br>▪ Common ringed plover (*Charadrius hiaticula*);<br>▪ Common oystercatcher (*Haematopus ostralegus*);<br>▪ Bar-tailed godwit (*Limosa lapponica*);<br>▪ Black-tailed godwit (*Limosa limosa*);<br>▪ Eurasian curlew (*Numenius Arquata*);<br>▪ Great cormorant (*Phalacrocorax carbo*);<br>▪ Grey plover (*Pluvialis squatarola*);<br>▪ Great crested grebe (*Podiceps cristatus*);<br>▪ Common tern (*Sterna Hirundo*);<br>▪ Sandwich tern (*Thalasseus sandvicensis*);<br>▪ Common Shelduck (*Tadorna tadorna*);<br>▪ Common redshank (*Tringa tetanus*);<br>▪ Salt marsh;<br>▪ River lamprey (*Lampetra fluviatilis*);<br>▪ European smelt (*Osmerus eperlanus*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ Estuaries;<br>▪ Moderately exposed sand;<br>▪ Rockpools;<br>▪ Sand influenced biogenic reefs;<br>▪ Soft piddock bored substrata;<br>▪ Thumbnail crab (*Thia scutellata*); and<br>▪ Bristleworm (*Ophelia bicornis*). | 0 |

# D.12 Mostyn Breakwater (IS103)

D.12.1 Map showing the designated sites in the vicinity of IS103 are presented in the figure below:



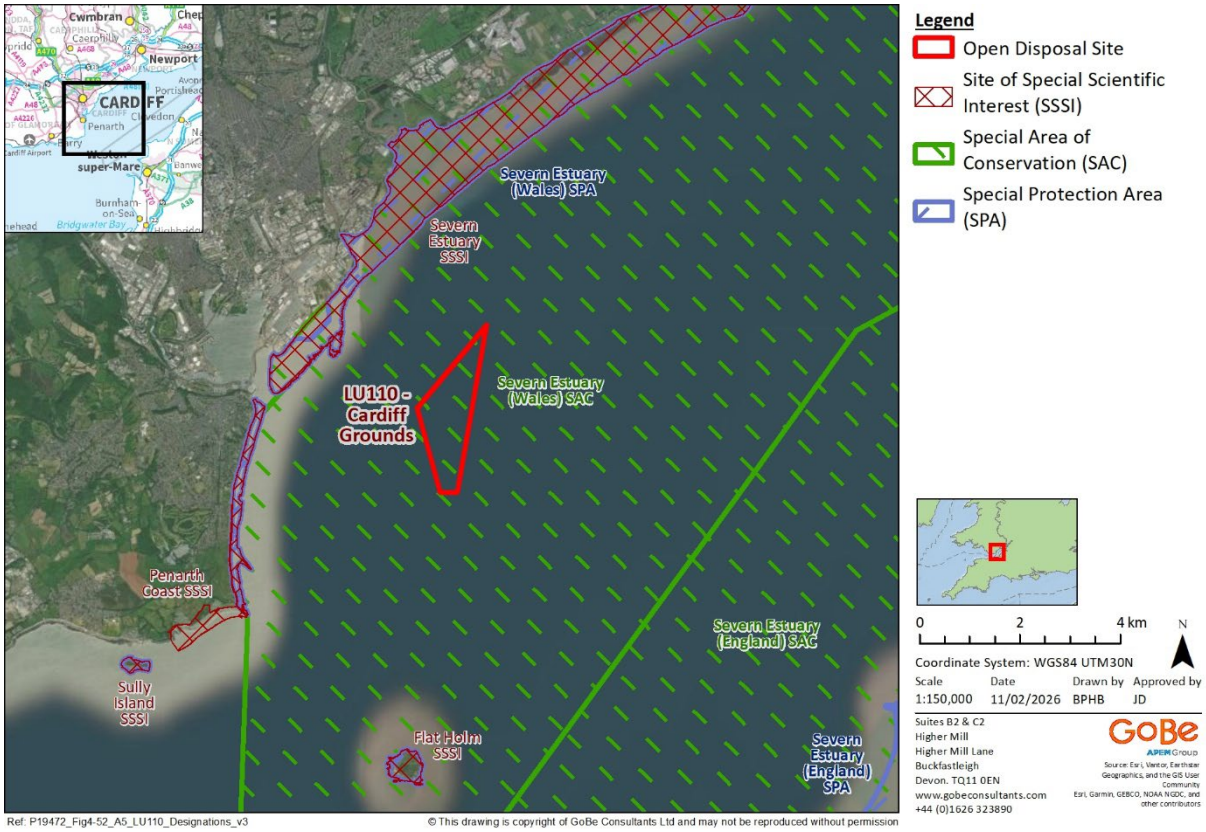

D.12.2 Designated features in the vicinity of IS103 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Dee Estuary / Aber Dyfrdwy SAC | ▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Salicornia and other annuals colonizing mud and sand;<br>▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);<br>▪ Estuaries;<br>▪ Annual vegetation of drift lines;<br>▪ Vegetated sea cliffs of the Atlantic and Baltic coasts;<br>▪ Embryonic shifting dunes;<br>▪ Shifting dunes along the shoreline with Ammophila arenaria (white dunes);<br>▪ Humid dune slacks;<br>▪ Fixed coastal dunes with herbaceous vegetation (grey dunes);<br>▪ River lamprey (*Lampetra fluviatilis*); | 0 |

| | | |
|---|---|---|
| | ▪ Sea lamprey (*Petromyzon marinus*); and<br>▪ Petalworth (*Petalophyllum ralfsii*). | |
| The Dee Estuary SPA | ▪ Waterbird assemblage;<br>▪ Northern pintail (*Anas acuta*);<br>▪ Eurasian Teal (*Anas crecca*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Red knot (*Calidris canutas*);<br>▪ Eurasian oystercatcher (*Haematopus ostralegus*);<br>▪ Bar-tailed godwit (*Limosa lapponica*);<br>▪ Black-tailed godwit (*Limosa limosa*);<br>▪ Eurasian curlew (*Numenius Arquata*);<br>▪ Grey plover (*Pluvialis squatarola*);<br>▪ Little tern (*Sternula albifrons*);<br>▪ Common tern (*Sterna Hirundo*);<br>▪ Sandwich tern (*Thalasseus sandvicensis*);<br>▪ Common Shelduck (*Tadorna tadorna*); and<br>▪ Common redshank (*Tringa tetanus*). | 0 |
| Dee Estuary / Aber Afon Dyfrdwy SSSI | ▪ Northern pintail (*Anas acuta*);<br>▪ Eurasian Teal (*Anas crecca*);<br>▪ Eurasian widgeon (*Anas Penelope*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Red knot (*Calidris canutas*);<br>▪ Common ringed plover (*Charadrius hiaticula*);<br>▪ Common oystercatcher (*Haematopus ostralegus*);<br>▪ Bar-tailed godwit (*Limosa lapponica*);<br>▪ Black-tailed godwit (*Limosa limosa*);<br>▪ Eurasian curlew (*Numenius Arquata*);<br>▪ Great cormorant (*Phalacrocorax carbo*);<br>▪ Grey plover (*Pluvialis squatarola*);<br>▪ Great crested grebe (*Podiceps cristatus*);<br>▪ Common tern (*Sterna Hirundo*);<br>▪ Sandwich tern (*Thalasseus sandvicensis*);<br>▪ Common Shelduck (*Tadorna tadorna*);<br>▪ Common redshank (*Tringa tetanus*);<br>▪ Salt marsh;<br>▪ River lamprey (*Lampetra fluviatilis*);<br>▪ European smelt (*Osmerus eperlanus*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ Estuaries;<br>▪ Moderately exposed sand;<br>▪ Rockpools;<br>▪ Sand influenced biogenic reefs;<br>▪ Soft piddock bored substrata;<br>▪ Thumbnail crab (*Thia scutellata*); and<br>▪ Bristleworm (*Ophelia bicornis*). | 0 |

# D.13 Cardiff Grounds (LU110)

D.13.1 Map showing the designated sites in the vicinity of IS110 are presented in the figure below:



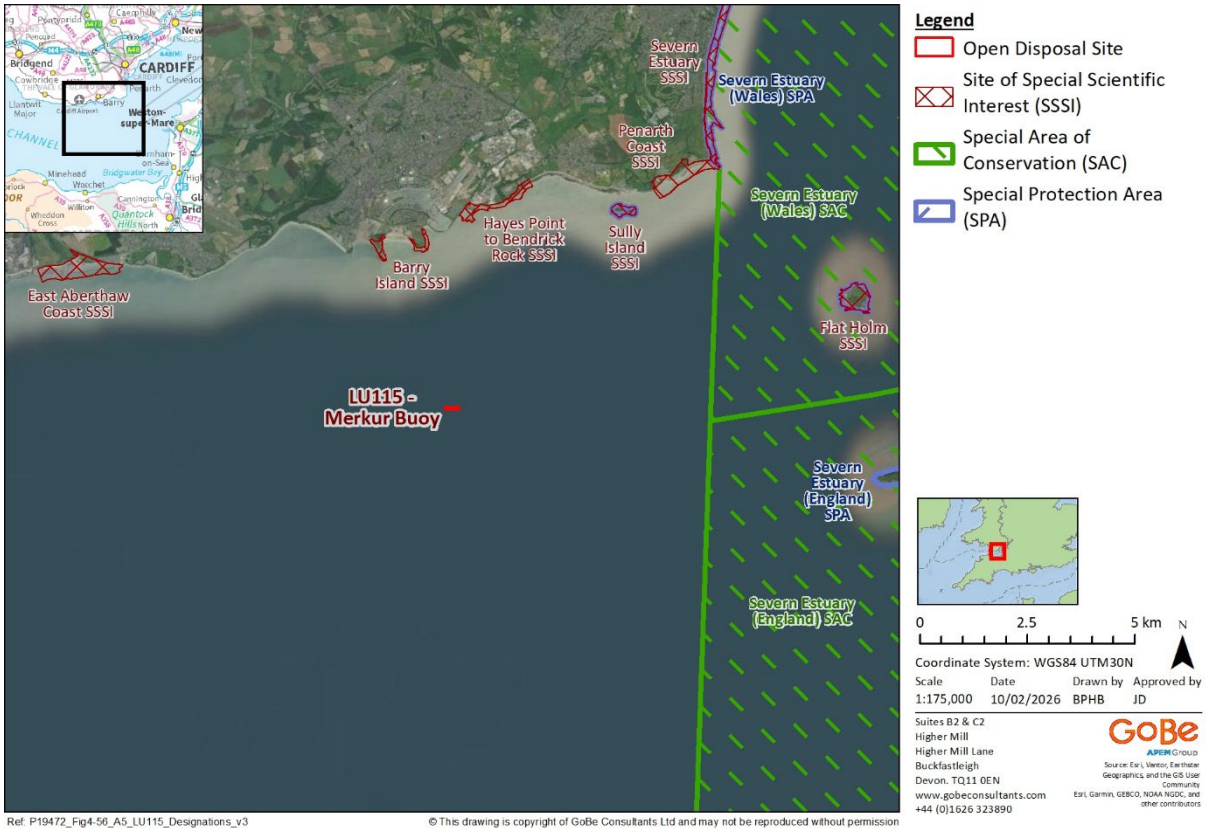

D.13.2 Designated features in the vicinity of IS110 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Severn Estuary SSSI | ▪ Northern pintail (*Anas acuta*);<br>▪ Northern Shoveler (*Anas clypeata*);<br>▪ Eurasian Teal (*Anas crecca*);<br>▪ Eurasian widgeon (*Anas Penelope*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Common ringed plover (*Charadrius hiaticula*);<br>▪ Black-tailed godwit (*Limosa limosa*);<br>▪ Eurasian curlew (*Numenius Arquata*);<br>▪ European golden plover (*Pluvialis apricaria*);<br>▪ Great cormorant (*Phalacrocorax carbo*);<br>▪ Grey plover (*Pluvialis squatarola*);<br>▪ Common Shelduck (*Tadorna tadorna*);<br>▪ Common redshank (*Tringa totanus*);<br>▪ Salt marsh;<br>▪ Allis shad (*Alosa alosa*);<br>▪ Twaite shad (*Alosa fallax*); | 1.5 |

| | | |
|---|---|---|
| | ▪ River lamprey (*Lampetra fluviatilis*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ Atlantic salmon (*Salmo salar*);<br>▪ Eel grass;<br>▪ Estuaries;<br>▪ Rockpools;<br>▪ Sand influenced biogenic reefs;<br>▪ Tide-swept algae;<br>▪ Amphipods (*Gammarus chevreuxi* and *Gammarus insensibilis*); and<br>▪ Grey seal (*Halichoerus grypus*). | |
| Penarth Coast SSSI | ▪ Rockpools;<br>▪ Sand influenced biogenic reefs;<br>▪ Soft piddock bored substrata; and<br>▪ Tide-swept algae. | 3.5 |
| Flat Holm SSSI | ▪ Sand influenced biogenic reefs. | 4.25 |
| Sully Island SSSI | ▪ Dunlin (*Calidris alpina*);<br>▪ Common ringed plover (*Charadrius hiaticula*);<br>▪ Grey plover (*Pluvialis squatarola*); and<br>▪ Common redshank (*Tringa totanus*). | 5.50 |
| Severn Estuary SAC | ▪ Estuaries;<br>▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);<br>▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Reefs;<br>▪ Twaite shad (*Alosa fallax*);<br>▪ River lamprey (*Lampetra fluviatilis*); and<br>▪ Sea lamprey (*Petromyzon marinus*). | 0 |
| Severn Estuary SPA | ▪ Bewick's swan (*Cygnus columbianus bewickii*);<br>▪ Common shelduck (*Tadorna tadorna*);<br>▪ Gadwall (*Anas strepera*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Common redshank (*Tringa tetanus*); and<br>▪ Greater white-fronted goose (*Anser albifrons*). | 1.5 |

# D.14 Merkur Buoy (LU115)

D.14.1 Map showing the designated sites in the vicinity of LU115 are presented in the figure below:




D.14.2 Designated features in the vicinity of LU115 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Severn Estuary SSSI | ▪ Northern pintail (*Anas acuta*);<br>▪ Northern Shoveler (*Anas clypeata*);<br>▪ Eurasian Teal (*Anas crecca*);<br>▪ Eurasian widgeon (*Anas Penelope*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Common ringed plover (*Charadrius hiaticula*);<br>▪ Black-tailed godwit (*Limosa limosa*);<br>▪ Eurasian curlew (*Numenius Arquata*);<br>▪ European golden plover (*Pluvialis apricaria*);<br>▪ Great cormorant (*Phalacrocorax carbo*);<br>▪ Grey plover (*Pluvialis squatarola*);<br>▪ Common Shelduck (*Tadorna tadorna*);<br>▪ Common redshank (*Tringa totanus*);<br>▪ Salt marsh;<br>▪ Allis shad (*Alosa alosa*);<br>▪ Twaite shad (*Alosa fallax*); | 6.5 |

| | | |
|---|---|---|
| | ▪ River lamprey (*Lampetra fluviatilis*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ Atlantic salmon (*Salmo salar*);<br>▪ Eel grass;<br>▪ Estuaries;<br>▪ Rockpools;<br>▪ Sand influenced biogenic reefs;<br>▪ Tide-swept algae;<br>▪ Amphipods (*Gammarus chevreuxi* and *Gammarus insensibilis*); and<br>▪ Grey seal (*Halichoerus grypus*). | |
| Penarth Coast SSSI | ▪ Rockpools;<br>▪ Sand influenced biogenic reefs;<br>▪ Soft piddock bored substrata; and<br>▪ Tide-swept algae. | 5.5 |
| Flat Holm SSSI | ▪ Sand influenced biogenic reefs. | 7 |
| Sully Island SSSI | ▪ Dunlin (*Calidris alpina*);<br>▪ Common ringed plover (*Charadrius hiaticula*);<br>▪ Grey plover (*Pluvialis squatarola*); and<br>▪ Common redshank (*Tringa totanus*). | 4.5 |
| Hayes Point to Bendrick Rock SSSI | ▪ Triassic fossil prints; and<br>▪ Triassic sedimentology and stratigraphy. | 3.5 |
| East Aberthaw Coast SSSI | ▪ Rockpools;<br>▪ Under-boulders; and<br>▪ Flatworm (*Convoluta roscoffensis*). | 6.5 |
| Barry Island SSSI | ▪ Mercia Mudstone Group; and<br>▪ Carboniferous Limestone vertical cliffs. | 3 |
| Severn Estuary SAC | ▪ Estuaries;<br>Reefs;<br>▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);<br>▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Twaite shad (*Alosa fallax*);<br>▪ River lamprey (*Lampetra fluviatilis*); and<br>▪ Sea lamprey (*Petromyzon marinus*). | 5.5 |
| Severn Estuary SPA | ▪ Bewick's swan (*Cygnus columbianus bewickii*);<br>▪ Common shelduck (*Tadorna tadorna*);<br>▪ Gadwall (*Anas strepera*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Common redshank (*Tringa tetanus*); and<br>▪ Greater white-fronted goose (*Anser albifrons*). | 4.5 |

# D.15 Swansea Bay (Outer) (LU130)

D.15.1 Map showing the designated sites in the vicinity of LU130 are presented in the figure below:

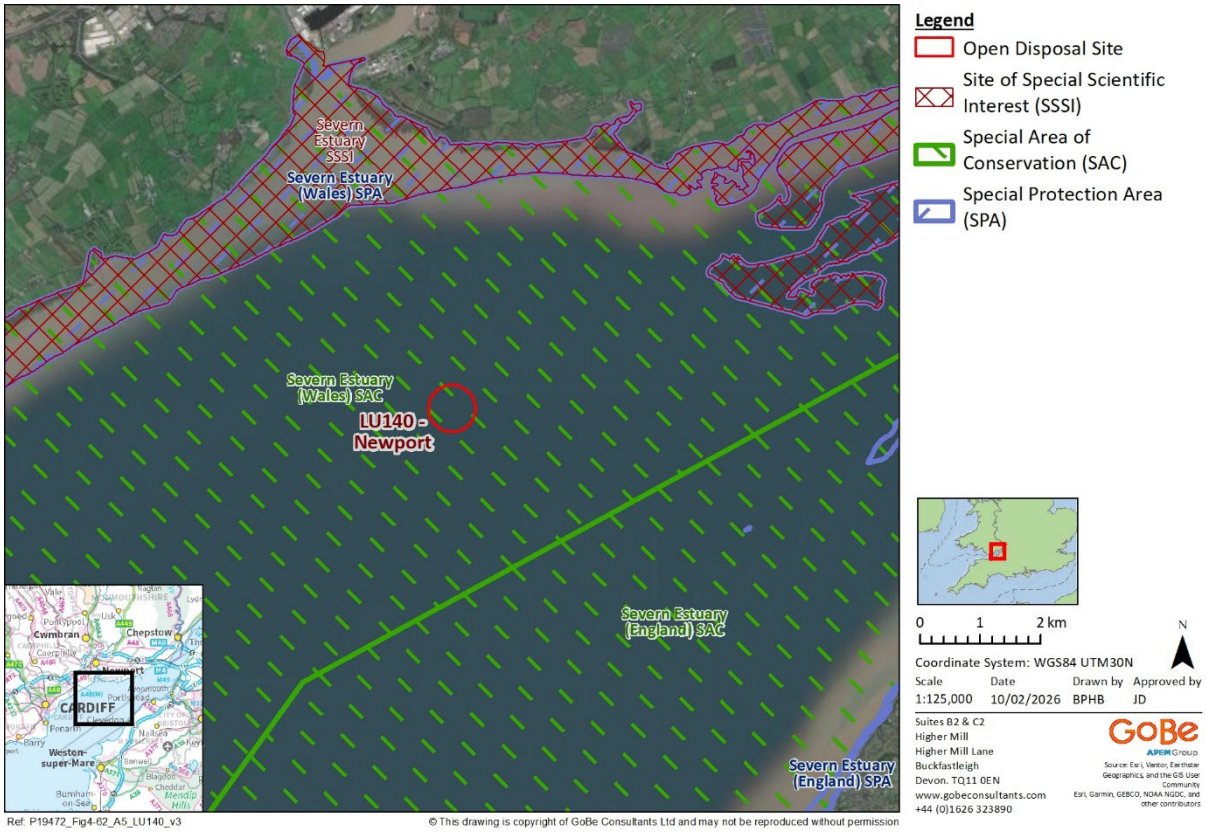



D.15.2 Designated features in the vicinity of LU130 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Blackpill, Swansea SSSI | ▪ Muddy gravel;<br>▪ Sanderling (*Calidris alba*); and<br>▪ Common ringed plover (*Charadrius hiaticula*). | 4.5 |
| Bracelet Bay SSSI | ▪ Sand influenced biogenic reefs. | 3.5 |
| Langland Bay (Rotherslade) SSSI | ▪ Pleistocene glacial deposits. | 4.5 |

# D.16 Newport (LU140)

D.16.1 Map showing the designated sites in the vicinity of LU140 are presented in the figure below:



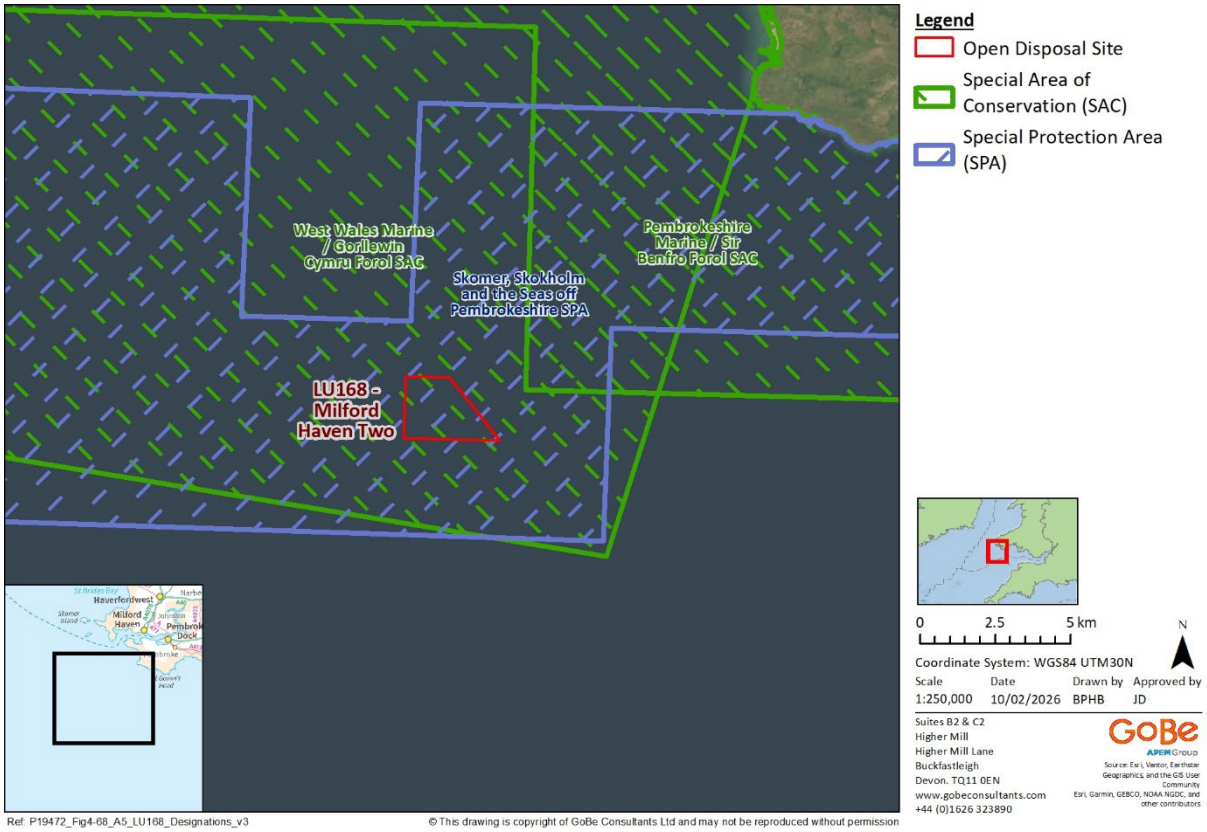

D.16.2 Designated features in the vicinity of LU140 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Severn Estuary SSSI | ▪ Northern pintail (*Anas acuta*);<br>▪ Northern Shoveler (*Anas clypeata*);<br>▪ Eurasian Teal (*Anas crecca*);<br>▪ Eurasian widgeon (*Anas Penelope*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Common ringed plover (*Charadrius hiaticula*);<br>▪ Black-tailed godwit (*Limosa limosa*);<br>▪ Eurasian curlew (*Numenius Arquata*);<br>▪ European golden plover (*Pluvialis apricaria*);<br>▪ Great cormorant (*Phalacrocorax carbo*);<br>▪ Grey plover (*Pluvialis squatarola*);<br>▪ Common Shelduck (*Tadorna tadorna*);<br>▪ Common redshank (*Tringa totanus*);<br>▪ Salt marsh;<br>▪ Allis shad (*Alosa alosa*);<br>▪ Twaite shad (*Alosa fallax*); | 2.5 |

| | | |
|---|---|---|
| | ▪ River lamprey (*Lampetra fluviatilis*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ Atlantic salmon (*Salmo salar*);<br>▪ Eel grass;<br>▪ Estuaries;<br>▪ Rockpools;<br>▪ Sand influenced biogenic reefs;<br>▪ Tide-swept algae;<br>▪ Amphipods (*Gammarus chevreuxi* and *Gammarus insensibilis*); and<br>▪ Grey seal (*Halichoerus grypus*). | |
| Severn Estuary SAC | ▪ Estuaries;<br>▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);<br>▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Reefs;<br>▪ Twaite shad (*Alosa fallax*);<br>▪ River lamprey (*Lampetra fluviatilis*); and<br>▪ Sea lamprey (*Petromyzon marinus*). | 0 |
| Severn Estuary SPA | ▪ Bewick's swan (*Cygnus columbianus bewickii*);<br>▪ Common shelduck (*Tadorna tadorna*);<br>▪ Gadwall (*Anas strepera*);<br>▪ Dunlin (*Calidris alpina*);<br>▪ Common redshank (*Tringa tetanus*); and<br>▪ Greater white-fronted goose (*Anser albifrons*). | 2.5 |

# D.17 Milford Haven Two (LU168)

D.17.1 Map showing the designated sites in the vicinity of LU168 are presented in the figure below:



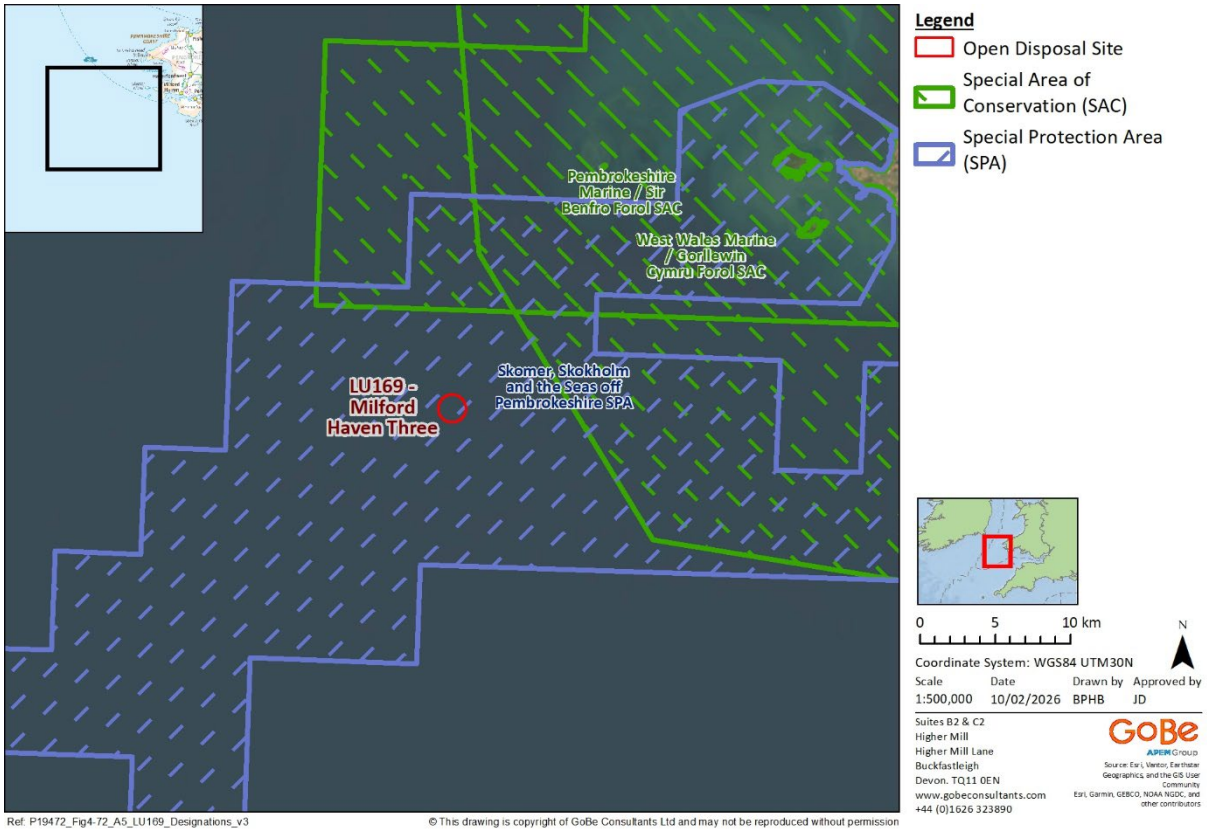

D.17.2 Designated features in the vicinity of LU168 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Skomer, Skokholm and the Seas off Pembrokeshire SPA | ▪ European storm petrel (*Hydrobates pelagicus*);<br>▪ Red-billed chough (*Pyrrhocorax pyrrhocorax*);<br>▪ Short-eared owl (*Asio flammeus*);<br>▪ Manx shearwater (*Puffinus puffinus*);<br>▪ Atlantic puffin (*Fratercula arctica*);<br>▪ Lesser black-backed gull (*Larus fuscus*); and<br>▪ Seabird assemblage. | 0 |
| West Wales Marine / Gorllewin Cymru Forol SAC | ▪ Harbour porpoise (Phocoena Phocoena); | 0 |
| Pembrokeshire Marine / Sir Benfro Forol SAC | ▪ Estuaries,<br>▪ Large shallow inlets and bays;<br>▪ Reefs; | 1.3 |

| | | |
|---|---|---|
| | ▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Coastal lagoons;<br>▪ 1Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);<br>▪ Submerged or partially submerged sea caves;<br>▪ Grey seal (*Halichoerus grypus*);<br>▪ Shore dock (*Rumex rupestris*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ River lamprey (*Lampetra fluviatilis*);<br>▪ Allis shad (*Alosa alosa*);<br>▪ Twaite shad (*Alosa fallax*); and<br>▪ Otter (*Lutra lutra*). | |

# D.18 Milford Haven Three (LU169)

D.18.1 Map showing the designated sites in the vicinity of LU169 are presented in the figure below:

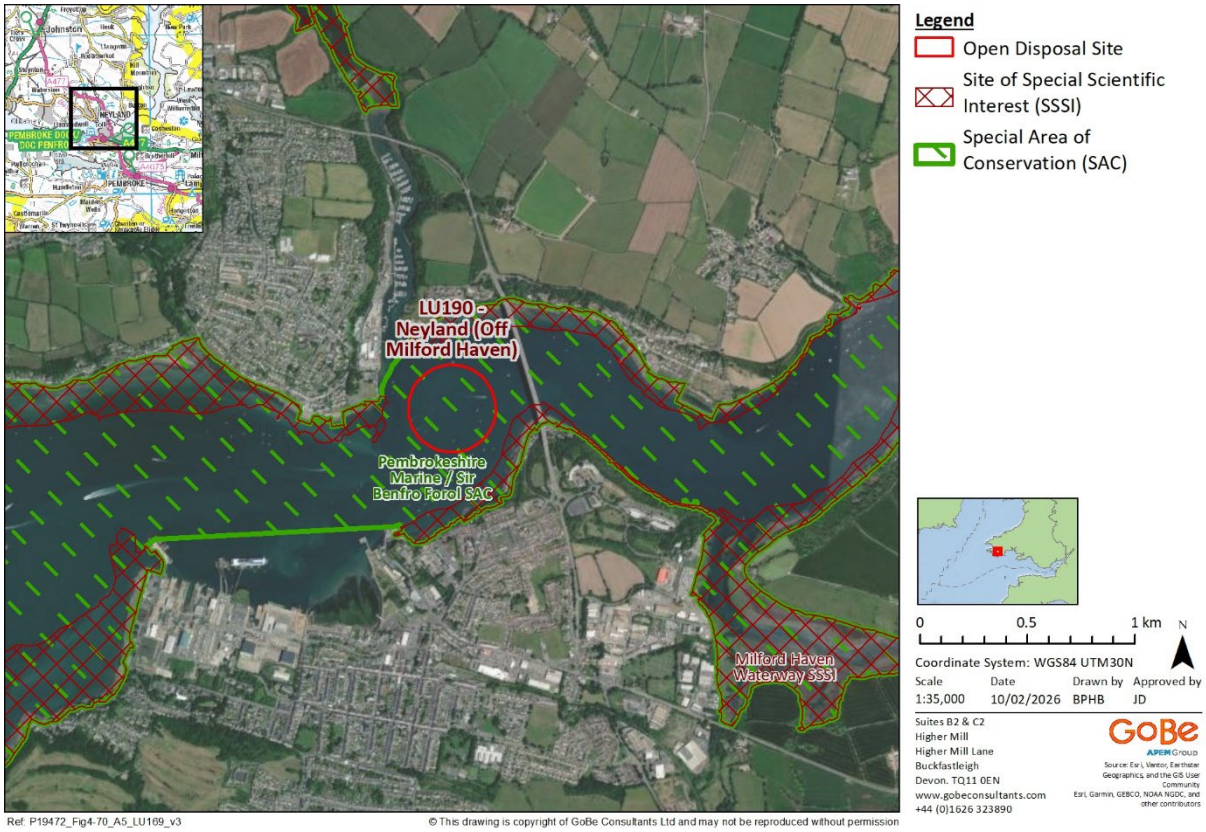


D.18.2 Designated features in the vicinity of LU169 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Skomer, Skokholm and the Seas off Pembrokeshire SPA | ▪ European storm petrel (*Hydrobates pelagicus*);<br>▪ Red-billed chough (*Pyrrhocorax pyrrhocorax*);<br>▪ Short-eared owl (*Asio flammeus*);<br>▪ Manx shearwater (*Puffinus puffinus*);<br>▪ Atlantic puffin (*Fratercula arctica*);<br>▪ Lesser black-backed gull (*Larus fuscus*); and<br>▪ Seabird assemblage. | 0 |
| West Wales Marine / Gorllewin Cymru Forol SAC | ▪ Harbour porpoise (*Phocoena Phocoena*); | 4.5 |
| Pembrokeshire Marine / Sir Benfro Forol SAC | ▪ Estuaries,<br>▪ Large shallow inlets and bays;<br>▪ Reefs;<br>▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Coastal lagoons;<br>▪ 1Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);<br>▪ Submerged or partially submerged sea caves;<br>▪ Grey seal (*Halichoerus grypus*);<br>▪ Shore dock (*Rumex rupestris*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ River lamprey (*Lampetra fluviatilis*);<br>▪ Allis shad (*Alosa alosa*);<br>▪ Twaite shad (*Alosa fallax*); and<br>▪ Otter (*Lutra lutra*). | 4.5 |

# D.19 Neyland (Off Milford Haven) (LU190)

D.19.1 Map showing the designated sites in the vicinity of LU190 are presented in the figure below:




D.19.2 Designated features in the vicinity of LU190 are listed in the table below:

| Designated site | Designated features | Distance from disposal sites (km) |
|---|---|---|
| Pembrokeshire Marine / Sir Benfro Forol SAC | ▪ Estuaries,<br>▪ Large shallow inlets and bays;<br>▪ Reefs;<br>▪ Sandbanks which are slightly covered by sea water all the time;<br>▪ Mudflats and sandflats not covered by seawater at low tide;<br>▪ Coastal lagoons;<br>▪ 1Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);<br>▪ Submerged or partially submerged sea caves;<br>▪ Grey seal (*Halichoerus grypus*);<br>▪ Shore dock (*Rumex rupestris*);<br>▪ Sea lamprey (*Petromyzon marinus*);<br>▪ River lamprey (*Lampetra fluviatilis*);<br>▪ Allis shad (*Alosa alosa*); | 0 |

| | | |
|---|---|---|
| | ▪ Twaite shad (*Alosa fallax*); and<br>▪ Otter (*Lutra lutra*). | |
| Milford Haven Waterway SSSI | ▪ Intertidal rocky shores, sandy beaches, mudflats and muddy creeks;<br>▪ Intertidal sediment and substrates;<br>▪ Rockpools;<br>▪ Eel grass (*Zostera spp.*) bed;<br>▪ Under-boulder communities; and<br>▪ Tide-swept lower shore communities. | |

# E Modelling report

Llywodraeth Cymru
Welsh Government

GoBe
APEM Group

PORT & COASTAL
SOLUTIONS

# Strategic Review of Welsh Marine Disposal Sites

## Modelling Report

PU089 R01F01



Welsh Government
Modelling Study
March 2026

GoBe Consultants Ltd
Suites B2 & C2, Higher Mill
Higher Mill Lane
Buckfastleigh
Devon
TQ11 0EN

www.gobeconsultants.com