Kilrush Maritime Ltd.

Maintenance Dredging Activity – Kilrush Marina

Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement

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AQUAFACT APEM Group

AQUAFACT Ref: P17851
November 2025
COMMERCIAL IN CONFIDENCE

Client:	**Kilrush Maritime Ltd.**
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Reference no:	**P17851**
Date of issue:	**November 2025**

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Tax Clearance Number:	**559674**

Approval Sheet

Client	Kilrush Maritime Ltd.
Report Title	Maintenance Dredging Activity – Kilrush Marina Supporting Information for Screening for Appropriate Assessment and Natura Impact Statement
Job Number	P17851
Report Status	Final
Issue Date	November 2025

Rev	Status	Issue Date	File Name	Author(s)	Approved By
1	Final	November 2025	P17851_Kilrush_DaS_NIS_Final	Aisling Hearty	Brendan Dickerson

AQUAFACT
APEM Group

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1. Introduction

1.1. Overview

This report has been prepared by AQUAFACT - APEM Group (AQUAFACT) to provide relevant information to enable the competent authority (MARA) to carry out a Stage 1: Screening for Appropriate Assessment for Kilrush Marina maintenance dredging activity ('the Project') as required under Article 6(3) obligations of the Habitats Directive. MARA's functions and decision-making in this context are guided by the Maritime Area Planning Act 2021 and related statutory instruments, which establish its responsibility for assessing licence applications in line with European and national environmental law. This report considers the potential effects of the Project on European sites.

The objective of the Project is to undertake maintenance dredging of the existing access channel on the seaward approaches to Kilrush Creek, Kilrush, County Clare. The works involve the removal of accumulated sediments that have reduced the navigability of the channel leading to Kilrush Marina and the inner harbour area. The dredged material is proposed to be disposed of at a licensed offshore dumping site in accordance with relevant environmental legislation and permitting requirements. The Project is essential to ensure the continued safe access for vessels using the marina and to maintain the operational functionality of the harbour. The locations of the dredging works are shown in **Figure 1-1** and **Figure 1-2**.

The aims/benefits of the Project can be summarised as follows:

- To restore and maintain safe navigational depths within the access channel to Kilrush Marina
- To ensure continued maritime access for recreational, commercial, and emergency vessels
- To prevent sedimentation-related access constraints that could impact the local economy and harbour operations
- To manage dredged material in an environmentally responsible manner through licensed at-sea disposal

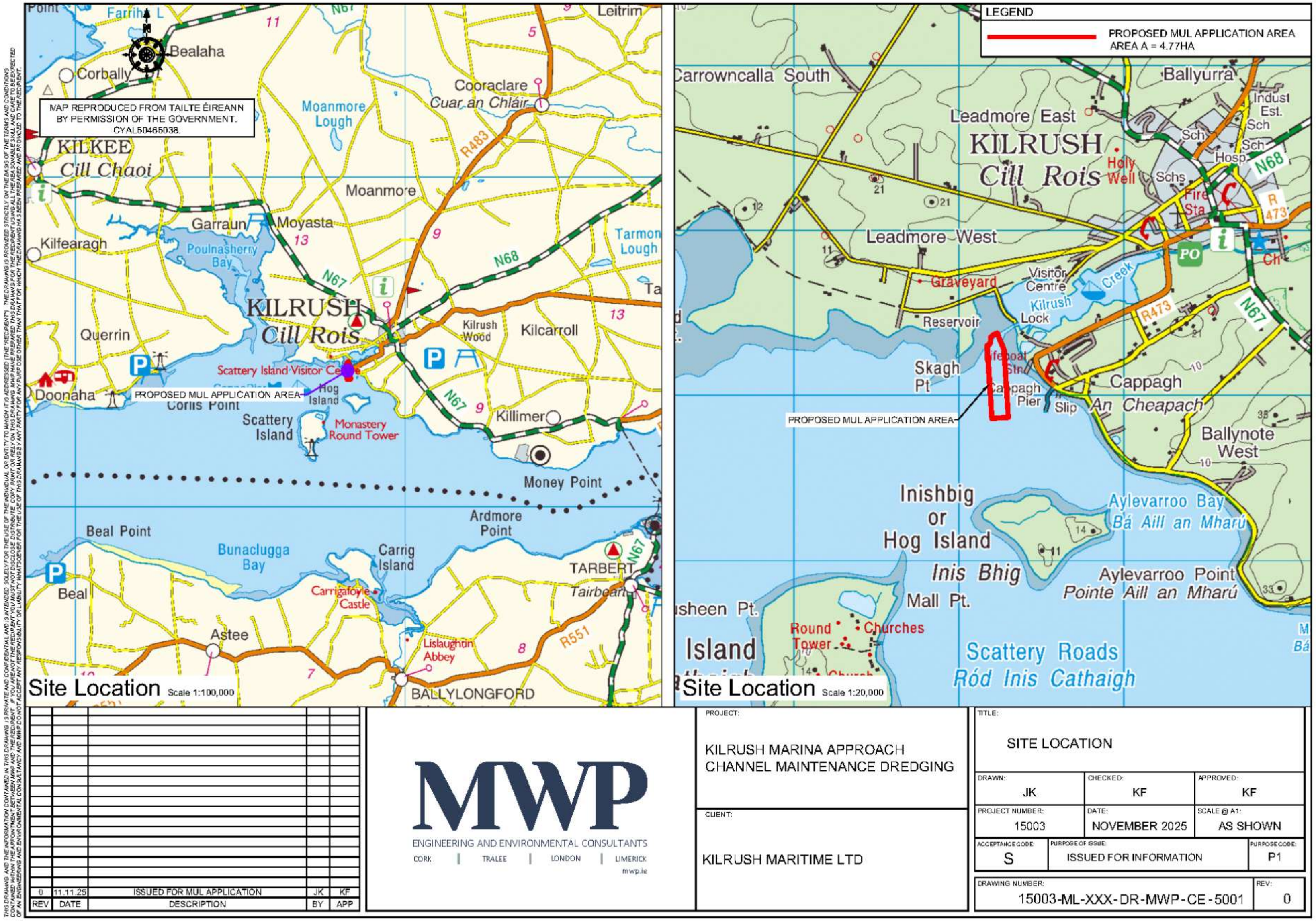


Figure 1-1: Proposed dredging area and site location, Kilrush Marina, Co. Clare.

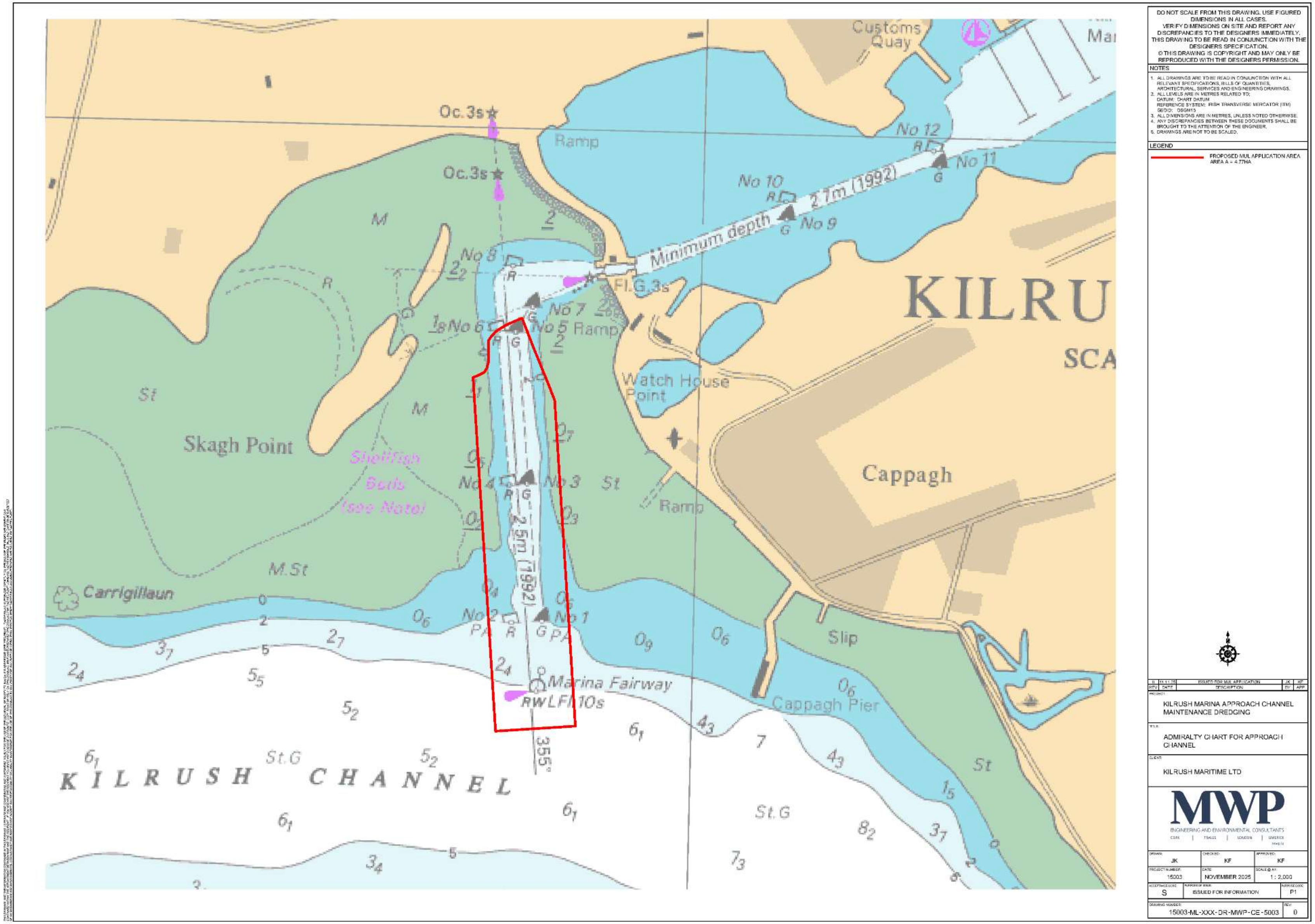


Figure 1-2: Proposed dredging area, Kilrush, Co. Clare.

1.2. Appropriate Assessment Process

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (commonly known as the Habitats Directive) is the European Community legislation based on nature conservation established to ensure biodiversity is conserved through the conservation of natural habitats, wild fauna and flora in Europe. A network of sites of conservation importance hosting habitats and species as needing to be either maintained at or, where appropriate, restored to favourable conservation status have been selected as a Special Area of Conservation (SAC) and Special Protection Area (SPA), which are collectively referred to in Ireland as European sites. Together these comprise the Natura 2000 network of protected sites (OPR, 2021). The specific named habitat and/or non-bird species for which an SAC is selected are called 'Qualifying Interests' (QI) of the site while specific named bird species for which an SPA is selected are called 'Special Conservation Interest' (SCIs) of the site (OPR, 2021). In this report, QIs and SCIs are collectively referred to as 'conservation features'.

The Habitats Directive was originally transposed into Irish law by the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997). The 1997 Regulations were subsequently revoked and replaced by the European Communities (Birds and Natural Habitats) Regulations 2011, as amended (herein referred to as the 2011 Birds and Natural Habitats Regulations). The Habitats (92/43/EEC) and Birds (2009/147/EC) Directives were transposed into the Irish legislation by Part XAB of the 2000 Act and the Birds and Natural Habitats Regulations 2011. The legislative provisions for AA Screening for planning applications are set out in Section 177U of the 2000 Act.

Articles 6(3) and Article 6(4) of the Habitats Directive outlines the decision-making procedures for considering plans and projects that may have a significant effect on a Natura 2000 site. The Department of the Environment Heritage and Local Government guidelines (DEHLG, 2009, reviewed in 2010) promotes a four-stage process (**Figure 1-3**) to complete the AA and outlines the issues and tests at each stage. Stage 1 and Stage 2 encompass the main requirements for assessment under Article 6(3) of the Habitats Directive. Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

Figure 1-3: Four stages of the Appropriate Assessment Process.

An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

1.3. Guidance/Legislation

This report has been prepared in accordance with the following guidance:

- European Commission (2018) Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive 92/43/EEC Commission notice.
- Office of Planning Regulator (2021) Practice Note PN01 Appropriate Assessment screening for development management.
- Department of Environment, Housing and Local Government (2009) Appropriate Assessment of plans and projects in Ireland guidance for planning authorities (Revised 2010).
- European Commission (2001) Assessment of plans and projects in relation to Natura 2000 sites – methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC Commission notice.
- Habitats Directive (Council Directive 92/43/EEC) 1992.
- Birds Directive (Directive 79/409/EEC) 1979, amended Directive 2009/147/EC.
- European Communities (Birds and Natural Habitats) Regulations 2011-2021
- Department of Arts, Heritage and the Gaeltacht – National Parks and Wildlife Service (DAHG - NPWS) (2012) Marine Natura Impact Statements in Ireland Special Areas of Conservation, a working document.
- NPWS (2014) Guidance to Manage the Risk to Marine Mammals from Man-Made Sound Sources in Irish Waters.
- EPA (2006, updated 2019) Guidelines for the Assessment of Dredged Material in Irish Waters and Addendum on Dumping at Sea Site Selection Guidance.
- Maritime Area Planning Act (2021) – provisions relating to Appropriate Assessment (AA) and Environmental Impact Assessment (EIA) for maritime projects.
- MARA (2024) Applicant Technical Guidance (V7) for Maritime Area Consents and Licensing.
- Marine Institute technical advice and data resources on sediment characterisation, dredged material assessment, and baseline marine environment datasets.

This assessment includes a desk-based review of available records of protected QIs and SCIs including the following sources:

- Conservation status assessment reports, backing documents and maps prepared to inform national reporting required under Article 17 of the Habitats Directive[1].
- Site synopsis, conservation objective reports and Natura 2000 forms available from NPWS.
- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports, species action plans and conservation management plans.

- Existing relevant mapping and databases *e.g.* waterbody status, species and habitat distribution, *etc*. (sourced from the Environmental Protection Agency (EPA) - http://gis.epa.ie/, the National Biodiversity Data Centre (NBDC) - http://maps.biodiversityireland.ie and the NPWS - http://www.npws.ie/mapsanddata/).

1.4. Statement of Authority

This report has been prepared by Aisling Hearty (BSc, MSc & ACIEEM).

Aisling is a Principal ecologist with 6 years of experience in consultancy and marine ecology. She is a graduate of B.Sc Science from University of Galway (UG, formerly National University of Ireland, Galway) and a First-Class Honours M.Sc in Marine Biology from UCC (University College Cork) where she completed her thesis on habitat distribution modelling of odontocetes using bioacoustic analysis. She then went on to co-author a published paper on the findings of this thesis which supported the designation of the Southeastern Rockall Slope and Canyons as an Important Marine Mammal Area (IMMA). Aisling also has a wide range of experience in ecological survey techniques and methodologies including grab sampling, freshwater kick sampling, intertidal sampling and drop-down video deployment and analysis and she is GWO and BOSIET certified. Aisling has a JNCC certification and a NPWS certification as a Marine Mammal Observer and has carried out both desk and field-based assessments regarding Marine Mammals in Ireland. Aisling has a wide range of experience in the preparation of Appropriate Assessment Screening reports, Natura Impact Statements, Ecological Impact Assessments, Environmental Impact Assessment Reports and supporting documents for an IROPI designated project. Aisling's project history includes working on aquaculture licencing, renewable energy projects (solar farms and onshore and offshore wind) and water quality projects. She is responsible for the preparation of the SISAA and NIS.

2. Stage 1: Screening for Appropriate Assessment

Stage I AA Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3):

i. whether a plan or project is directly connected to or necessary for the management of European site, and
ii. whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a European site in view of its conservation objectives.

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). Screening should be undertaken without the inclusion of mitigation, unless potential impacts clearly can be avoided through the modification or redesign of the plan or project, in which case the screening process is repeated on the altered plan. The greatest level of evidence and justification will be needed in circumstances when the process ends at screening stage on grounds of no impact.

2.1. Description of the Project

Maintenance dredging is required to ensure that navigable water depths are maintained at previously approved levels within the existing approach channel to Kilrush Creek. The dredging of the channel seaward of the lock gates is necessary to provide adequate under-keel clearance, thereby facilitating the safe and efficient passage of vessels to and from Kilrush Marina and the inner harbour.

The proposal described in this report forms part of a long-established programme of maintenance dredging in this area, which has been carried out periodically since the completion of Cappagh Pier in the mid-19th century. Dredging activities have become more regular and essential following the development of the adjacent Kilrush Marina, which was completed circa 1990.

The proposed works will be carried out over a period of approximately 6 working days per campaign. The equipment used to plough the marina approach channel will include a Multicat type tug towing an 8m wide plough blade suspended from an A-frame on the stern of the vessel. SFPC's Multicat Shannon 1 has been successfully used previously and will be commissioned again for this project, if it is not available a similar model will be used. The dredge area is 4.77 Ha which will produce approximately 8000T of material per campaign. The sides of the channel will have a gradient of 1:4. The ploughing rate is estimated to be 100m^3 per hour depending on the length of the haul.

The channel to be ploughed is *ca*. 250m long. Ploughing commences with a short run at the outermost end in a seaward direction. Each successive pass extends inwards until the ploughing run covers the full length of the channel. This is repeated daily for the duration of the campaign.

The licence is requested for a duration of 8 years, with 5 campaigns planned, spaced out approx. every 2 years for a total of 40,000T dredged material over the licence duration.

2.2. Assessment Methodology: Source-Pathway-Receptor

The assessment of impact mechanisms considers all relevant aspects of the Project that have potential direct or indirect and effects on conservation features. In order to establish the Zone of Influence (ZoI) of the Project, the assessment of likely significant effects will be based on the Source-Pathway-Receptor (S-P-R) Model (OPR, 2021):

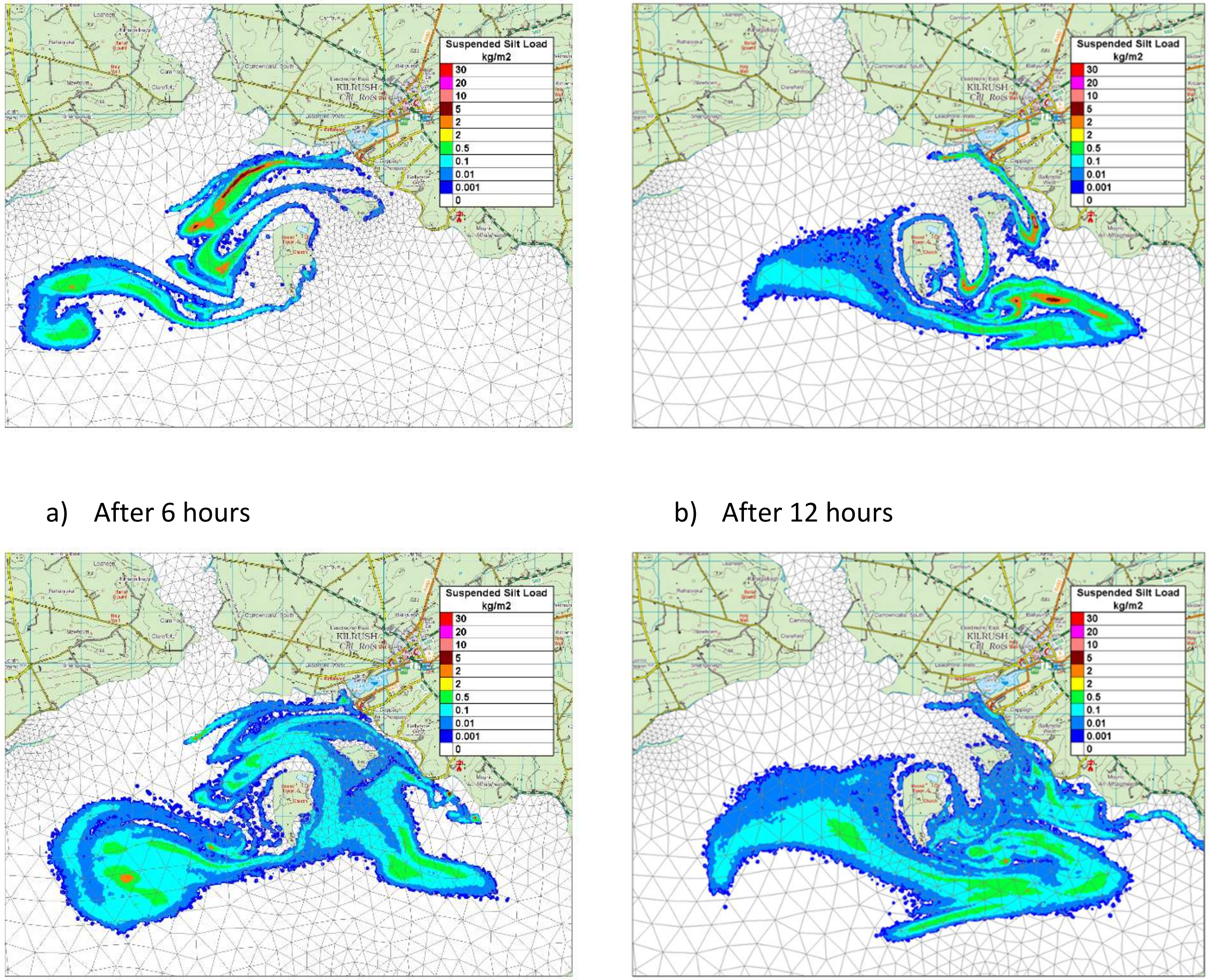
- **Source** - Identification of the characteristics of the Project based on the nature, size, location and type of impacts.
- **Pathway** – Identification of pathways that could link European sites and their conservation features to the Project.
- **Receptor** – Identification of the location, nature and sensitivities of the conservation features and the ecological conditions supporting their survival and the conservation objectives specified to maintain or restore favourable conservation status.

In order to establish the ZoI of the Project, the assessment of connectivity between impact mechanisms and a conservation feature considers the location of the Project relative to habitats and non-mobile species, species foraging distances and migration routes, the proximity of the Project to foraging and breeding areas, potential changes in species behaviour, potential hydrological connectivity between the Project and conservation features, effects on prey species resulting in alteration of interactions and associated impacts.

The ZoI for the proposed Project is defined as the area encompassing the dredging footprint (**Figure 2-1** and **Figure 2-2**) and the extent of predicted sediment dispersion identified in the sediment transport modelling report (**Appendix 1**). The modelling indicates that dredged material will disperse effectively within the outer and middle Shannon Estuary, with only minor localised deposition near the disposal area. The ZoI therefore includes areas subject to temporary increases in turbidity, minor sedimentation, and vessel activity. Underwater and airborne noise from plough dredging and associated vessel operations are expected to be low intensity and short duration, attenuating rapidly with distance. Consequently, the acoustic ZoI is considered to be limited to the immediate vicinity of the dredging and disposal sites, with no significant effects anticipated beyond this local area.

To inform the screening exercise, available data on protected habitats and species was mapped using a Geographic Information System (GIS) and interrogated to identify the S-P-R connectivity. The source, pathways and receptors were identified based on a review of ecological data in the area. If there is no ecological pathway or functional link between the Project and the conservation feature of the European site, there is no potential for impact and the conservation feature can be screened out.

Section 2.4 and section 2.5 considers the likely significant effects from the impact mechanisms from the Project alone, while **section 2.6** considers potential in-combination effects with other plans or projects.



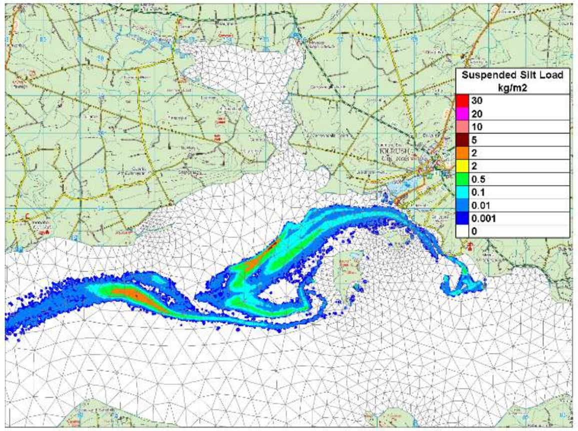
a) After 6 hours

b) After 12 hours

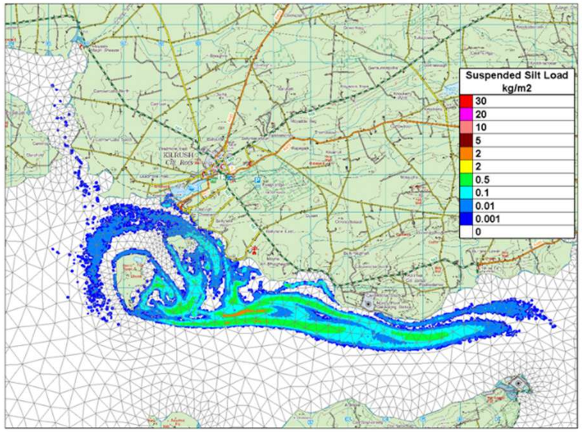
c) After 18 hours

d) After 24 hours

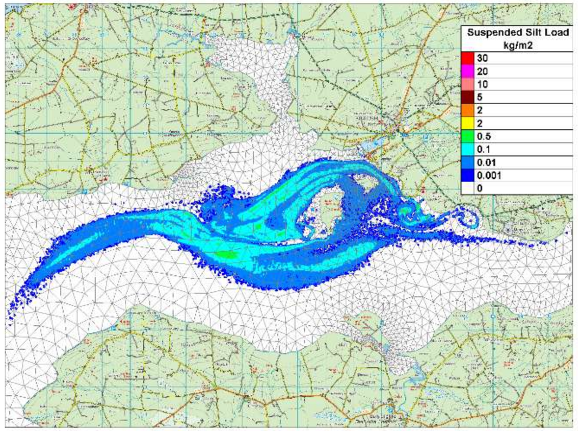
Figure 2-1: Suspended sediment over 24-hour period after neap tide ploughing (100m^3 per hour).



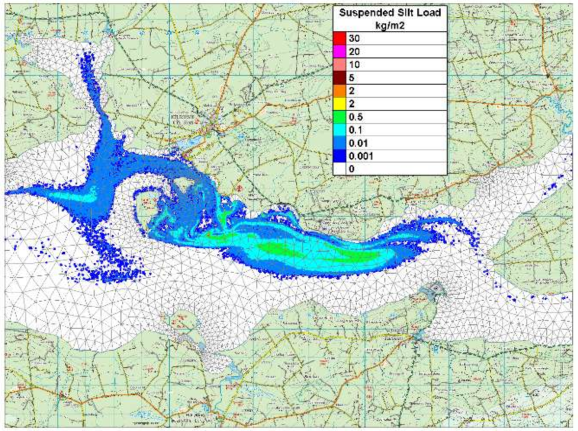
a) After 6 hours



b) After 12 hours



c) After 18 hours



d) After 24 hours

Figure 2-2: Suspended sediment over 24-hour period after spring tide ploughing (100m^3 per hour).

2.3. Potential Impact Mechanisms

A detailed description of the Project is provided above; given the nature of the proposed activities associated with the Project, the potential impact mechanisms (or sources of impact) are:

2.3.1. Potential Impact Mechanism 1: Pollution of marine environment from spills/leakages

Accidental spills or leakages from machinery poses a potential risk to the marine environment during the dredging and disposal operations. Such incidents could result in the release of polluting substances, including hydrocarbons (e.g. diesel, lubricants, hydraulic fluids), into the surrounding water column or sediment. These substances can be toxic to aquatic organisms, particularly filter feeders, benthic invertebrates, bird species and fish species, and may contribute to the degradation of water quality within the zone of influence. Furthermore, any accidental release of contaminants may lead to indirect impacts on qualifying interests of nearby Natura 2000 sites, including designated bird species reliant on intertidal or subtidal foraging habitats. While the risk of such events is typically low if best practice measures are in place, it remains a relevant potential impact pathway and must be considered in the overall assessment of likely significant effects.

2.3.2. Potential Impact Mechanism 2: Noise and vibration

The dredging operations and associated vessel movements have the potential to generate underwater noise and vibration, which may cause temporary disturbance to sensitive marine fauna, particularly marine mammals and fish species. Mechanical dredging equipment, support vessels, and disposal activities can produce low to moderate levels of underwater acoustic emissions that may disrupt normal behaviour, including foraging, communication, or navigation. Species listed under Annex II of the Habitats Directive, such as the Harbour Porpoise (*Phocoena phocoena*), are known to be particularly sensitive to anthropogenic noise. While the anticipated noise levels are not expected to result in permanent hearing damage or physical harm, there remains the potential for temporary behavioural disturbance within the zone of acoustic influence. The significance of such impacts depends on the presence, abundance, and sensitivity of qualifying species within nearby European Sites, and must therefore be assessed in the context of the conservation objectives of those sites.

2.3.3. Potential Impact Mechanism 3: Loss of prey biomass

The proposed dredging and disposal activities have the potential to result in a temporary loss or reduction of benthic and epibenthic prey biomass within the affected areas, which may impact species that rely on these resources for foraging. Physical disturbance of the seabed during dredging can displace, injure, or remove infaunal and epifaunal organisms, including polychaetes, molluscs, and small crustaceans, which form important components of the diet for a range of protected species. In particular, fish, marine mammals such as bottlenose dolphins (*Tursiops truncatus*), and diving waterbirds designated as qualifying interests of nearby European Sites (*e.g*. the River Shannon and Fergus Estuaries SPA) may be affected if their foraging grounds are temporarily degraded or their prey availability is significantly reduced. While recolonisation of disturbed areas typically occurs over time, the scale, timing, and frequency of the proposed works must be considered in assessing the potential for short-term prey depletion and whether this could lead to significant ecological impacts on designated species within Natura 2000 sites. Full details of the benthic ecology report can be found in **Appendix 2**.

2.3.4. Potential Impact Mechanism 4: Physical Disturbance

The proposed dredging operations have the potential to cause physical disturbance to the marine environment, both within the dredging footprint and at the offshore disposal site. This disturbance may result from the direct removal of seabed sediments, which can lead to temporary habitat loss or alteration, and from increased turbidity caused by sediment resuspension during dredging and disposal activities. Such physical impacts may affect benthic communities, particularly in areas supporting sensitive or slow-recovering species. While these effects are generally localised and temporary in nature, their potential to impact the conservation objectives of nearby European Sites must be carefully assessed, particularly where qualifying habitats or species are located within or adjacent to the zone of influence of the proposed works.

In addition to the direct disturbance caused by dredging activities, the operation of project vessels has the potential to cause additional physical disturbance to marine fauna. Increased vessel traffic in and around the dredge and disposal areas may lead to displacement of sensitive species, such as marine mammals and waterbirds, from important foraging or resting areas. Vessel movements can also increase the risk of collision with large marine fauna, including basking sharks, seals, and cetaceans. For species reliant on undisturbed intertidal or nearshore habitats, such as otters, increased vessel activity could cause temporary avoidance behaviour, thereby reducing habitat use in the vicinity of the works. While such disturbance is typically short-term and reversible once activity ceases, it remains an important impact pathway to consider, particularly where vessels operate in close proximity to known areas of ecological importance.

An annex IV Marine Mammal Assessment has been undertaken, with full details provided in a separate document.

2.4. European sites in the zone of influence

The zone of influence (ZoI) for the proposed dredging and disposal at sea activities at Kilrush Marina was established through a review of the hydrodynamic and sediment dispersion modelling previously carried out, alongside consideration of the proposed dredging methodology and associated equipment. The modelling report provided spatial predictions of the extent, duration, and concentration of suspended sediment plumes during dredging and operations, thereby identifying the likely spatial footprint of potential water quality impacts. In addition, the type of dredging equipment to be employed and the operational methodology were reviewed to determine the potential for physical disturbance and resuspension of sediments. The assessment also incorporated the potential for sound propagation from dredging equipment and vessel activity, recognising that underwater noise can act as a disturbance mechanism for sensitive marine fauna. Together, these factors informed a precautionary delineation of the ZoI, ensuring that all relevant Natura 2000 sites and receptors with a reasonable likelihood of interaction were included in the screening and subsequent impact assessment. The SACs and SPAs within the Zone of Influence of the proposed Kilrush Creek site are shown in **Figure 2-3** and **Figure 2-4**, respectively.

Table 2-1 and **Table 2-2** shows the conservation features for which the European sites are designated, their conservation objectives and the distance of the SACs and SPAs to the Project. Bird foraging ranges can be seen in **Table 2-3**. All site synopsis and conservation objectives for the European sites can be accessed through the NPWS website[2].

2.4.1. Special Areas of Conservation

In accordance with Article 6(3) of the Habitats Directive, this assessment considers the potential for the proposed dredging and dumping at sea activities to significantly affect any Special Areas of Conservation (SACs) located within the project's identified zone of influence. The zone of influence encompasses the spatial extent within which direct, indirect, or cumulative impacts arising from the proposed works could reasonably occur, including those related to sediment disturbance, water quality changes, noise, and habitat alteration. All SACs hydrologically or ecologically connected to the project area have been screened in. The Qualifying Interests (QIs) and conservation objectives of each relevant SAC have been reviewed to determine whether the proposed activities could undermine the integrity of these sites, either alone or in combination with other plans or projects.

Table 2-1: Qualifying Interests (QIs) for SACs in the Zone of Influence (ZoI) of the Project.

SAC (site code)	Distance from Project (km)	Qualifying Interest	Ecological Group	Conservation objective
Lower River Shannon SAC [002165]	<0 km	Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]	Annex II freshwater mollusc	Restore favourable conservation condition
		Sea Lamprey (*Petromyzon marinus*) [1095]	Annex II fish species	Restore favourable conservation condition
		Brook Lamprey (*Lampetra planeri*) [1096]	Annex II fish species	Maintain favourable conservation condition
		River Lamprey (*Lampetra fluviatilis*) [1099]	Annex II fish species	Maintain favourable conservation condition
		Atlantic Salmon (*Salmo salar*) [1106]	Annex II fish species	Restore favourable conservation condition
		Bottlenose Dolphin (*Tursiops truncatus*) [1349]	Annex II marine mammal	Maintain favourable conservation condition
		Otter (*Lutra lutra*) [1355]	Annex II mammal species	Restore favourable conservation condition
		Sandbanks slightly covered by sea water all the time [1110]	Annex I marine habitat	Maintain favourable conservation condition
		Estuaries [1130]	Annex I marine habitat	Maintain favourable conservation condition
		Mudflats and sandflats not covered at low tide [1140]	Annex I marine habitat	Maintain favourable conservation condition
		Coastal Lagoons [1150]	Annex I marine habitat	Restore favourable conservation condition
		Large shallow inlets and bays [1160]	Annex I marine habitat	Maintain favourable conservation condition
		Reefs [1170]	Annex I marine habitat	Maintain favourable conservation condition
		Perennial vegetation of stony banks [1220]	Annex I coastal habitat	Maintain favourable conservation condition
		Vegetated sea cliffs of the Atlantic & Baltic coasts [1230]	Annex I coastal habitat	Maintain favourable conservation condition
		Salicornia and other annual colonisers [1310]	Annex I saltmarsh habitat	Maintain favourable conservation condition
		Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	Annex I saltmarsh habitat	Restore favourable conservation condition
		Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Annex I saltmarsh habitat	Restore favourable conservation condition
		Water courses of plain to montane levels with Ranunculion fluitantis/Callitricho-Batrachion [3260]	Annex I freshwater habitat	Maintain favourable conservation condition
		Molinia meadows on calcareous/peaty soils [6410]	Annex I grassland habitat	Maintain favourable conservation condition
		Alluvial forests (*Alnus glutinosa* & *Fraxinus excelsior*) [91E0]	Annex I woodland (priority)	Restore favourable conservation condition

SAC (site code)	Distance from Project (km)	Qualifying Interest	Ecological Group	Conservation objective
Kerry Head Shoal SAC [002263]		Reefs [1170]	Annex I marine habitat	Maintain favourable conservation condition

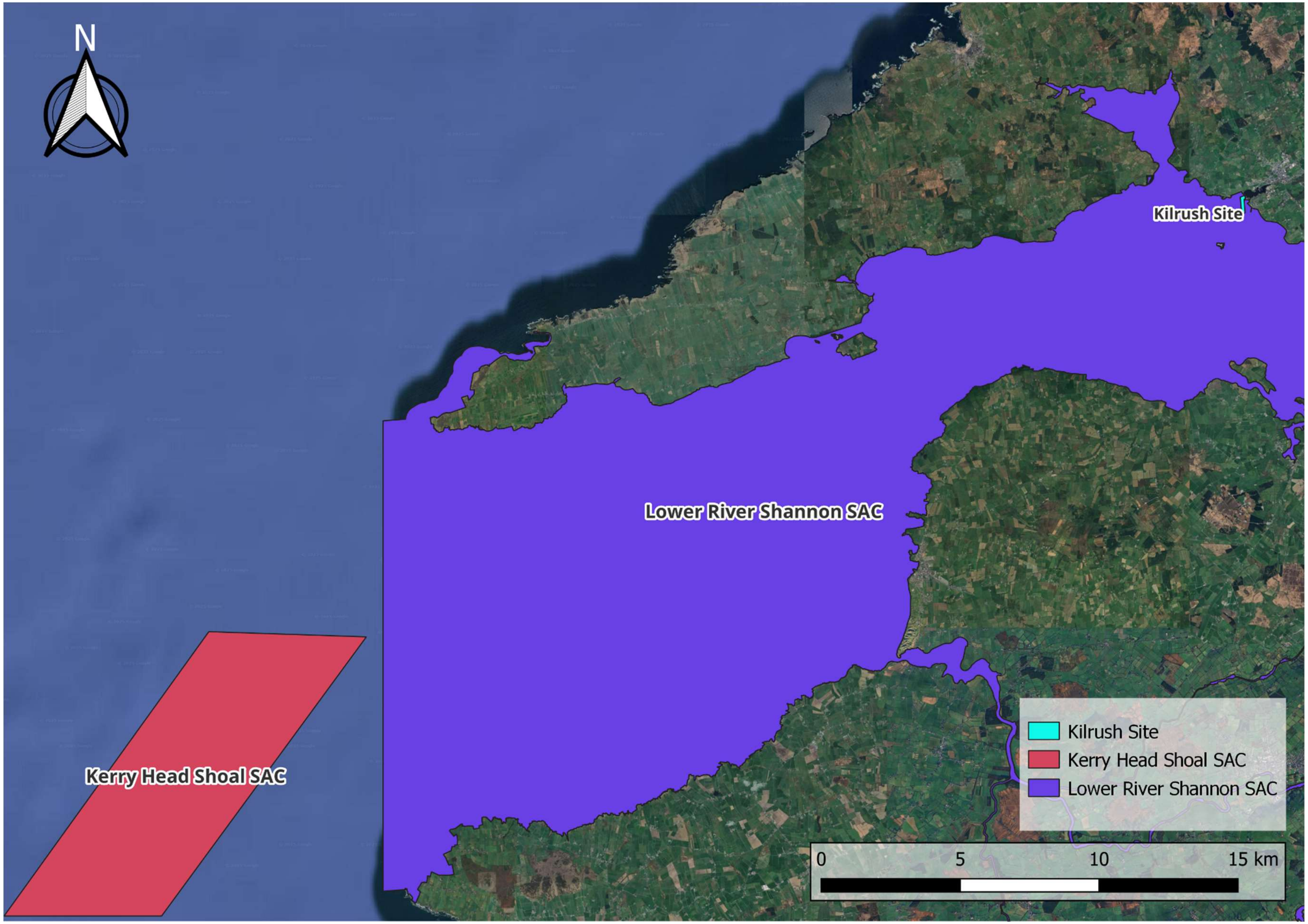


Figure 2-3: SACs in ZoI of Project.

2.4.2. Special Protection Areas

In accordance with Article 6(3) of the Habitats Directive, this assessment evaluates the potential for the proposed dredging and dumping at sea activities to result in significant effects on any Special Protection Areas (SPAs) located within the identified zone of influence of the project. This zone encompasses the area within which direct, indirect, or cumulative impacts could plausibly arise, including those associated with disturbance to bird species, changes in water quality, sediment dispersion, and alteration of foraging or roosting habitats. All SPAs that are ecologically connected to the project site, either through hydrological linkage or functional habitat use by listed bird species, have been included in the screening process. The Special Conservation Interests (SCIs) and site-specific conservation objectives of each SPA have been examined to determine whether the proposed works could adversely affect the integrity of these sites, either individually or in combination with other relevant plans or projects.

Table 2-2: Special Conservation Interests (SCIs) for SPAs in the Zone of Influence (ZoI) of the Project.

SPA (site code)	Distance from Project (km)	Special Conservation Interest	Ecological Group	Conservation objective
River Shannon and River Fergus Estuaries SPA [004077]	<0 km	Whooper Swan (*Cygnus cygnus*) [A038]	Wintering wildfowl (Annex I)	Maintain the favourable conservation
		Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]	Wintering wildfowl (Annex I)	Maintain the favourable conservation
		Shelduck (*Tadorna tadorna*) [A048]	Wader species	Maintain the favourable conservation
		Wigeon (*Anas penelope*) [A050]	Wintering wildfowl	Maintain the favourable conservation.
		Teal (*Anas crecca*) [A052]	Wintering wildfowl	Maintain the favourable conservation
		Pintail (*Anas acuta*) [A054]	Wintering wildfowl	Maintain the favourable conservation
		Shoveler (*Anas clypeata*) [A056]	Wintering wildfowl	Maintain the favourable conservation
		Scaup (*Aythya marila*) [A062]	Wintering wilfowl	Maintain the favourable conservation
		Cormorant (*Phalacrocorax carbo*) [A017]	Seabird species	Maintain the favourable conservation
		Ringed Plover (*Charadrius hiaticula*) [A137]	Wintering wader (Annex I) (Year round population also present)	Maintain the favourable conservation
		Golden Plover (*Pluvialis apricaria*) [A14+0]	Wintering wader (Annex I)	Maintain the favourable conservation.
		Grey Plover (*Pluvialis squatarola*) [A141]	Wintering wader (Annex I)	Maintain the favourable conservation
		Lapwing (*Vanellus vanellus*) [A142]	Wintering wader (Year-round population also present)	Maintain the favourable conservation
		Knot (*Calidris canutus*) [A143]	Wintering wader (Annex I)	Maintain the favourable conservation
		Dunlin (*Calidris alpina alpina*) [A149]	Wintering wader (Annex I)	Maintain the favourable conservation
		Black-tailed Godwit (*Limosa limosa*) [A156]	Wintering wader (Annex I)	Maintain the favourable conservation
		Bar-tailed Godwit (*Limosa lapponica*) [A157]	Wintering wader (Annex I)	Maintain the favourable conservation
		Curlew (*Numenius arquata*) [A160]	Wintering wader (Annex I)	Maintain the favourable conservation
		Redshank (*Tringa totanus*) [A162]	Wintering wader	Maintain the favourable conservation
		Greenshank (*Tringa nebularia*) [A164]	Wintering wader (Annex I)	Maintain the favourable conservation
		Black-headed Gull (*Chroicocephalus ridibundus*) [A179]	Gull species	Maintain the favourable conservation.

SPA (site code)	Distance from Project (km)	Special Conservation Interest	Ecological Group	Conservation objective
		Wetlands and Waterbirds [A999]	Supporting habitat	Maintain the favourable conservation condition of the wetland habitat.
Illaunonearaun SPA [004114]	15.3	Barnacle Goose (*Branta leucopsis*) [A045]	Wintering wildfowl (Annex I)	To restore the favourable conservation condition
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA [004161]	16.7	Hen Harrier (*Circus cyaneus*) [A082]	Grassland bird (Annex I)	To restore the favourable conservation condition
Kerry Head SPA [004189]	22.3	Fulmar (*Fulmarus glacialis*) [A009]	Seabird species	Maintain favourable conservation condition
		Chough (*Pyrrhocorax pyrrhocorax*) [A346]	Annex I bird species	Restore favourable conservation condition
Loop Head SPA [004119]	27	Kittiwake (*Rissa tridactyla*) [A188]	Seabird species	Maintain favourable conservation condition
		Guillemot (*Uria aalge*) [A199]	Seabird species	Maintain favourable conservation condition

Figure 2-4: SPAs in ZoI of project.

Table 2-3: Foraging Distances of Relevant SCIs.

Species (SCI code)	Typical foraging/commuting distance used for screening	Notes	Key sources
Whooper Swan (A038)	Core ~5 km; up to ~20 km	Regular roost–field commutes; 5 km "core" widely used in SPA connectivity.	NatureScot SPA Connectivity guidance[3]
Light-bellied Brent Goose (A046)	Typically 3–10 km (often ≤5 km)	Coastal/estuarine feeders commuting between high-tide roosts and shores/fields.	BSG Ecology collation of literature[4]
Shelduck (A048)	Usually within estuary; ~1–10 km	Crepuscular/nocturnal feeding; commuting within and between estuary sectors.	Johnson *et al*. 2014 (review of duck FFDs).
Wigeon (A050)	~1–10 km (mean dabblers ≈5 km)	Grazing on eelgrass/saltmarsh and fields near roosts.	Johnson *et al*. 2014 (mean dabblers 5.1 ± 4.4 km).
Teal (A052)	~1–10 km (often ≤5 km)	Shorter flights where food abundant; site-dependent.	Johnson *et al*. 2014 & Guillemain *et al*., 2008
Pintail (A054)	~1–15 km (commonly ≤10 km)	Longer flights recorded in some systems.	Johnson *et al*. 2014
Shoveler (A056)	~1–10 km (often ≤5 km)	Filtering in shallow wetlands; usually close to roost.	Johnson *et al*. 2014 & Gray *et al*., 1996
Scaup (A062)	Typically within 5–15 km of core mussel beds/roosts (site-specific)	Wintering in bays/estuaries near benthic prey; movements between bays possible.	Natural England, 2012[5] & Marchowski *et al*., 2020
Cormorant (A017)	Commonly ≤10–20 km; up to 25–30 km recorded	Wide variability; central-place forager from roost/colony.	BirdLife factsheet[6]; Paillisson *et al*., 2004, Veneranta et al., 2020
Ringed Plover (A137)	Typically within estuary/shoreline; ~1–5 km from roosts	Small coastal home ranges; strong roost–flat linkage.	Clausen & Bregnballe 2022, Goodship & Furness 2022
Golden Plover (A140)	Core ~3 km; up to ~10 km	Regular high-tide roost ↔ inland pasture commutes.	NatureScot SPA Connectivity guidance [3]; Whittingham *et al*., 2000.
Grey Plover (A141)	Typically within 5–10 km of roosts	Estuarine commuting between roosts and outer flats.	Clausen & Bregnballe 2022
Lapwing (A142)	Usually ≤.5 of breeding/nesting loacations	Inland field foraging from coastal roosts.	Cevenini *et al*., 2025
Knot (A143)	10–16 km (typically)	Strong site fidelity shown, with major aggregation within ≲10 km; weekly foraging area ~800 km² (radius ~16 km)	Oudman *et al*., 2018 & Peng *et al*., 2024
Dunlin (A149)	Majority ≤5 km from roost	Densities fall steeply beyond ~5 km from roost.	Dias *et al*., 2006
Black-tailed Godwit (A156)	0.5 km–31 km	Commutes between estuarine roosts and flooded grasslands.	Wadertales – Inland feeding by coastal godwits[7]

Species (SCI code)	Typical foraging/commuting distance used for screening	Notes	Key sources
Bar-tailed Godwit (A157)	Typically ≤5–10 km	Largely intertidal forager near coastal roosts.	Clausen & Bregnballe 2022
Curlew (A160)	Often ≤5–10 km	Movements between mudflat foraging and inland fields.	Clausen & Bregnballe 2022, Goodship & Furness 2022
Redshank (A162)	Typically ≤5 km	High site fidelity within estuary sectors.	Clausen & Bregnballe 2022
Greenshank (A164)	Typically ≤2–3 km during breeding season (no information on general foraging dist.)	Scattered individuals; commute between creeks and roosts.	NatureScot SPA Connectivity guidance[3]
Black-headed Gull (A179)	Commonly 5–17 km (with longer distances for rural colonies	Generalist; wide ranging to farmland, tips, intertidal.	Jakubas *et al.*, 2020
Barnacle Goose (A045)	Commonly 10–15 km; occasionally longer	Primarily forage on terrestrial grasslands; limited use of intertidal.	NatureScot SPA Connectivity guidance[3]
Hen Harrier (A082)	Core ~1 km (breeding); up to ~9 km recorded	In forested areas Hen Harriers forage in young plantations, closed canopy forests are generally not used by this species.	Arroyo *et al.*, 2014
Fulmar (A009)	Mean range of 69 Km, max 0f 664 km	Offshore forager; large colony-centred ranges.	Natural England Technical Information Note TIN126[8] - Fulmar
Chough (A346)	Typically 0–2 km from nest/roost (often ≤1–1.5 km)	Coastal pasture/strandline specialist; short commute.	Robertson *et al.*, 1995 & Colhoun *et al.*, 2024
Kittiwake (A188)	Commonly 30-50 km, Mean max ~60 km (breeding)	Pelagic forager; wide colony radius.	Natural England Technical Information Note TIN128[9] - Black Legged Kittiwake
Guillemot (A199)	Commonly 24 km, Mean max ~50–100 km (breeding)	Central-place forager at sea; large ranges.	Natural England Technical Information Note TIN123[10] - Common Guillemot

I-WeBS Data Request

An I-WeBS (Irish Wetland Bird Survey) data request was submitted in September 2025 for subsites in proximity to the proposed Project area. The purpose of this request was to establish recent patterns of waterbird usage within and adjacent to the Zone of Influence (ZoI). The closest sub-site to the Kilrush site with available information was Poulnasherry bay. The datasets included peak counts for relevant species over the 2019/20 and 2020/21 seasons, allowing assessment against all-Ireland and flyway 1% population thresholds, as well as evaluation of species of conservation concern *(e.g*. BoCCI (Birds of Conservation Concern in Ireland) Red and Amber listed species).

The information supplied forms the basis for determining the relative importance of the site to wintering and migratory waterbirds, identifying species regularly present in notable numbers, and highlighting those that meet or exceed national or international thresholds. This data summarised below

Across the 2019/20 and 2020/21 I-WeBS seasons, Poulnasherry Bay supported moderate numbers of wintering waterbirds, with peaks recorded for Light-bellied Brent Goose (93), Shelduck (175), Teal (321), Dunlin (646), Pintail (35) and Curlew (276). None exceeded the 1% flyway population thresholds, but Shelduck, Curlew, Pintail and Teal approached or exceeded the all-Ireland 1% thresholds in at least one year, highlighting their local conservation significance. Several Red List species (Curlew, Lapwing, Dunlin) were also regularly present.

These results indicate that Poulnasherry Bay functions as an important supporting site for a range of wintering and migratory waterbirds within the lower Shannon Estuary complex. While no species were recorded in numbers exceeding international (flyway) thresholds, the consistent presence of several species meeting or approaching the national (all-Ireland) 1% threshold underscores the site's local ecological value. The assemblage reflects the wider estuarine character of the area, supporting both intertidal foragers and surface-feeding waterfowl. Given the distance of Poulnasherry Bay from the proposed works and the limited spatial extent of predicted disturbance, no significant adverse effects on the integrity or conservation objectives of relevant waterbird populations are anticipated.

2.5. Assessment of Potential Significant Effects

A detailed description of the proposed Project has been provided in the preceding sections. Based on the nature, scale, and location of the proposed works, specifically the maintenance dredging of the existing navigation channel and the associated disposal of dredged material at sea, there are several potential impact mechanisms that could give rise to effects on nearby European sites. These impact mechanisms (or sources of impact) arise primarily from the physical and operational characteristics of the dredging and disposal activities and include both direct and indirect pressures on the receiving environment. The key potential impact mechanisms identified for assessment are as follows:

Table 2-4: Assessment of potential significant effects from the impact mechanisms to the conservation features.

Site	QIs or SCIs	Impact Mechanisms	S-P-R Assessment	Brought to Stage 2 (Y/N)
Lower River Shannon SAC [002165]	Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1029]	**1.** Pollution of marine environment from spills/leakages **2.** Noise and vibration **3.** Loss of prey biomass **4.** Physical disturbance	No clear hydrological pathway between marine dredging area and known populations of FPM (limited to upstream, freshwater rivers). No functional link. No connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Sea Lamprey (*Petromyzon marinus*) [1095]		Adults and juveniles may occur in estuarine areas seasonally during migration. Potential exposure to sediment disturbance, underwater noise and contaminants. Connectivity identified.	Connectivity established, will be brought forward for Stage 2 assessment.
	Brook Lamprey (*Lampetra planeri*) [1096]		Species restricted to freshwater; unlikely to be present near marine works. No exposure pathway. No connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 assessment.
	River Lamprey (*Lampetra fluviatilis*) [1099]		Species uses estuarine areas during migration. Potential exposure to dredging-related impacts. Connectivity identified.	Connectivity established, will be brought forward for Stage 2 assessment.
	Atlantic Salmon (*Salmo salar*) [1106]		Migratory species passing through estuarine/marine areas; potential exposure to water quality, noise, suspended sediment. Connectivity identified.	Connectivity established, will be brought forward for Stage 2 assessment.
	Bottlenose Dolphin (*Tursiops truncatus*) [1349]		Mobile marine species; may be sensitive to underwater noise, vessel traffic, and pollution. Although it is noted that the works will be carried out outside of the areas of Critical Habitat identified in the Conservation Objectives document. Connectivity identified.	Connectivity established, will be brought forward for Stage 2 assessment.
	Otter (*Lutra lutra*) [1355]		Otters may forage in coastal areas; limited but potential exposure to disturbance, due to territorial nature the number of individuals within in the marina is expected to be low. However they may be susceptible to contamination from pollutants.	Connectivity established, will be brought forward for Stage 2 assessment.
	Sandbanks slightly covered by sea water all the time [1110]		Sensitive benthic habitat; may be affected by dredge plume, smothering or spills. Connectivity identified.	Connectivity established, will be brought forward for Stage 2 assessment.
	Estuaries [1130]		Directly within receiving environment; potential for physical alteration, turbidity, or contamination. Connectivity identified.	Connectivity established, will be brought forward for Stage 2 assessment.
	Mudflats and sandflats not covered at low tide [1140]		Vulnerable to smothering and turbidity during dredging operations. Connectivity identified.	Connectivity established, will be brought forward for Stage 2 assessment.

Site	QIs or SCIs	Impact Mechanisms	S-P-R Assessment	Brought to Stage 2 (Y/N)
	Coastal Lagoons [1150]		Sediment dispersion model does not show any deposition in this habitat.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 assessment.
	Large shallow inlets and bays [1160]		Broad habitat type; may experience temporary disturbance or water quality changes. Connectivity identified.	Connectivity established, will be brought forward for Stage 2 assessment.
	Reefs [1170]		Sensitive benthic habitat; may be affected by dredge plume, smothering or spills. Connectivity identified.	Connectivity established, will be brought forward for Stage 2 assessment.
	Perennial vegetation of stony banks [1220]		Typically supratidal; unlikely exposure. No connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Vegetated sea cliffs of the Atlantic & Baltic coasts [1230]		No plausible pathway from marine dredging to sea cliff vegetation. No connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Salicornia and other annual colonisers [1310]		Habitat not within ZoI on review of sediment dispersion modelling.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Atlantic salt meadows (*Glauco Puccinellietalia maritimae*) [1330]		Habitat not within ZoI on review of sediment dispersion modelling.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Mediterranean salt meadows (*Juncetalia maritimi*) [1410]		Habitat not within ZoI on review of sediment dispersion modelling.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Water courses of plain to montane levels with *Ranunculion fluitantis/Callitricho Batrachion* [3260]		Freshwater habitat; located upstream to the proposed works. No connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Molinia meadows on calcareous/peaty soils [6410]		Terrestrial habitat, no connection to marine works. No connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Alluvial forests (*Alnus glutinosa* & *Fraxinus excelsior*) [91E0]		Riparian/floodplain woodland; no pathway from marine works. No connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.

Site	QIs or SCIs	Impact Mechanisms	S-P-R Assessment	Brought to Stage 2 (Y/N)
Kerry Head Shoal SAC [002263]	Reefs [1170]	**1.** Pollution of marine environment from spills/leakages **2.** Noise and vibration **3.** Loss of prey biomass **4.** Physical disturbance	The SAC is located approximately 35 km from the proposed project area. Given this distance, there is no hydrodynamic or acoustic pathway linking the project to the reef habitats. No connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
River Shannon and River Fergus Estuaries SPA [004077]	Whooper Swan (*Cygnus cygnus*) [A038]	**1.** Pollution of marine environment from spills/leakages **2.** Noise and vibration **3.** Loss of prey biomass **4.** Physical disturbance	Species mainly forage on grassland/agricultural land adjacent to estuary; minimal reliance on intertidal. No significant exposure to dredging impacts.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]		Key reliance on intertidal eelgrass and mudflat; sensitive to smothering/turbidity and prey loss. Direct connectivity exists.	Connectivity established, will be brought forward for Stage 2 assessment
	Shelduck (*Tadorna tadorna*) [A048]		Estuarine invertebrate feeder; potential exposure to sediment plume and turbidity. Connectivity present.	Connectivity established, will be brought forward for Stage 2 assessment
	Wigeon (*Anas penelope*) [A050]		Primarily feeds on grassland but also intertidal algae; limited pathway. Weak functional link.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Teal (*Anas crecca*) [A052]		Uses shallow estuarine margins; potential exposure to turbidity and prey reduction. Connectivity exists.	Connectivity established, will be brought forward for Stage 2 assessment
	Pintail (*Anas acuta*) [A054]		Mainly forage in shallow estuary/mudflats; potential exposure. Connectivity present.	Connectivity established, will be brought forward for Stage 2 assessment
	Shoveler (*Anas clypeata*) [A056]		Species generally use freshwater/brackish wetlands; weak link to dredge footprint. No clear pathway.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Scaup (*Aythya marila*) [A062]		Diving duck dependent on benthic prey in estuary; direct overlap with potential disturbance.	Connectivity established, will be brought forward for Stage 2 assessment
	Cormorant (*Phalacrocorax carbo*) [A017]		Forages widely in estuarine/marine areas; local displacement possible. Connectivity exists.	Connectivity established, will be brought forward for Stage 2 assessment
	Ringed Plover (*Charadrius hiaticula*) [A137]		Intertidal forager; sensitive to smothering/turbidity. Connectivity exists.	Connectivity established, will be brought forward for Stage 2 assessment

Site	QIs or SCIs	Impact Mechanisms	S-P-R Assessment	Brought to Stage 2 (Y/N)
	Golden Plover (*Pluvialis apricaria*) [A140]		Primarily roost/forage on terrestrial fields. Weak functional link.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Grey Plover (*Pluvialis squatarola*) [A141]		Estuarine intertidal forager; pathway via prey disturbance. Connectivity exists.	Connectivity established, will be brought forward for Stage 2 assessment
	Lapwing (*Vanellus vanellus*) [A142]		Mainly terrestrial roosting/feeding; estuarine link is weak. No significant pathway.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Knot (*Calidris canutus*) [A143]		Strong dependence on mudflat invertebrates; sensitive to smothering/turbidity. Connectivity exists.	Connectivity established, will be brought forward for Stage 2 assessment
	Dunlin (*Calidris alpina alpina*) [A149]		Key intertidal feeder; exposure to turbidity and prey reduction. Connectivity exists.	Connectivity established, will be brought forward for Stage 2 assessment
	Black-tailed Godwit (*Limosa limosa*) [A156]		Strong intertidal dependence; pathway for smothering/turbidity exists.	Connectivity established, will be brought forward for Stage 2 assessment
	Bar-tailed Godwit (*Limosa lapponica*) [A157]		Forages in intertidal areas; sensitive to turbidity and prey loss.	Connectivity established, will be brought forward for Stage 2 assessment
	Curlew (*Numenius arquata*) [A160]		Forages both estuarine and terrestrial; partial exposure to intertidal disturbance. Weak but present connectivity.	Connectivity established, will be brought forward for Stage 2 assessment
	Redshank (*Tringa totanus*) [A162]		Key intertidal species; directly vulnerable to disturbance and turbidity.	Connectivity established, will be brought forward for Stage 2 assessment
	Greenshank (*Tringa nebularia*) [A164]		Uses intertidal shallows; potential exposure to sediment impacts.	Connectivity established, will be brought forward for Stage 2 assessment
	Black-headed Gull (*Chroicocephalus ridibundus*) [A179]		Generalist feeder; may scavenge near works but limited sensitivity. Pathway weak.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Wetlands and Waterbirds [A999]		Feature encompasses full assemblage; overall wetland quality could be affected by habitat disturbance/turbidity. Connectivity present.	Connectivity established, will be brought forward for Stage 2 assessment
Illaunonearaun SPA [004114]	Barnacle Goose (*Branta leucopsis*) [A045]	**1.** Pollution of marine environment from spills/leakages **2.** Noise and vibration **3.** Loss of prey biomass **4.** Physical disturbance	Foraging resource base primarily terrestrial (improved grassland, pasture), rather than intertidal benthos. Species average foraging range extent just outside of project. No pathway for significant impacts from dredging activities predicted.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.

Site	QIs or SCIs	Impact Mechanisms	S-P-R Assessment	Brought to Stage 2 (Y/N)
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA[004161]	Hen Harrier (*Circus cyaneus*) [A082]	1. Pollution of marine environment from spills/leakages 2. Noise and vibration 3. Loss of prey biomass 4. Physical disturbance	Species associated with upland habitats, not coastal or estuarine. No functional link to marine works.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
Kerry Head SPA [004189]	Fulmar (*Fulmarus glacialis*) [A009]	5. Pollution of marine environment from spills/leakages	Fulmars breed on exposed coastal cliffs and forage mainly offshore in open marine waters. The dredging and disposal site at Kilrush Marina lies within a sheltered estuary, outside the typical foraging range of breeding fulmars at Kerry Head. No functional connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Chough (*Pyrrhocorax pyrrhocorax*) [A346]	6. Noise and vibration 7. Loss of prey biomass 8. Physical disturbance	Chough are terrestrial foragers using coastal grasslands and pastures adjacent to nesting cliffs. They do not rely on estuarine or subtidal habitats where dredging impacts may occur. No source–pathway–receptor link exists.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
Loop Head SPA [004119]	Kittiwake (*Rissa tridactyla*) [A188]	1. Pollution of marine environment from spills/leakages	Kittiwakes are surface-feeding seabirds breeding on sea cliffs. No breeding colonies are located in the immediate vicinity of Kilrush Marina, and the proposed dredging works are confined to sheltered estuarine waters. The foraging range of kittiwakes extends offshore rather than within the inner Shannon Estuary. Weak connectivity, screened out.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.
	Guillemot (*Uria aalge*) [A199]	2. Noise and vibration 3. Loss of prey biomass 4. Physical disturbance	Guillemots nest in colonies on exposed cliffs and forage by pursuit-diving in open waters, generally outside sheltered estuaries. The project area is well removed from breeding or foraging habitats used by guillemots. No functional connectivity.	No connectivity exists, therefore this QI has been screened out and will not be considered for Stage 2 Assessment.

2.5.1. Assessment of Mobile Annex II Marine Species

Due to the foraging ranges of Annex II marine mammal species found in Irish waters, the following species listed as QIs in SACs in Ireland have been assessed in terms of their potential to occur in the Project area:

- Harbour seal (*Phoca vitulina*)
- Grey seal (*Halichoerus grypus*)
- Harbour porpoise (*Phocoena phocoena*)
- Bottlenose dolphin (*Tursiops truncatus*)

Two species of pinniped, the grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*), inhabit Irish waters year-round and are recorded along the south Irish coast. Both are listed as species of Least Concern on the IUCN Red List (Bowen, 2016; Lowry, 2016).

Both species have established haul-out sites along all coastlines of Ireland for resting, breeding, and engaging in social activity (Cronin et al., 2004; Ó Cadhla et al., 2007). The largest proportion of the grey seal population is hauled out ashore during the annual moult which begins in November and continues until April (Ó Cadhla and Strong, 2007). Grey seals also aggregate in large colonies during the breeding season between August and December (Ó Cadhla *et al*., 2013), with peak pup production during October and November (Lyons, 2004). Grey seals tend to breed on exposed rocky shores, on sandbars or in sea caves with ready access to deeper water.

The nearest designated sites for Grey Seal and Harbour Seal (Blasket Islands SAC and Galway Bay Complex SAC respectively) are located at considerable distances from the project area (over 100 km away). There are no established haul-out sites or known core resting areas for either seal species within the Shannon Estuary, including the waters near Kilrush. As such, any interaction with seals is expected to involve only occasional individuals passing through the area, and the likelihood of significant disturbance from the proposed dredging activities is considered very low.

The Otter (*Lutra lutra*), listed as a qualifying interest of the Lower River Shannon SAC, is known to use the coastal and riparian habitats around Kilrush Creek for commuting and foraging. However, Kilrush Marina and its surroundings are already subject to regular marine activity, vessel movement, and human presence. Any otters within the area are therefore likely to be accustomed to ambient disturbance levels. While short-term disturbance during dredging works may occur, it is not expected to result in any significant adverse effects on otter behaviour or habitat use.

More than 25 species of cetaceans have been recorded in Irish waters (NBDC, 2023).

The harbour porpoise is the most widespread and frequently recorded species in Irish waters, sighted largely in inshore waters in the Celtic Sea throughout the entire year (Ó Cadhla *et al*., 2004; Berrow *et al*., 2010; Wall *et al*., 2013; Rogan *et al*., 2018). Porpoise sightings tend to differ by season, with densities peaking in summer

(Berrow *et al*., 2010). There are sixteen SACs designated for harbour porpoises. They are listed as a species of Least Concern on the International Union for Conservation of Nature (IUCN) Red List (Braulik *et al*., 2020).

Bottlenose dolphins are one of the most frequently recorded cetaceans in Ireland (NPWS, 2019) and have been observed throughout Irish waters year-round. The Lower River Shannon SAC lists bottlenose dolphins as a QI due to the presence of the resident Shannon population, making the Shannon Estuary one of the most important habitats for cetaceans in Ireland and Europe (O' Brien *et al*., 2009; Rogan *et al*., 2018). Standardised boat surveys combined with mark–recapture photo-identification in the Lower River Shannon SAC (June–October 2018) estimated a total population of 139 bottlenose dolphins (95% CI: 121–160; CV = 0.109), within the range of previous estimates since 1997 thus indicating a stable population size (Rogan *et al*., 2018). The population size estimated by Rogan *et al*., 2018 was similar to that estimated by Blázquez *et al.,* 2020, based on surveys conducted in 2015 which provided an abundance of 145 extant individuals. Two critical areas of habitat within the SAC have been identified and have consistently shown to be important to dolphins in the estuary year-round, including a large area at the estuary mouth near Kilcredaun and a smaller area off Moneypoint (Rogan *et al*., 2018). These two areas are approximately 15 and 6 kilometres respectively from the area of the proposed works. Year-round surveys have shown a seasonal reduction in the number of bottlenose dolphins present within the estuary in winter which suggests the home range of this population extends beyond the extent of the Lower Shannon River SAC (Rogan *et al*., 2018). They are listed as a species of Least Concern on the IUCN Red List (Wells *et al*., 2019).

The relevant SACs designated for Annex II marine mammal species are detailed in **Table 2-5**.

Table 2-5: Hydrological distance of SACs designated for marine mammal species in Ireland.

SAC (Site code)	Qualifying Interest				
	Harbour seal (*Phoca vitulina*) (1365)	Grey seal (*Halichoerus grypus*) (1364)	Harbour porpoise (*Phocoena phocoena*) (1351)	Bottlenose dolphin (*Tursiops truncatus*) (1349)	Distance from Site
Slyne Head Peninsula SAC [002074]				✓	116 Km
West Connacht Coast SAC [002998]			✓	✓	127 Km
Slyne Head Islands SAC [000328]		✓			120 Km
Inishbofin and Inishshark SAC [000278]		✓			145 Km
Kilkieran Bay and Islands SAC [002111]	✓				99 Km
Clew Bay Complex SAC [001482]	✓				187 Km
Duvillaun Islands SAC [000495]		✓		✓	201 Km
Galway Bay Complex SAC [000268]	✓				119 Km
Inishkea Islands SAC [000507]		✓			206 Km
Killala Bay/Moy Estuary SAC [000458]	✓				236 Km
Lower River Shannon SAC [002165]				✓	0 Km
Ballysadare Bay SAC [000622]	✓				330 Km
Cummeen Strand/Drumcliff Bay (Sligo Bay) SAC [000627]	✓				327 Km
Blasket Islands SAC [002172]		✓	✓		90 Km
Slieve Tooey/Tormore Island/Loughros Beg Bay SAC [000190]		✓			340 Km
Donegal Bay (Murvagh) SAC [000133]	✓				363 Km
West of Ardara/Maas Road SAC [000197]	✓				356 Km
Kenmare River SAC [002158]	✓		✓		139 Km

SAC (Site code)	Qualifying Interest				
	Harbour seal (*Phoca vitulina*) (1365)	Grey seal (*Halichoerus grypus*) (1364)	Harbour porpoise (*Phocoena phocoena*) (1351)	Bottlenose dolphin (*Tursiops truncatus*) (1349)	Distance from Site
Rutland Island and Sound SA [002283]	✓				356 Km
Glengarriff Harbour and Woodland SAC [000090]	✓				198 Km
Roaringwater Bay and Islands SAC [000101]		✓	✓		194 Km
Horn Head and Rinclevan SAC [000147]		✓			402 Km
Slaney River Valley SAC [000781]	✓				462 Km
Rockabill to Dalkey Island SAC [003000]			✓		574 Km
Lambay Island SAC [000204]	✓	✓	✓		602 Km
Saltee Islands SAC [000707]		✓			416 Km
St. John's Point SAC [000191]				✓	341 Km
Inishmore Island SAC [000213]			✓		87 Km
Porcupine Bank Canyon SAC [003001]				✓	360 Km
South-west Porcupine Bank SAC [002329]				✓	385 Km
Belgica Mound Province SAC [002327]			✓	✓	196 Km
Hook Head SAC [000764]			✓	✓	391 Km
Carnsore Point SAC [002269]			✓		438 Km
Blackwater Bank SAC [002953]			✓		458 Km
Bunduff Lough and Machair Trawalua/Mullaghmore SAC [000625]			✓		336 Km
Codling Fault Zone SAC [003015]			✓		592 Km

SAC (Site code)	Qualifying Interest				
	Harbour seal (*Phoca vitulina*) (1365)	Grey seal (*Halichoerus grypus*) (1364)	Harbour porpoise (*Phocoena phocoena*) (1351)	Bottlenose dolphin (*Tursiops truncatus*) (1349)	Distance from Site
Lough Swilly SAC [002287]			✓		448 Km
Gweedore Bay and Islands SAC [001141]			✓		372 Km

Noise Disturbance to Habitats Directive Annex II Species

The dredging operations and associated vessel movements have the potential to generate underwater noise and vibration, which may cause temporary disturbance to sensitive marine fauna, particularly marine mammals and fish species. Mechanical dredging equipment, support vessels, and disposal activities can produce low to moderate levels of underwater acoustic emissions that may disrupt normal behaviour, including foraging, communication, or navigation. Species listed under Annex II of the Habitats Directive, such as the Harbour Porpoise (*Phocoena phocoena*), are known to be particularly sensitive to anthropogenic noise. Previous studies have assessed the potential impacts of noise on marine mammals (Weilgart, 2007; Southall *et al.,* 2007; Wright *et al.,* 2007). Acoustic masking is the term used when a frequency of anthropogenic noise overlaps with the frequencies used by marine mammals, which reduces their ability to detect important sounds for communication, navigation and prey detection (Weilgart, 2007). Acoustic Masking can occur anywhere within an organism's auditory range (Wright *et al.,* 2007), and can result in increased information ambiguity and, in extreme circumstances, inability for cetaceans to orientate themselves, hunt or evade predation in the marine environment (Wright *et al.,* 2007). Potential effects of noise disturbance on marine mammals can result in lethal effects, physical injury, auditory injury and behavioural response. Otters (*Lutra lutra*) spend 75% of their lives on land. They can be relatively tolerant of disturbance and adjust to circumstances. They are often present in urban areas with considerable human activity nearby. There are no criteria to assess the significance of underwater noise on the Eurasian otter however it is thought they are similar to those of pinnipeds (Ghoul & Reichmuth, 2014).

Southall *et al*. (2019) have categorised pinnipeds (listed as phocid carnivores) and cetaceans into different functional groups based on several laboratory studies, audiometric data, and comparisons of anatomy (**Table 2-6**). The functional groups for cetaceans were created in relation to their known auditory ability and functional frequencies, whilst all pinniped species were assessed based on their auditory ability in air, as well as their auditory ability in water.

While the anticipated noise levels are not expected to result in permanent hearing damage or physical harm, there remains the potential for temporary behavioural disturbance within the zone of acoustic influence. The significance of such impacts on the presence, abundance, and sensitivity of qualifying species within nearby European Sites, and must therefore be assessed in the context of the conservation objectives of those sites.

Table 2-6: Functional frequencies of various cetaceans and pinnipeds found in Irish waters (adapted from Southall *et al.* (2007 & 2019)).

Hearing Group	Species in Irish Waters (examples)	Functional Hearing Range (approx.)	Key Sensitivities
Low-Frequency (LF) Cetaceans	Baleen whales (Minke, Fin, Humpback, Blue, Sei)	7 Hz – 35 kHz	Highly sensitive to low-frequency impulsive and continuous noise (pile driving, dredging, vessel noise).
Mid-Frequency (MF) Cetaceans	Dolphins (Bottlenose, Common, Striped, Pilot whales, Killer whales)	150 Hz – 160 kHz	Sensitive to mid-frequency broadband noise (sonar, vessel engines, dredgers).
High-Frequency (HF/VHF) Cetaceans	Harbour porpoise	275 Hz – 160 kHz (peak ~120–140 kHz)	Most sensitive of all groups; disturbance at low received levels, particularly from impulsive sources.
Phocid Pinnipeds in Water (PCW)	Grey seal, Harbour seal	50 Hz – 86 kHz	Sensitive to both impulsive and continuous sources at lower to mid-frequencies.
Phocid Pinnipeds in Air (PCA)	Grey seal, Harbour seal	75 Hz – 30 kHz	More limited sensitivity than underwater hearing.

Assessment

Overall, the proposed dredging and disposal activities have the potential to give rise to short-term underwater noise and physical disturbance within the project footprint and surrounding waters. Given the location of the works, the absence of core seal haul-outs in the Shannon Estuary, and the fact that otters in the Kilrush area are already exposed to regular human activity, the likelihood of significant effects on these species is considered low. However, bottlenose dolphins (a qualifying interest of the Lower River Shannon SAC) and harbour porpoise (recorded widely in Irish waters and highly sensitive to acoustic disturbance) represent the most relevant receptors for potential impact. While predicted noise levels are not expected to cause permanent auditory injury, temporary disturbance, acoustic masking, and displacement within the zone of influence remain possible, particularly during periods of sustained vessel or dredger operation. Pre-mitigation, there is therefore potential for localised and reversible behavioural effects on otter, harbour porpoise and bottlenose dolphin populations, necessitating the implementation of targeted mitigation measures to ensure no adverse effects on the integrity of relevant European Sites. These three species will be taken to a stage 2 assessment.

2.6. Plans or Projects That Might Act in Combination

As outlined in above the obligation to undertake AA under the 2011 Birds and Natural Habitats Regulations derives from the Habitats Directive. Regulation 42(1) of the 2011 Regulations requires that:

> *A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or* ***in combination with other plans or projects*** *is likely to have a significant effect on the European site*.

It is therefore required that the potential impacts of the proposed Project be considered in combination with other relevant plans or projects. Given the nature of the proposed activities associated with the Project, the potential project impact mechanisms (or sources of impact) are:

1. Pollution of marine environment from spills/leakages
2. Noise and vibration
3. Loss of prey biomass
4. Physical disturbance

The assessment of potential in-combination effects considers other plans and projects that may result in significant effects to QIs and SCIs of SACs and SPAs. To inform the assessment of potential in-combination effects a review of consent applications for projects in the vicinity of the proposed Project included on the following websites was completed in September 2025:

- DHPLG - EIA Portal[11]
- Clare County Council - Planning System[12]
- An Coimisiún Pleanála
- DHLGH – Foreshore Applications[13]
- Aquaculture Information Management System (AQUAMIS) by DAFM[14]
- Irelands Marine Atlas[15]
- MARA Licence Applications

The focus of this section is on the Lower River Shannon SAC [002165] and the River Shannon and River Fergus Estuaries SPA [004077], as these are the Natura 2000 sites within which the project is situated.

2.6.1. Threats and Pressures

The Natura 2000 Standard Data Form for the Lower River Shannon SAC identifies a variety of pressures affecting estuarine habitats and qualifying interests, including:

- Nutrient and chemical inputs from agriculture, industry, and domestic discharges;
- Physical modifications to estuarine habitats, including land reclamation and coastal defence works;
- Disturbance to marine mammals from vessel activity, underwater noise, and fishing interactions;
- Spread of invasive Spartina anglica, altering sediment dynamics.

In the context of Kilrush, the most relevant in-combination pressures are water quality pressures (linked to agriculture and wastewater), background vessel activity, and the presence of invasive species.

Table 2-7: Ranked threats and pressures to Lower River Shannon SAC relevant to Kilrush.

Rank	Category	Relevance at Kilrush Harbour
Medium	Grazing / Fertilisation	Agricultural runoff into estuary catchments.
Medium	Marine and freshwater aquaculture	Present upstream; limited near Kilrush.
Medium	Polderisation / land reclamation	Limited locally but historic reclamation evident.
Low	Discharges (industrial/agricultural/domestic)	Domestic discharges via small agglomerations.
Low	Nautical sports / vessel traffic	Small-scale at Kilrush but cumulatively relevant.
Low	Invasive non-native species (Spartina)	Well-established in mudflat/saltmarsh habitats.
Low	Sea defence and coastal works	Localised embankments and quayside structures.

The River Shannon and River Fergus Estuaries SPA supports internationally important numbers of wintering waterbirds. Pressures include:

- Water quality deterioration from upstream sources;
- Reclamation and aquaculture, reducing intertidal feeding habitat;
- *Spartina anglica* spread, encroaching on mudflats and saltmarsh;
- Disturbance from vessel traffic and boating, affecting foraging and roosting behaviour.

At Kilrush, the main concern is disturbance from marine activity, although existing background levels are relatively low compared with the busy commercial ports upstream.

Table 2-8: threats and pressures in River Shannon and River Fergus Estuaries SPA relevant to Kilrush.

Rank	Category	Relevance at Kilrush Harbour
High	Discharges (agriculture, domestic, industry)	Contributes to nutrient load but largely upstream.
Medium	Nautical sports and boating activity	Local leisure and sailing common at Kilrush.
Medium	Shipping lanes	Kilrush is peripheral to main estuary channel.
Medium	Marine and freshwater aquaculture	More prevalent upstream; little direct overlap.
Low	Spread of Spartina	Locally established in intertidal habitats.

2.6.2. Plans

Several statutory plans provide the policy framework for development in the Shannon Estuary and its catchment, including:

- **Clare County Development Plan 2017–2023** (and draft 2023–2029), which supports Kilrush as a service town with associated harbour functions;
- **Limerick Development Plan 2022–2028**, relevant upstream;
- **Strategic Integrated Framework Plan for the Shannon Estuary 2013–2020**, which identified port expansion areas and safeguarded key navigation channels.

These plans collectively promote the sustainable use of the estuary for transport, tourism, and industry. Given the small scale and localised nature of the Kilrush dredging, no significant in-combination interaction with higher-level policies is expected.

2.6.3. Projects

Numerous small-scale planning applications (housing, farm infrastructure, wastewater systems) exist in the Kilrush area, but these are not of a scale to interact significantly with the dredging works. Larger projects are listed in **Table 2-9**.

Table 2-9: Assessment of potential in-combination effects with projects.

Website	Project Details	File Reference	Date Application Received	Assessment of Potential Cumulative or In-combination Effects	Potential significant effect assessment
DHPLG - EIA Portal	A search of the DHPLG EIA Portal was undertaken to examine projects with potential for in-combination effects.	-	-	-	No potential significant cumulative or in-combination effects
Clare County Council - Planning System	A search of the Clare planning databases was undertaken to examine projects with potential for in-combination effects.	-	-	Applications made typically to Clare County Council and published on the planning database within the ZOI consisted of extensions and renovations to existing houses, and retention of existing developments. These are small-scale terrestrial developments which do not have the potential to result in cumulative effects in combination with the proposed Project.	No potential significant cumulative or in-combination effects
An Coimisiún Pleanála (ACP)	The Port of Foynes expansion in Ireland is a multi-phased Strategic Infrastructure Development (SID) process managed by ACP. It involves extensive public consultation and the development of a detailed Environmental Impact Assessment for regulatory approval.	ACP - 301561 MARA - MAC20230024	08/05/2018	This is a large project that could increase regional shipping, dredging and industrial activity. It is located >30 km upstream of Kilrush; hydrodynamic modelling and the known behaviour of sediment plumes indicate no plume connectivity. Increased regional shipping is a broad background pressure but does not combine spatially with Kilrush dredging to create a plausible pathway for in-combination adverse effects.	No potential significant cumulative or in-combination effects
	Expansion of the Bauxite Disposal Area, extension to the existing Salt Cake Disposal Cell and extension of the permitted borrow pit at Aughinish Alumina Limited.	318302 & 312146	24/10/2023 & 8/12/2021	These works are terrestrial industrial expansions at Aughinish, c. >30 km upstream of Kilrush. Potential pathways are limited to indirect water-quality changes via runoff or leachate. However, the project includes lined containment, regulatory controls, and is subject to EPA licensing. No mechanism for additive plume, noise, or disturbance effects in Kilrush ZoI.	No potential significant cumulative or in-combination effects

Website	Project Details	File Reference	Date Application Received	Assessment of Potential Cumulative or In-combination Effects	Potential significant effect assessment
Maritime Area Regulatory Authority (MARA)	Marine environmental surveys for the purposes of site investigation for GNI at Cariacon/Foynes (to be determined)	MUL250010	28/07/2025	Site investigations are localised geophysical/geotechnical surveys with temporary footprint and low pollution risk. They do not generate ongoing sediment plumes or long-term habitat loss that would combine with Kilrush impacts.	No potential significant cumulative or in combination effects
	A survey campaign at the Moneypoint Generating Station site carried out by ESB to inform the engineering design of the proposed Moneypoint Hub Project. The marine surveys will include geophysical, geotechnical, environmental, and met ocean surveys. (Granted)	LIC230008	24/11/2023	Survey works are temporary and limited in extent. No persistent ecological pressures that overlap with Kilrush ZoI; therefore negligible potential for in-combination effects.	No potential significant cumulative or in combination effects
	A Marine Site Investigation carried out on behalf of Shannon Foynes Port Company to support the preliminary and detailed engineering design of the Deep-Water Terminal Development on Foynes Island. (Granted)	LIC230014	16/11/2023	Site investigation/survey works are temporary and upstream (>30 km); they do not produce sustained sediment plumes or water-quality changes that could combine with Kilrush effects.	No potential significant cumulative or in combination effects
	Maintenance dredging at four sites around the Aughinish Alumina Ltd (AAL) jetty, Shannon Estuary, Co. Limerick. (Granted)	LIC230004	17/11/2023	AAL maintenance dredging is larger in scale and occurs upstream. Potential for cumulative effects would require overlapping plumes or coincident timing and disposal activities. Hydrodynamic modelling and site separation indicate no plume connectivity to Kilrush. Provided disposal and monitoring at Aughinish complies with licence conditions, no pathway for additive longterm significant effects at Kilrush is identified.	No potential significant cumulative or in combination effects

Website	Project Details	File Reference	Date Application Received	Assessment of Potential Cumulative or In-combination Effects	Potential significant effect assessment
	Upgrade of wastewater infrastructure by Uisce Éireann, including a wastewater terminal pumping station and outfall pipeline with diffuser arrangement (Granted)	MAC20230028	04/07/2025	An upgraded outfall can alter local water-quality conditions. The Foynes / Limerick works are upstream of Kilrush; potential cumulative water-quality effects at Kilrush would require persistent downstream transport of contaminants beyond modelled decay, modelling indicates dilution and attenuation with distance. Therefore, combination risk is low but should be controlled by discharge consents.	No potential significant cumulative or in combination effects
	Deployment of up to 300MW of floating solar photovoltaic (PV) units and ancillary infrastructure including mooring systems, inter-array cabling and export cables in Lower River Shannon (To be determined)	MAC20230032	N/A	Potential effects (shading, local hydrodynamics) would be site-specific. As this project is outside of the ZoI no interaction is expected.	No potential significant cumulative or in combination effects
	Provision of a Floating Pontoon and Cantilever Platform for Rescue Services, Limerick (To be determined)	MAC240037	N/A	Localised, low magnitude works; no pathway for additive effects with Kilrush maintenance dredging.	No potential significant cumulative or in combination effects
	Extension of existing 300mm ID concrete combined outfall pipeline with 15m segment of 500mm OD HDPE SDR17 pipeline equipped with 3 duckbill style diffusers and concrete anchoring in Foynes Harbour (To be determined)	MAC20240010	N/A	Similar to other outfall works: potential local water-quality implications upstream; due to distance and dilution no credible pathway for in-combination effects at Kilrush provided discharge standards are maintained	No potential significant cumulative or in combination effects
	Reconstruction/altering of existing coastal defences along the Shannon Estuary near Shannon Town, (To be determined)	MAC20230035	N/A	This project is located over 30 km upstream of Kilrush and is primarily terrestrial/coastal engineering in nature. Potential effects are limited to localised disturbance, sediment release, and temporary construction activity in its immediate area. No overlap in ZoI for sediment plumes, noise, or vessel activity with the Kilrush maintenance dredging project.	No potential significant cumulative or in combination effects

2.6.4. Aquaculture Operations

Aquaculture is an established activity within the wider Shannon Estuary, with licensed sites supporting both mussel and oyster cultivation. The closest aquaculture sites and designated shellfish waters are located within Poulnasherry Bay, situated approximately 5–6 km to the west of Kilrush Harbour.

However, the following considerations apply:

- **Hydrodynamic separation**: Modelling and site conditions confirm that the suspended sediment from dredging at Kilrush Harbour will remain highly localised, settling rapidly within the immediate vicinity of the works with no deposition predicted in Poulnasherry Bay.

  Nature of activity: The Kilrush dredging is a short-term, small-scale maintenance campaign, whereas impacts to shellfish waters would require sustained or large-scale discharges to cause measurable deterioration.

- **Regulatory safeguards**: Ongoing water quality monitoring and the requirement to comply with shellfish water quality standards provide additional assurance against cumulative or in-combination impacts.

While aquaculture and designated shellfish waters exist within the wider Shannon Estuary, the nearest areas at Poulnasherry Bay will not be subject to significant effects in water quality and therefore there is no potential for in-combination effects with aquaculture operations or shellfish water designations.

2.6.5. Dredging and Disposal

While dredging is routine throughout the Shannon Estuary, campaigns are geographically separated. Modelling demonstrates that plumes are short-lived and highly localised. No additive plume or sediment load is predicted between Kilrush and upstream dredging locations.

2.6.6. Navigation and Marine Traffic

The Shannon Estuary is a busy navigation route for deep-draft vessels bound for Aughinish, Foynes, and Moneypoint. By contrast, Kilrush is primarily a marina and fishing harbour with small-scale vessel movements. Any disturbance is therefore highly localised and not significant in-combination with upstream commercial traffic.

2.6.1. Diffuse and Point Source Pollution

Agricultural run-off and wastewater discharges contribute to background nutrient enrichment and reduced water quality in the estuary. The Kilrush dredging campaign is temporary and unlikely to materially exacerbate these pressures, though sediment disturbance will be managed to avoid localised exceedances.

2.6.2. Conclusion

The proposed dredging at Kilrush Harbour occurs within a section of the Shannon Estuary already subject to ongoing pressures including water quality impacts, vessel disturbance, and spread of invasive species. However:

- The scale and duration of dredging is minor compared with industrial port dredging upstream;
- Hydrodynamic modelling confirms highly localised effects, with no downstream or upstream connectivity to other dredging operations;
- The harbour is peripheral to the main navigation channel, reducing overlap with large vessel traffic;
- The works will be subject to standard mitigation measures, further minimising risk of cumulative impacts.

Accordingly, the project does not contribute materially to existing threats or pressures and will not result in adverse effects on the integrity of the Lower River Shannon SAC or the River Shannon and River Fergus Estuaries SPA, either alone or in-combination with other plans and projects.

2.7. Screening Outcome

The assessment has determined, in light of best available scientific data, that there is potential for significant effects on conservation features of SACs and SPAs resulting from the Project, *i.e.,* the likelihood of significant effects on all European sites has not been ruled out. Therefore, it is recommended that this Project be brought forward to Stage 2 Appropriate Assessment. The assessment determined that there is an increased potential likelihood for significant effects from the Project in combination with other plans or projects. The assessment will therefore be brought forward to Stage 2 – Natura Impact Statement (NIS). The findings of the assessment are summarised in **Table 2-10**.

Table 2-10: Summary of the Appropriate Assessment Screening outcome.

AA Screening outcome	
Brief description of the Project.	The objective of the Project is to undertake maintenance dredging of the existing access channel on the seaward approaches to Kilrush Creek, Kilrush, County Clare. The works involve the removal of accumulated sediments that have reduced the navigability of the channel leading to Kilrush Marina and the inner harbour area. The dredged material is proposed to be disposed of at a licensed offshore dumping site in accordance with relevant environmental legislation and permitting requirements. The Project is essential to ensure the continued safe access for vessels using the marina and to maintain the operational functionality of the harbour. The locations of the dredging works are shown in **Figure 1-1.**
European site(s)	
List of the European site(s) in the Zone of Influence.	The conservation features of the following SACs and SPAs are listed in **Table 2-1** and **Table 2-2** alongside conservation objectives. **SACs** • Lower River Shannon SAC [002165] • Kerry Head Shoal SAC [002263] **SPAs** • River Shannon and River Fergus Estuaries SPA [004077] • Kerry Head SPA [004189] • Loop Head SPA [004119] • Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA [004161]
Assessment summary	
Description of the potential impact mechanisms from the Project that have likely significant effects on the conservation features.	All potential impact mechanisms are detailed in **Section 2.3**. Here follows the impact mechanisms for which likely significant effects have been identified: 1. Pollution of marine environment from spills/leakages 2. Noise and vibration 3. Loss of prey biomass 4. Physical disturbance

Conservation features with the potential to be impacted by the Project.	• Sandbanks slightly covered by sea water all the time [1110] • Estuaries [1130] • Mudflats and sandflats not covered at low tide [1140] • Large shallow inlets and bays [1160] • Reefs [1170] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] • Mediterranean salt meadows (*Juncetalia maritimi*) [1410] • Bottlenose dolphin (*Tursiops truncatus*) [1349] • Harbour porpoise (*Phocoena phocoena*) • Otter (*Lutra lutra*) [1355] • Sea lamprey (*Petromyzon marinus*) [1095] • River lamprey (*Lampetra fluviatilis*) [1099] • Atlantic salmon (*Salmo salar*) [1106] • Light-bellied Brent Goose (*Branta bernicla hrota*) [A046] • Shelduck (*Tadorna tadorna*) [A048] • Teal (*Anas crecca*) [A052] • Pintail (*Anas acuta*) [A054] • Scaup (*Aythya marila*) [A062] • Cormorant (*Phalacrocorax carbo*) [A017] • Ringed Plover (*Charadrius hiaticula*) [A137] • Grey Plover (*Pluvialis squatarola*) [A141] • Knot (*Calidris canutus*) [A143] • Dunlin (*Calidris alpina alpina*) [A149] • Black-tailed Godwit (*Limosa limosa*) [A156] • Bar-tailed Godwit (*Limosa lapponica*) [A157] • Curlew (*Numenius arquata*) [A160] • Redshank (*Tringa totanus*) [A162] • Greenshank (*Tringa nebularia*) [A164] • Wetlands and Waterbirds [A999]
Description of the potential direct or indirect impacts of the Project in combination with other plans or projects on the European sites.	No plans or projects identified to have potential in combination effects with the Kilrush Maintenance Dredging Project.
Conservation features with the potential to be impacted by the Project in combination with other plans or projects.	None
Concluding statement.	It is concluded that there is a potential pathway between the Project impact mechanisms, alone or in combination with other plans or projects, and some of the conservation features of European sites. The assessment is presented in full in **Section 2.5 to 2.6**. The Project will be taken to a Stage 2, Nature Impact Statement.

3. Stage 2: Natura Impact Statement

3.1. Overview

Stage 2 of the Appropriate Assessment process considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the integrity of a European site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The proponent of the plan or project will be required to submit a Natura Impact Statement (NIS), that examines the plan or project and the relevant European sites, to identify and characterise any possible implications for the site in view of the site's conservation objectives, accounting for in-combination effects. This should provide information to enable the competent authority to carry out the appropriate assessment. If the assessment deems that adverse effects on the integrity of a site cannot be excluded, then the process must proceed to Stage 3, or the plan or project should be abandoned.

Regarding the European sites and their associated conservation features identified in the ZoI of the Project, which were not excluded in Stage 1, an appropriate assessment is required to identify the impacts associated with the Project that may have a significant adverse impact. A summary of the screening outcome from the Stage 1 AA Screening can be found in **Section 2.6.4**.

This NIS gives a detailed ecological assessment of European sites and their associated conservation features, considering *inter alia* site-specific or activity-specific impacts. In preparation of this NIS, the NPWS-DELGH (2009; revised 2010)/NPWS-DAHG (2012) guidance document on marine NIS in SACs was used as described below:

The assessment of impacts for **Annex I Habitats** needs to:

- consider the principle ecological components or broad community types of Annex I Habitats.
- consider the extent to which Annex I Habitats vary under natural conditions when assessing the likely significance of impact mechanisms.
- consider the degree to which Annex I Habitats are impacted by specific impact mechanisms (consider habitat attributes and their resident species) in terms of degree of change and recoverability.
- understand the likely resistance and resilience of Annex I Habitats to the impact mechanisms.
- carefully consider the physical, chemical, and biological nature of Annex I Habitats.

- The assessment of impacts on **Annex II Species** needs to:
  - consider many aspects of the likely impact and its effects on individuals and or population of Annex II Species at sites and to their likely habitats.
  - ensure that the assessment approach focuses on direct effects (*e.g.,* physical harm, detrimental changes to or interference with natural behaviour) and indirect effects (*e.g.*, changes in prey distribution and habitat use) to ensure a comprehensive approach.

In line with NPWS-DEHLG (2009; revised 2010) guidance, the Stage 2 AA consists of three main steps:

1. **Impact Prediction** - where the likely impacts of the Project are examined. A source-pathway-receptor model has been used to assess potential for impact.
2. **Assessment of Effects** – where the effects of the Project are assessed as to whether they have any adverse effects on the integrity of European Sites as defined by conservation objectives.
3. **Mitigation Measures** – where mitigation measures are identified to ameliorate any adverse effects on the integrity of any European site.

3.2. Impact Prediction

The following sections consider the risk of potential effects associated with **Impact mechanism 1** to **4**. The assessment of potential impacts from the proposed Project on conservation features considered the negative threats and pressures affecting the conservation objectives of these conservation features as listed on the NPWS website. These species are conservation features of the **Lower River Shannon SAC (002165)** and the **River Shannon and River Fergus Estuaries SPA (004077)**.

- Pollution of marine environment from spills/leakages
- Noise and vibration
- Loss of prey biomass
- Physical disturbance

Table 3-1 presents a quick reference summary of the project impact mechanisms listed above with regards to the conservation features.

Table 3-1: Impact mechanisms relevant to the conservation features.

Ecological Group	Conservation feature [code]	Impact Mechanism			
		1. Pollution of marine environment from spills/leakages	2. Noise and vibration	3. Loss of prey biomass	4. Physical disturbance
Annex I - Habitats Lower River Shannon SAC	Sandbanks slightly covered by sea water all the time [1110]	**Potential Direct Effect**	**Potential Indirect Effect**		**Potential Direct Effect**
	Estuaries [1130]	**Potential Direct Effect**	**Potential Indirect Effect**		**Potential Direct Effect**
	Mudflats and sandflats not covered at low tide [1140]	**Potential Direct Effect**	**Potential Indirect Effect**		**Potential Direct Effect**
	Large shallow inlets and bays [1160]	**Potential Direct Effect**	**Potential Indirect Effect**		**Potential Direct Effect**
	Reefs [1170]	**Potential Direct Effect**	**Potential Indirect Effect**		**Potential Direct Effect**
Annex II – marine mammal species Lower River Shannon SAC	Bottlenose dolphin (*Tursiops truncatus*) [1349]	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**
	Otter (*Lutra lutra*) [1355]	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**
	Harbour porpoise [1351]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
Annex II - diadromous fish species Lower River Shannon SAC	Sea lamprey (Petromyzon marinus) [1095]	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**
	River lamprey (Lampetra fluviatilis) [1099]	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**
	Atlantic salmon (Salmo salar) [1106]	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**

Ecological Group	Conservation feature [code]	Impact Mechanism			
		1. Pollution of marine environment from spills/leakages	2. Noise and vibration	3. Loss of prey biomass	4. Physical disturbance
Bird Species - River Shannon and River Fergus Estuaries SPA	Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Shelduck (*Tadorna tadorna*) [A048]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Teal (*Anas crecca*) [A052]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Pintail (*Anas acuta*) [A054]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Scaup (*Aythya marila*) [A062]	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**
	Cormorant (*Phalacrocorax carbo*) [A017]	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Direct Effect**
	Ringed Plover (*Charadrius hiaticula*) [A137]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Grey Plover (*Pluvialis squatarola*) [A141]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Knot (*Calidris canutus*) [A143]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Dunlin (*Calidris alpina alpina*) [A149]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Black-tailed Godwit (*Limosa limosa*) [A156]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Bar-tailed Godwit (*Limosa lapponica*) [A157]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Curlew (*Numenius arquata*) [A160]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Redshank (*Tringa totanus*) [A162]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Greenshank (*Tringa nebularia*) [A164]	**Potential Direct Effect**	**Potential Direct Effect**		**Potential Direct Effect**
	Wetlands and Waterbirds [A999]	**Potential Direct Effect**	**Potential Direct Effect**	**Potential Indirect Effect**	**Potential Direct Effect**

3.2.1. Potential Impact Mechanism 1 - Pollution of marine environment from spills/leakages

Accidental spills or leakages from machinery poses a potential risk to the marine environment during the dredging and disposal operations. Such incidents could result in the release of polluting substances, including hydrocarbons (e.g. diesel, lubricants, hydraulic fluids), into the surrounding water column or sediment. These substances can be toxic to aquatic organisms, particularly filter feeders, benthic invertebrates, bird species and fish species, and may contribute to the degradation of water quality within the zone of influence. Furthermore, any accidental release of contaminants may lead to indirect impacts on qualifying interests of nearby Natura 2000 sites, including designated bird species reliant on intertidal or subtidal foraging habitats. While the risk of such events is typically low if best practice measures are in place, it remains a relevant potential impact pathway and must be considered in the overall assessment of likely significant effects.

3.2.1.1. Potential Receptors

Habitats (Annex I & supporting features)

- Estuaries [1130] – highly productive habitats that can trap and accumulate pollutants.
- Mudflats and sandflats not covered by seawater at low tide [1140] – important for benthic fauna and foraging birds.
- Sandbanks slightly covered by sea water all the time [1110] - important for benthic fauna and foraging birds.
- Reefs [1170] – sensitive to smothering and hydrocarbon contamination.
- Large shallow inlets and bays [1160] – enclosed waters can retain pollutants for longer.

Marine Mammals (Annex II species)

- Bottlenose dolphin [1349] – risk from ingestion of contaminated prey or exposure in foraging areas.
- Otter [1355] – vulnerable through contaminated prey or direct contact in coastal habitats.
- Harbour porpoise [1351] – sensitive to waterborne pollutants via bioaccumulation in prey.
- Grey seal & harbour seal – potential ingestion of contaminated prey or oiling of fur affecting thermoregulation.
- (Wider Marine Fauna) Basking shark – risk through filter-feeding in contaminated waters and Marine turtles – rare but possible presence, sensitive to surface contaminants.

Diadromous Fish (Annex II species)

- Atlantic salmon[1106] – sensitive to poor water quality during marine and estuarine life stages.
- Sea lamprey [1095], river lamprey [1099], and brook lamprey – sensitive to toxic substances during juvenile and adult stages.

Birds (SCIs)

- Waterbird SCIs in River Shannon & Fergus Estuaries SPA – *e.g*. cormorant, redshank, curlew, bar-tailed godwit, black-tailed godwit, shelduck, *etc*., which rely on intertidal prey that could be affected by contamination.

3.2.1.2. Impact Assessment

Accidental spills or leakages of hydrocarbons or other hazardous substances from dredging plant, support vessels, or machinery present a potential risk to the marine environment during both dredging and disposal activities. Such releases could enter the surrounding water column or settle into sediments within the zone of influence, leading to acute or chronic toxic effects. Sensitive benthic habitats, including estuaries [1130], mudflats and sandflats [1140], reefs [1170], and large shallow inlets and bays [1160], may be directly affected through smothering, adsorption of contaminants, or reduced oxygenation. Contaminant exposure could also impact benthic invertebrate communities that form the prey base for a variety of SCI species, potentially leading to indirect reductions in foraging success. Mobile Annex II species such as bottlenose dolphin, Atlantic salmon, sea lampreys, and otter may be exposed via ingestion of contaminated prey or direct contact in affected waters. Other marine fauna afforded protection under Annex IV, including harbour porpoise, grey seal, harbour seal, basking shark, and occasionally occurring marine turtles, may also be susceptible to contamination through bioaccumulation or surface contact. While the likelihood of significant pollution events is low in the absence of mitigation the potential for short-term adverse effects on water quality and sensitive ecological receptors remains a relevant impact pathway.

3.2.1.3. Mitigation Measures

Habitats (Annex I & supporting features)

- Implement a comprehensive pollution prevention plan covering fuel storage, transfer, and handling procedures.
- Refuelling of vessels and machinery will be carried out in designated, bunded areas away from intertidal or sensitive habitats where practicable.

- Spill kits and absorbent materials will be kept on all vessels and at all working locations, with personnel trained in their use.
- Immediate clean-up protocols will be in place for any accidental release to prevent contaminant spread into estuarine or intertidal habitats.

Marine Mammals (Annex II species)

- Vessel operations will follow industry-standard environmental management systems (*e.g*. MARPOL) to minimise the risk of oil discharges.
- Maintain buffer zones between refuelling/storage areas and otter foraging grounds.
- In the unlikely event of a significant spill, operations will be halted and the MMO (Marine Mammal Observer) notified to monitor for potential effects on dolphins, seals, or porpoises in the vicinity.

Diadromous Fish (Annex II species)

- Use biodegradable, non-toxic hydraulic fluids in machinery where feasible, reducing risk in the event of leakage.

Birds (SCIs)

- Avoid fuel storage and refuelling in intertidal areas used by foraging waterbirds.
- In the event of a spill, deploy booms or absorbent barriers rapidly to prevent contamination of mudflats and sandflats supporting prey species.
- Schedule high-risk activities (*e.g*. bulk fuel transfers) outside peak wintering periods to minimise overlap with sensitive assemblages (From 1st October to 31st March).

General Best Practice

- Develop and implement a Construction Environmental Management Plan (CEMP) with a dedicated Pollution Incident Response Plan.
- Train all crew and site personnel in pollution emergency response procedures, including rapid deployment of spill containment and reporting protocols.
- All plant and equipment will be subject to an inspection regime for leaks or defective fittings before operation.
- Maintain a contact chain for reporting and responding to environmental incidents to ensure rapid mitigation of potential impacts.

3.2.1.4. Conclusion

The risk of pollution from accidental spills or leakages during dredging and disposal operations is a recognised impact pathway with potential to affect a broad range of sensitive receptors within and beyond the immediate works area. Receptors include Annex I estuarine and intertidal habitats, filter-feeding and benthic invertebrate communities, and species that depend on these systems, including Annex II marine mammals (e.g. bottlenose dolphin, otter), migratory fish (e.g. salmon, lamprey species), and SCI waterbirds designated within the River Shannon and Fergus Estuaries SPA. These species may be affected either directly (through physical exposure or ingestion) or indirectly (via trophic disruption or habitat contamination). While estuarine environments possess some natural resilience to disturbance, persistent or large-scale pollution events could lead to acute or chronic ecological effects if unmanaged.

However, the likelihood of such events occurring is low due to the adoption of rigorous mitigation and pollution prevention protocols, which are standard within well-regulated marine dredging projects. These include bunded fuel storage, regular inspection and maintenance of plant and equipment, spill containment systems, and the availability of emergency spill response kits and trained personnel on-site. Specific mitigation tailored to sensitive species and habitats, such as maintaining safe distances from designated shorelines and coordinating with Marine Mammal Observers (MMOs), further reduces the risk of direct exposure.

In summary, while a pollution event remains a theoretical risk during marine operations, the combination of appropriate best-practice measures, receptor-specific mitigation, and the inherent resilience of the estuarine system ensures that the potential for significant adverse effects on the conservation objectives of nearby Natura 2000 sites is negligible. Provided the mitigation measures outlined in **Section 3.2.1.3** are fully implemented and maintained throughout the project lifecycle, no long-term or irreversible effects on qualifying habitats or species are anticipated as a result of accidental contamination.

3.2.2. Potential Impact Mechanism 2 – Noise and vibration

The dredging operations and associated vessel movements have the potential to generate underwater noise and vibration, which may cause temporary disturbance to sensitive marine fauna, particularly marine mammals and fish species. Mechanical dredging equipment, support vessels, and disposal activities can produce low to moderate levels of underwater acoustic emissions that may disrupt normal behaviour, including foraging, communication, or navigation. Species listed under Annex II of the Habitats Directive, such as the Harbour Porpoise (*Phocoena phocoena*), are known to be particularly sensitive to anthropogenic noise. While the anticipated noise levels are not expected to result in permanent hearing damage or physical harm, there remains the potential for temporary behavioural disturbance within the zone of acoustic influence. The significance of such impacts depends on the presence, abundance, and sensitivity of qualifying species within nearby European Sites, and must therefore be assessed in the context of the conservation objectives of those sites.

3.2.2.1. Potential Receptors

Marine Mammals (Annex II species)

- Bottlenose dolphin [1349] – sensitive to mid-frequency underwater noise; behavioural disturbance possible.
- Harbour porpoise [1351] – highly sensitive to acoustic disturbance; disturbance at relatively low noise levels.
- Otter [1355] – potential disturbance from shoreline noise and vibration, especially in foraging/commuting areas.

Diadromous Fish (Annex II)

- Atlantic salmon [1106] – migrating through estuary, susceptible to underwater noise during passage.
- Sea lamprey [1095] – estuarine phase could overlap with works.
- River lamprey [1099] – similar exposure potential in estuarine environment.

Habitats (Annex I)

- Reefs [1170], Sandbanks [1110], Estuaries [1130], Mudflats and sandflats [1140], Large shallow inlets and bays [1160] – habitats themselves are not directly sensitive to noise/vibration, but the species they support (fish, invertebrates, marine mammals, birds) are.

Birds (SCIs)

- Light-bellied Brent Goose [A046], Shelduck [A048], Teal [A052], Pintail [A054], Scaup [A062] – Potential disturbance from vessel noise and activity, with diving species (e.g. Scaup) more vulnerable during foraging.
- Cormorant [A017] – May experience disturbance or reduced foraging efficiency due to underwater noise and vessel presence.
- Waders (Ringed Plover [A137], Grey Plover [A141], Knot [A143], Dunlin [A149], Black-tailed Godwit [A156], Bar-tailed Godwit [A157], Curlew [A160], Redshank [A162], Greenshank [A164]) – Sensitive to disturbance from surface noise and vibration, potentially displaced from intertidal foraging areas.
- Wetlands and Waterbirds [A999] – Assemblage feature may be indirectly affected if disturbance leads to displacement of key populations.

3.2.2.2. Impact Assessment

The proposed dredging and disposal operations will generate both underwater noise (from vessel engines, pumps, and drag-heads) and airborne noise/vibration (from equipment and vessel activity). Marine mammals, including Bottlenose Dolphin, Harbour Porpoise, and Otter may be exposed within the estuarine zone of influence. Cetaceans are highly sensitive to acoustic disturbance, particularly harbour porpoise, which may respond at relatively low sound levels. Pinnipeds are less sensitive but may experience short-term behavioural disturbance when foraging near the works. Otter could be present in shoreline areas used for commuting or feeding however they are likely habituated to noise within the marina area. Other Annex IV species (such as common dolphin or migratory baleen whales) are less likely to occur in the inner estuary and therefore exposure risk is minimal.

Diadromous fish, including Atlantic Salmon, Sea Lamprey, and River Lamprey migrate through the Shannon Estuary and could be exposed to underwater noise during estuarine passage. While noise is not expected to cause injury, temporary behavioural disruption during sensitive migratory windows cannot be excluded.

Annex I habitats (*e.g*. Reefs, Sandbanks, Estuaries, Mudflats and sandflats, Large shallow inlets and bays) are not directly sensitive to acoustic disturbance. However, they support prey species (fish, invertebrates, and benthic fauna) that may be indirectly affected, with potential knock-on effects for higher trophic levels such as birds and marine mammals.

Bird species associated with the River Shannon and River Fergus Estuaries SPA are also potential receptors. Waterfowl (Light-bellied Brent Goose, Shelduck, Teal, Pintail, Scaup) may experience displacement from intertidal or subtidal foraging areas due to vessel noise and activity, with diving species (*e.g*. Scaup) more vulnerable to disturbance. Cormorant may also be affected through temporary reduction in foraging efficiency linked to underwater noise and prey movements. Waders (Ringed Plover, Grey Plover, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank and Greenshank) are sensitive to surface noise and vibration and may be displaced from feeding areas, particularly in intertidal zones close to dredging. The assemblage feature Wetlands and Waterbirds may be indirectly impacted if disturbance leads to wider displacement of constituent populations.

Overall, noise and vibration impacts are expected to be localised, temporary, and reversible, but they cannot be excluded as a potential source of disturbance to designated features and species. Mitigation is therefore required.

3.2.2.3. Mitigation Measures

Marine Mammals (Annex II species)

To avoid disturbance to the population of bottlenose dolphins for which the Lower River Shannon SAC is designated along with otter, porpoise and seals, mitigation measures consistent with DAHG (2014) guidance will be implemented for all dredging and disposal operations.

- A suitably qualified Marine Mammal Observer (MMO) will be appointed for the duration of works. The MMO will conduct a 30-minute pre-start watch within 500 m of the dredging vessel. If dolphins are observed within this zone, start-up will be delayed until animals have left or a 30-minute clearance period has elapsed.
- A "ramp-up" or "soft start" procedure will be used to gradually introduce sound to the environment.
- Dredging will only commence in daylight hours when effective visual monitoring is possible.
- If dredging is paused for more than 30 minutes, pre-start monitoring will be repeated before recommencement.
- Clear communication protocols will be established between the MMO and site management to control commencement and resumption of works.
- Vessel speeds will be limited to reduce the risk of collision with dolphins.
- Any close approach of bottlenose dolphins to the works area will be reported to the National Parks and Wildlife Service.

Once dredging has commenced, operations may continue at night or during poor visibility, as continuous activity is considered less disruptive than repeated start-ups.

Birds (SCIs)

- Limit dredging near key foraging areas during peak wintering season From (1st October to 31st March) to reduce disturbance.
- Maintain minimum buffer distance from large rafts of feeding/diving birds where practicable.
- Minimise night-time lighting to avoid displacement from adjacent feeding areas.
- Adopt gradual movement of vessels near feeding flocks to reduce flushing events.

Diadromous Fish (Annex II)

- Minimise night-time lighting of works area to reduce disorientation of migrating fish.

Habitats (Annex I)

- Apply acoustic and operational controls already outlined for species (e.g., ramp-up, MMO, scheduling) to indirectly protect the ecological integrity of habitats through reduced disturbance to dependent fauna.

3.2.2.4. Conclusion

The proposed dredging and disposal operations will generate underwater noise and vibration that could result in temporary behavioural disturbance to qualifying interest species, particularly marine mammals, diadromous fish, and waterbirds, as well as indirect effects on Annex I habitats through impacts on associated prey species. While these effects are anticipated to be localised, short-term, and reversible, they cannot be excluded in the absence of mitigation.

Implementation of the prescribed measures, including marine mammal mitigation protocols, vessel speed restrictions, temporal and spatial controls to reduce disturbance to birds and fish, and soft-start procedures – will ensure that the risk of significant adverse effects is minimised. With these controls in place, the works are not expected to result in permanent or population-level impacts on any Qualifying Interests or Special Conservation Interests of nearby European Sites.

Accordingly, it is concluded that, following mitigation, noise and vibration arising from the proposed Project will not adversely affect the integrity of the Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA, or any other Natura 2000 site, either alone or in combination with other plans or projects, in view of their conservation objectives.

3.2.3. Potential Impact Mechanism 3 - Loss of Prey Biomass

The proposed dredging and disposal activities have the potential to result in a temporary loss or reduction of benthic and epibenthic prey biomass within the affected areas, which may impact species that rely on these resources for foraging. Physical disturbance of the seabed during dredging can displace, injure, or remove infaunal and epifaunal organisms, including polychaetes, molluscs, and small crustaceans, which form important components of the diet for a range of protected species. In particular, fish, marine mammals such as bottlenose dolphins (*Tursiops truncatus*), and diving waterbirds designated as qualifying interests of nearby European Sites (*e.g*. the River Shannon and Fergus Estuaries SPA) may be affected if their foraging grounds are temporarily degraded or their prey availability is significantly reduced. While recolonisation of disturbed areas typically occurs over time, the scale, timing, and frequency of the proposed works must be considered in assessing the potential for short-term prey depletion and whether this could lead to significant ecological impacts on designated species within Natura 2000 sites.

3.2.3.1. Potential Receptors

Marine Mammals (Annex II species)

- **Bottlenose dolphin [1349]** – primary qualifying interest of the Lower River Shannon SAC; relies on estuarine fish populations which may in turn depend on benthic prey.
- **Otter [1355]** – opportunistic predator of fish and crustaceans, potentially affected by temporary reductions in prey resources in shallow estuarine zones.

Diadromous Fish (Annex II species)

- **Atlantic salmon** – juvenile smolts and adults migrate through estuary; dependent on prey-rich estuarine habitats during transitional phases.
- **Sea lamprey** – estuarine adults require sufficient prey fish biomass to complete migration cycle.
- **River lamprey** – may be exposed to reduced prey availability during estuarine passage.

Birds (SCIs)

- **Diving species** (e.g., **Scaup**, **Cormorant**) – sensitive to reduced fish and invertebrate prey in benthic foraging zones.
- **Assemblage feature Wetlands & Waterbirds** – may be indirectly affected if prey depletion leads to displacement or reduced carrying capacity within foraging habitats.

3.2.3.2. Impact Assessment

The proposed dredging and disposal activities will temporarily disturb and remove benthic and epibenthic communities, including polychaetes, molluscs, and small crustaceans, which form a critical component of the estuarine food web. This disturbance may result in a short-term reduction in prey biomass within the affected areas. The extent of the impact will depend on the scale of dredging, the spatial overlap with foraging areas of protected species, and the rate of natural recolonisation of disturbed sediments, which typically occurs over months to years in dynamic estuarine environments.

Bottlenose dolphin, a qualifying interest of the Lower River Shannon SAC, relies on estuarine fish populations, which themselves may be indirectly affected by a reduction in benthic prey. However, given the highly mobile nature of dolphins and the wide availability of alternative foraging areas within the Shannon Estuary, any localised depletion of prey is expected to cause at most temporary, minor behavioural disturbance. The otter is also a qualifying interest of the Lower River Shannon SAC and forages in shallow estuarine areas, which could also experience reduced prey availability in the immediate works area. As their foraging territories are extensive and prey resources are replenished over time, significant adverse effects on the conservation objectives of this species are not anticipated.

Atlantic salmon, sea lamprey, and river lamprey migrate through the Shannon Estuary and may encounter temporary reductions in prey availability within disturbed zones. As their migratory behaviour relies more on passage than local foraging, impacts are expected to be minimal. Short-term reductions in prey biomass are unlikely to significantly affect migratory success or population status.

Diving species such as Scaup and Cormorant could experience reduced prey abundance within benthic foraging zones directly impacted by dredging. However, the spatial footprint of works is limited relative to the overall extent of suitable foraging habitat in the estuary, and alternative feeding grounds remain accessible. The Wetlands and Waterbirds assemblage feature may be indirectly affected through displacement if prey resources are temporarily reduced in localised areas. Given the scale and duration of the works, such effects are predicted to be minor and reversible, with no significant long-term consequences for the integrity of the SPA.

Overall, while a temporary reduction in benthic prey biomass is expected in the dredged and disposal areas, the effects on screened-in receptors are predicted to be localised, short-term, and reversible. Mobile species such as dolphins, salmonids, lampreys, and waterbirds can shift to alternative foraging areas within the extensive Shannon Estuary. Accordingly, significant adverse effects on the conservation objectives of relevant European sites are not anticipated, provided standard best-practice measures are implemented.

3.2.3.3. Mitigation Measures

To minimise the potential for significant ecological impacts arising from temporary reductions in benthic prey biomass, the following receptor-specific mitigation measures will be implemented:

Marine Mammals (Annex II species)

- Avoid prolonged works in shallow margins commonly used by otters, minimising the duration of prey disruption in these zones.

Diadromous Fish (Annex II species)

- Where possible, phase dredging to allow rapid recolonisation of benthic communities between operations.

Birds (SCIs)

- Avoid peak wintering season (1st October to 31st March) for the most disturbance-sensitive species where feasible.
- Maintain buffer distances from large rafts of diving birds actively feeding in adjacent waters.

- Ensure dredging and disposal footprints are as small and localised as possible to maintain extensive alternative foraging grounds.

General Best Practice

- Monitor benthic communities post-works to verify recovery rates, enabling adaptive management if impacts persist.
- Coordinate dredging campaigns with other estuary users (e.g. aquaculture, fisheries) to avoid cumulative prey depletion.

3.2.3.4. Conclusion

The proposed dredging and disposal activities will result in a temporary and localised reduction of benthic and epibenthic prey biomass within the works footprint. While this disturbance has the potential to affect foraging opportunities for marine mammals, diadromous fish, and waterbirds, these impacts are expected to be minor, short-term, and reversible. All screened-in receptors are highly mobile and can access alternative foraging habitats within the extensive Shannon Estuary, while benthic communities are expected to naturally recolonise disturbed sediments over time.

With the implementation of the receptor-specific mitigation and best-practice measures set out above, no significant adverse effects on the conservation objectives of the Lower River Shannon SAC, River Shannon and Fergus Estuaries SPA, or other relevant European sites are predicted.

3.2.4. Potential Impact Mechanism 4 – Physical Disturbance

The proposed dredging operations have the potential to cause physical disturbance to the marine environment, both within the dredging footprint and at the offshore disposal site. This disturbance may result from the direct removal of seabed sediments, which can lead to temporary habitat loss or alteration, and from increased turbidity caused by sediment resuspension during dredging and disposal activities. Such physical impacts may affect benthic communities, particularly in areas supporting sensitive or slow-recovering species. While these effects are generally localised and temporary in nature, their potential to impact the conservation objectives of nearby European Sites must be carefully assessed, particularly where qualifying habitats or species are located within or adjacent to the zone of influence of the proposed works.

Sediment transport modelling for the plough disposal of fine sands and silts indicates that dredged material is effectively dispersed under both neap and spring tidal conditions, with only minor deposition predicted at isolated shoreline locations. Localised deposition is expected to be minimal, generally below 0.2 kg/m^2 (equivalent to <0.1 mm), with isolated higher values (up to ~2.8 mm) in small areas such as Skagh Point. Maximum accumulation is estimated at approximately 35 mm following five planned campaigns over eight years, confirming that significant long-term build-up at the disposal site is unlikely. Overall, the modelling supports the conclusion that deposition effects are minimal and largely confined to small, localised areas.

In addition to the direct disturbance caused by dredging activities, the operation of project vessels has the potential to cause additional physical disturbance to marine fauna. Increased vessel traffic in and around the dredge and disposal areas may lead to displacement of sensitive species, such as marine mammals and waterbirds, from important foraging or resting areas. Vessel movements can also increase the risk of collision with large marine fauna, including basking sharks, seals, and cetaceans. For species reliant on undisturbed intertidal or nearshore habitats, such as otters, increased vessel activity could cause temporary avoidance behaviour, thereby reducing habitat use in the vicinity of the works. While such disturbance is typically short-term and reversible once activity ceases, it remains an important impact pathway to consider, particularly where vessels operate in close proximity to known areas of ecological importance.

3.2.4.1. Potential Receptors

Habitats (Annex I)

- **Estuaries [1130]** – sensitive to sediment removal, resuspension, and increased turbidity.
- **Mudflats and sandflats not covered by seawater at low tide [1140]** – risk of disturbance to benthic infauna and prey availability for birds.
- **Sandbanks slightly covered by sea water all the time [1110]** – vulnerable to seabed alteration and sediment redistribution.
- **Reefs [1170]** – may be sensitive to smothering from resuspended sediments.
- **Large shallow inlets and bays [1160]** – potential for localised turbidity and benthic disturbance.

Marine Mammals (Annex II species)

- **Bottlenose dolphin** – potential displacement due to vessel activity, collision risk, and turbidity effects on prey.
- **Harbour porpoise** – sensitive to displacement and vessel interactions.
- **Otter (Lutra lutra) [1355]** – disturbance of shoreline/nearshore habitats, avoidance behaviour in response to vessel activity.
- **Other Annex IV species (e.g. basking shark, marine turtles, large cetaceans)** – low likelihood of occurrence, but at risk of vessel collision when present.

Fish (Annex II species)

- **Atlantic salmon** – potential disruption of migration pathways due to vessel activity and localised turbidity.

- **Sea lamprey** – susceptible to turbidity and sedimentation during estuarine migration.
- **River lamprey** – as above.

Birds (SCIs)

- **Diving species (e.g. Scaup, Cormorant)** – disturbance from vessel traffic, turbidity effects reducing foraging efficiency.
- **Intertidal waders (e.g. Redshank, Curlew, Dunlin, Knot)** – displacement from foraging habitats if disturbed by vessel presence or altered sediment conditions.
- **Other waterfowl (e.g. Light-bellied Brent Goose, Shelduck, Teal)** – potential disturbance from vessel movements near intertidal feeding areas.
- **Assemblage feature Wetlands & Waterbirds** – indirect displacement or disturbance of constituent species within estuarine habitats.

3.2.4.2. Impact Assessment

The proposed dredging and disposal operations will result in direct and indirect physical disturbance within the marine environment. Direct disturbance will arise from the removal of seabed sediments in the dredging footprint and from deposition of material at the designated offshore disposal site. This disturbance will cause temporary habitat loss and alteration, as well as displacement of benthic communities that underpin the estuarine food web. There are naturally high suspended solid concentrations in the Shannon Estuary as a result of relatively high current speeds and high volumes of river runoff. This suspended solid load moves with the tides and currents and can ultimately settle to the seafloor. This creates an environment and communities adapted to and tolerant of a level of sediment deposition on the seafloor.

The infaunal communities encountered in the study area during DDV analysis are consistent with the NPWS *subtidal sand to mixed sediment with Nucula nucleus community complex* community type for the area, alongside Laminaria-dominated assemblages at the more structurally complex rocky fringe. These communities are well adapted to naturally dynamic conditions, including high levels of suspended sediment and periodic siltation, due to the relatively strong tidal currents in the estuary (up to 1.5 m/s). The drop-down video survey confirmed that sediment conditions and associated assemblages remain stable and consistent with historic records, supporting the conclusion that the benthic environment is resilient to disturbance and dominated by silt-tolerant and opportunistic species.

Sensitivity assessments of the identified biotopes indicate low to medium vulnerability to dredging-related pressures, with infaunal sand and mud communities (SS.SSa.IMuSa.ArelSa) found to be largely tolerant of smothering, turbidity fluctuations, and sediment penetration, while Laminaria-dominated habitats

(IR.MIR.KR.Ldig.Bo) show greater sensitivity to heavy siltation and abrasion but remain unlikely to be significantly impacted given local hydrodynamic conditions and minimal predicted deposition. Sediment transport modelling further confirms that plough disposal of fine sand and silt results in effective dispersion, with only minor, localised deposition (≤ 35 mm over five campaigns in eight years), thereby limiting the risk of lasting habitat alteration. Although the model provides the ultimate fate of material settling to the seafloor from the dredging operation, it does not take into account the further dispersion and dilution of re-suspended dredged material from the sea floor. Sedimentation at the levels predicted (worst case scenario) will have little additional effect on epi- or infaunal communities in this region.

Overall, the benthic environment of the project area is considered resilient, with impacts from dredging expected to be temporary, spatially limited, and within the natural variability of the system. Recovery potential is high, and with the implementation of standard best practice measures, the risk of significant adverse effects on benthic habitats or qualifying features of nearby European sites is considered low.

The intertidal survey (**Appendix 3**) recorded biotopes consistent with the NPWS community type *'Fucoid-dominated intertidal reef community complex'*, characteristic of rocky shore habitats within the Shannon Estuary. These communities are naturally adapted to fluctuating sediment regimes resulting from the large catchment size and high suspended sediment loads typical of the estuary. Strong tidal currents (up to 1.5 m/s) and substantial freshwater input generate high baseline turbidity and dynamic sediment transport conditions, resulting in faunal and floral assemblages tolerant of intermittent sediment deposition. The biotopes identified are generally resilient, with most exhibiting *low to medium* sensitivity to light siltation events (<5 cm), as may occur during maintenance dredging.

Hydrodynamic modelling confirms effective dispersion of fine material generated during plough dredging, with suspended sediments widely dispersed throughout the outer and middle estuary within approximately 18 hours under both neap and spring tidal conditions. Localised deposition is expected to be minimal, generally below 0.2 kg/m² (equivalent to <0.1 mm), with isolated higher values (up to ~2.8 mm) in small areas such as Skagh Point. Even assuming cumulative deposition over multiple dredging campaigns, sediment settlement remains well within the tolerance thresholds of the recorded biotopes. The continual tidal action will rapidly redistribute any deposited material, limiting the potential for prolonged smothering or habitat alteration. Given the timing of dredging operations (commencing two hours after low tide) and the inherent resilience and recovery capacity of the intertidal assemblages, significant long-term effects on the structure or function of intertidal habitats are not anticipated.

Indirect disturbance will occur through increased turbidity associated with sediment resuspension during dredging and disposal activities. Elevated turbidity levels may temporarily reduce light penetration, impairing primary productivity in shallow waters and causing localised stress to filter-feeding organisms. While these effects are generally confined to the immediate dredging plume and are reversible following cessation of activity, there is potential for short-term reductions in prey availability for species reliant on benthic and epibenthic organisms, including waterbirds, fish, and marine mammals. Given the spatially restricted footprint of works relative to the wider Shannon Estuary, the overall scale of prey depletion is expected to be limited, with alternative foraging areas available to mobile species.

Vessel activity associated with the project introduces an additional pathway of physical disturbance. The presence and movement of dredging vessels and support craft may cause temporary displacement of sensitive receptors, such as marine mammals (e.g. bottlenose dolphin, harbour porpoise, grey seal) and qualifying waterbird species. Disturbance may manifest as short-term avoidance behaviour or reduced use of foraging and resting habitats adjacent to the works. Vessel operations also increase the potential risk of collision with large marine fauna such as basking shark, dolphins, or seals, although such risks are low given the relatively small scale and duration of the proposed campaign compared to background navigation and marine traffic in the estuary.

Overall, the impacts of physical disturbance from dredging, disposal, and associated vessel activity are expected to be temporary, localised, and reversible. Benthic habitats are predicted to recover within a reasonable timeframe, and mobile qualifying species of the SACs and SPAs are likely to relocate temporarily to alternative suitable habitats within the extensive Shannon Estuary system. With the implementation of standard best-practice measures and mitigation (including seasonal restrictions, vessel speed controls, and MMO monitoring), significant adverse effects on the integrity of European sites are not anticipated.

3.2.4.3. Mitigation Measures

To minimise the potential for significant adverse effects arising from physical disturbance during dredging, disposal, and associated vessel operations, the following receptor-specific and general mitigation measures will be implemented:

Habitats (Annex I)

- Restrict dredging and disposal to the footprint in order to reduce the extent of direct seabed disturbance.
- Adherence to timing and tonnage descriptions

Marine Mammals (Annex II species)

- Employ a Marine Mammal Observer (MMO) to monitor for the presence of dolphins, porpoises, and seals during vessel operations, with authority to halt activities if animals are observed in close proximity.
- Vessel speed restrictions in the dredging zone to reduce collision risk and disturbance.

Birds (SCIs)

- Schedule dredging outside peak overwintering months (1st October to 31st March) where feasible, to minimise displacement of sensitive waterbird species.
- Maintain distance from large flocks of feeding or roosting birds; operations will not commence or will temporarily pause if significant aggregations are recorded within the immediate works area.

Diadromous Fish (Annex II species)

- Adherence to methodology outlined in the project description to reduce turbidity plumes, ensuring suspended sediment concentrations remain within thresholds that avoid significant stress to migratory fish.

General Vessel Activity

- Implement a vessel traffic management plan to coordinate dredging and support vessel movements, thereby reducing disturbance pressure and collision risk.

Monitoring & Adaptive Management

- Conduct post-dredging benthic surveys to verify recovery of disturbed habitats and prey biomass.
- Report any accidental interactions (e.g. marine mammal approach, bird displacement, fish kills) to NPWS and apply adaptive mitigation where necessary.

3.2.4.4. Conclusion

The proposed dredging and disposal operations are expected to cause localised, temporary physical disturbance within the footprint of the works and at the offshore disposal site. The sediment transport modelling for the plough disposal of fine sand and silt indicates that the majority of material remains in suspension and disperses widely throughout the estuary under both neap and spring tidal conditions. Minor deposition is predicted at discrete locations along the shoreline, such as Cappagh, Ballymote West, Scattery Island, Moyne Point, and Ballymacrinan Bay. These findings suggest that long-term sediment accumulation at the disposal site is minimal, and the potential for significant habitat smothering is low.

Benthic habitats and communities within the immediate dredging and disposal footprint will experience temporary removal or alteration, with minor resuspension-related effects extending into adjacent areas. While this may temporarily reduce prey availability for certain mobile species, including fish, marine mammals, and diving birds, the highly mobile nature of these receptors, combined with the relatively small scale and short duration of the works, means that any adverse effects are expected to be short-term, reversible, and localised. Vessel activity may also lead to temporary displacement of species such as otters, waterbirds, and marine mammals, but these impacts are anticipated to be minor given the routine presence of vessels and human activity in the Kilrush Marina area.

Overall, when considered in the context of species-specific sensitivities, ecological function, and the widespread dispersion of dredged material demonstrated by the modelling, the physical disturbance associated with the proposed works is unlikely to result in significant adverse effects on the conservation objectives of nearby Natura 2000 sites. Implementation of standard best-practice mitigation measures, including operational controls, pre-start monitoring, and buffer zones for sensitive species, will further reduce the potential for ecological impacts and ensure that physical disturbance remains within acceptable, reversible limits.

3.3. Summary of Mitigation Measures

Mitigation measures have been developed to ensure that the proposed dredging and disposal activities will not result in adverse effects on the integrity of any European site, with reference to the Site-Specific Conservation Objectives. These measures are based on the outcomes of the screening and impact assessment, the zone of influence derived from hydrodynamic and sediment dispersion modelling, and best practice guidance for marine projects in Ireland and the EU.

Habitats (Annex I & Supporting Features)

- Implement a comprehensive Pollution Prevention Plan covering fuel storage, transfer, and handling.
- Refuelling of vessels and machinery will take place in designated, bunded areas away from intertidal or otherwise sensitive habitats where practicable.
- Spill kits and absorbent materials will be kept on all vessels and at all working locations; personnel will be trained in their use.
- Immediate clean-up protocols will be in place for any accidental release to prevent spread into estuarine or intertidal habitats.
- Restrict dredging and disposal strictly to the permitted footprint to minimise seabed disturbance.
- Timing and tonnage restrictions will be applied where necessary to reduce the scale of habitat disturbance.

Marine Mammals (Annex II species)

- A qualified Marine Mammal Observer (MMO) will be appointed for the duration of works.
- MMO to conduct a 30-minute pre-start watch within 500 m of the vessel; dredging will not commence if marine mammals are observed until they leave the zone or a 30-minute clearance has elapsed.
- Apply “soft-start/ramp-up” procedures when commencing dredging.
- Dredging will commence only in daylight hours when effective visual monitoring is possible; if paused >30 minutes, pre-start monitoring must be repeated.
- Clear communication protocols will be maintained between MMO and crew for start/resume decisions.
- Vessel operations will follow MARPOL and equivalent best-practice environmental management standards to minimise hydrocarbon risks.
- Buffer zones will be maintained between refuelling/storage areas and otter foraging habitats.
- Vessel speeds will be limited within the dredging zone to reduce collision risk.
- Close approaches of bottlenose dolphins will be reported to NPWS.

- In the unlikely event of a spill, operations will be halted and the MMO notified to monitor potential effects.
- Dredging and disposal will be scheduled outside peak dolphin foraging activity (e.g. crepuscular hours) where feasible.
- Works in shallow margins commonly used by otters will be minimised in duration.
- Once dredging has started, continuous operations may proceed into night hours, as this is considered less disruptive than repeated stop-start cycles.

Diadromous Fish (Annex II species – salmon, sea lamprey, river lamprey)

- Limit dredging intensity to ensure suspended sediment concentrations remain within safe thresholds.
- Use biodegradable, non-toxic hydraulic fluids in machinery where feasible.
- Minimise night-time lighting to reduce disorientation of migrating fish.
- Phase dredging campaigns where possible to allow benthic communities to recolonise between operations.

Birds (SPA Qualifying Interests)

- Schedule dredging outside the peak overwintering season (1st October to 31st March) where feasible, to minimise displacement of sensitive waterbirds.
- Maintain buffer distances from large rafts of feeding or roosting birds; dredging will pause if significant aggregations occur nearby.
- Avoid fuel storage and refuelling in intertidal areas used by foraging waterbirds.
- In the event of a spill, deploy booms or absorbent barriers rapidly to protect mudflats and sandflats supporting prey species.
- Minimise night-time lighting to avoid displacement or disorientation of nocturnal and roosting bird species.
- Adopt gradual vessel movements near feeding flocks to reduce flushing events.

Monitoring & Adaptive Management

- Conduct post-dredging benthic surveys to verify recovery of disturbed habitats and prey biomass.
- Implement a vessel traffic management plan to coordinate dredging and support vessel movements, reducing collision risk and disturbance.
- Report accidental interactions (e.g. marine mammal approach, fish kills, significant bird displacement) to NPWS and implement adaptive mitigation as required.

3.4. Plans or Projects that might act in-combination

As set out in **Section 2.6**, a detailed review of threats, pressures, and potential interacting activities within the ZoI has been carried out to determine whether cumulative or in-combination effects could arise from the proposed project. This review considered a range of relevant activities and pressures, including aquaculture operations, dredging and disposal activities, navigation and marine traffic, diffuse and point-source pollution, and other existing or planned projects within the Shannon Estuary and surrounding coastal areas.

Aquaculture sites in the estuary, particularly shellfish production areas in Poulnasherry Bay, were identified as the closest aquaculture activity with potential overlap. However, these sites are located outside the ZoI and are physically separated from the works footprint. Given this spatial separation and the relatively small-scale and temporary nature of the proposed dredging operations, no cumulative interaction with aquaculture operations is expected. Similarly, historic and permitted dredging and disposal activities have already been subject to regulatory assessment and licensing, and the proposed project is not expected to overlap temporally or spatially in a manner that could give rise to additive impacts.

Navigation and marine traffic are ongoing pressures in the estuary, but the proposed works are of limited duration and will utilise standard vessel types already operating in the system. As such, they do not represent a significant intensification of this activity. Diffuse and point-source pollution inputs, including wastewater discharges and land-based run-off, represent background pressures on estuarine water quality. However, the project will implement strict pollution prevention measures, ensuring that no additional contribution to these pressures occurs.

Taking these factors together, and acknowledging the findings of the screening stage, it is concluded that there are no realistic pathways by which the proposed project could give rise to cumulative or in-combination effects with other plans, projects, or pressures. The temporary, localised nature of the dredging operations, combined with the extensive spatial extent and resilience of the Shannon Estuary's designated habitats and species, ensures that the works will not exacerbate existing pressures or interact adversely with other activities. Accordingly, the proposed project can be considered in isolation without risk of cumulative effects undermining the conservation objectives of the Lower River Shannon SAC or River Shannon and River Fergus Estuaries SPA.

3.5. Natura Impact Statement Conclusion

This report has been prepared with regard to the relevant provisions of the EU Council Directive 92/43/EEC and Ireland’s EU (Birds and Natural Habitats) Regulations 2011 (as amended). This NIS has been prepared as it was not possible in the Screening for AA to rule out, as a matter of scientific certainty, that the proposed operation at the Project site will not have a likely significant effect on SACs and SPAs. The NIS has examined and analysed, in light of the best scientific knowledge, how the proposed operations could impact on the QIs of SACs and SCIs of SPAs, *i.e.,* conservation features, and whether the predicted impacts would adversely affect the integrity of protected sites.

Mitigation measures have been identified which ensure that any impacts on the Conservation Objectives of conservation features for which SACs and SPAs are designated will be avoided so that there will be no risk of adverse effects to the protected sites.

It has been objectively concluded following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted impacts from the proposed operations together with the mitigation measures proposed, that the proposed operations will not pose a risk of adversely affecting (either directly or indirectly) the integrity of SACs or SPAs, either alone or in combination with other plans and projects, and that there is no reasonable scientific doubt in relation to this conclusion.

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Kilrush Maritime Ltd.

Appendix 1 - **Addendum to Sediment Transport Modelling Study of Kilrush Marina**

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AQUAFACT APEM Group

AQUAFACT Ref: (P-17851)

November 2025

COMMERCIAL IN CONFIDENCE

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Report Approval Sheet

Client	**Kilrush Mar**itime **Ltd**.
Report Title	**Addendum to Sediment Transport Modelling Study of Kilrush Marina**
Job Number	**P17851**
Report Status	Final
Date	November 2025

Rev	**Status**	**Issue Date**	**Document File Name**	**Author (s)**	**Approved by:**
1	Final	November 2025	**P17851_Kilrush_marina_sediment_model_Addendum.docx**	**G. Gao**	BD

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1. Introduction

This addendum provides an assessment of the potential impacts associated with the proposed dredging of the approach channel to Kilrush Marina located in Kilrush Creek. It also evaluates the suitability of applying a previously developed sediment transport and dredging model to the current proposal. Specifically, it examines how the proposed dredging activities may influence suspended sediment levels and sediment deposition during the dredging process.

The analysis draws upon numerical modelling developed for the area, referencing findings and results from the modelling study conducted by AQUAFACT (AQUAFACT, 2013). At that time, AQUAFACT was commissioned by Malachy Walsh & Partners to carry out a preliminary sediment transport study in support of the original dredging proposal.

Compared to the initial proposal, which involved dredging of 6,000 tonnes, the revised plan increases the dredged volume to 8,000 tonnes per campaign. The original AQUAFACT (2013) study assessed the potential impacts of dredging over a full tidal cycle (12 hours) under both spring and neap tide conditions. The model was developed using a conservative approach, applying the highest plausible sediment release rate during dredging. In the previous model, sediment transport was simulated based on the rate of sediment release during a single tidal cycle, rather than the total volume of sediment. Under the revised proposal, the dredging and disposal procedures will remain the same, meaning the existing model remains representative of the new plan. The primary difference is that the overall dredging duration will increase proportionally to accommodate the larger volume. Therefore, the AQUAFACT (2013) report remains a valid and representative study for assessing the potential impacts of the updated dredging proposal on suspended sediment concentrations and sediment deposition.

2. Hydrodynamic and tidal circulation

To support this assessment, a two-dimensional, depth-averaged hydrodynamic model of the Shannon Estuary—from Loop Head to Corbally Weir—was developed using the TELEMAC-2D modelling system. This model, originally created for the Shannon-Foynes Port Company's oil spill predictive modelling and GIS system, employs an unstructured finite element mesh tailored to the estuary's geometry. The mesh comprises 10,294 nodes and 17,980 elements, representing a total estuarine area of 561 km² (see **Figure 2-1**).

Hydrodynamic simulations were conducted for both spring and neap tidal cycles. These outputs from the hydrodynamic model were then used to drive the PSED sediment transport model which developed by the Canadian Hydraulics Centre (CHC) for sediment transport simulation. PSED model incorporates bathymetry, time-varying water depths, and velocity fields from TELAMAC-2D to simulate suspended and bed load transport of fine silts, sands, and gravels. The model accounts for sediment mobility, entrainment, advection, dispersion, settling, and re-suspension once critical shear stress thresholds are exceeded.

For completeness, the hydrodynamic modelling results are presented below. **Figure 2-2** illustrates the location of the proposed disposal area, while **Figure 2-3** shows the modelled current speeds at mid-ebb, near low water level, mid-flood, and near high water level in the vicinity of Kilrush Creek.

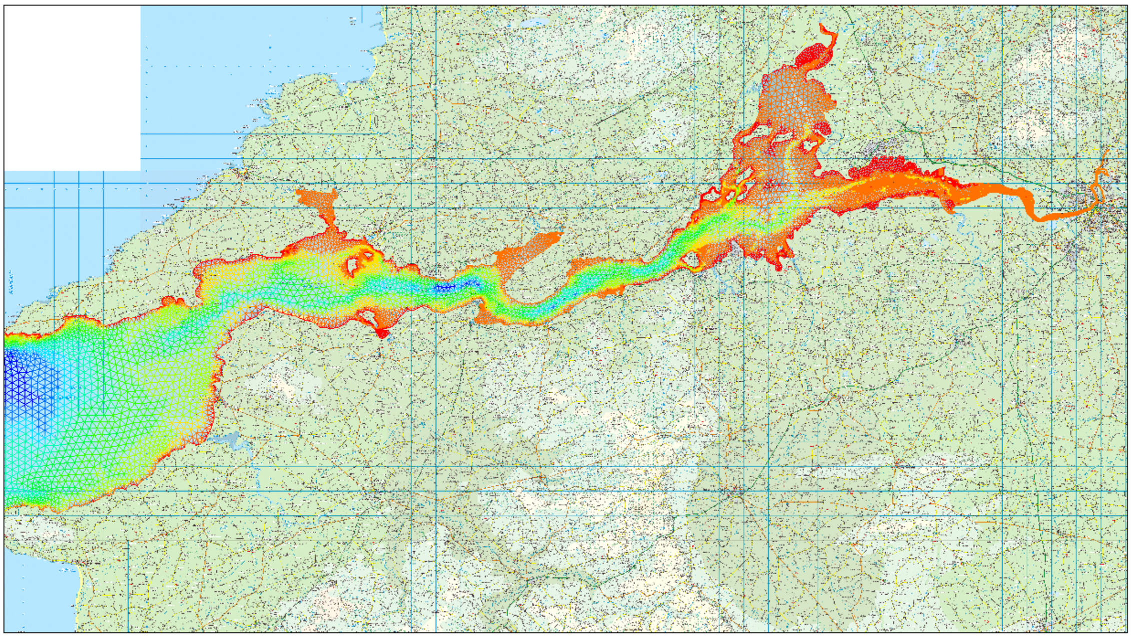


Figure 2-1: Shannon Estuary Model Domain.

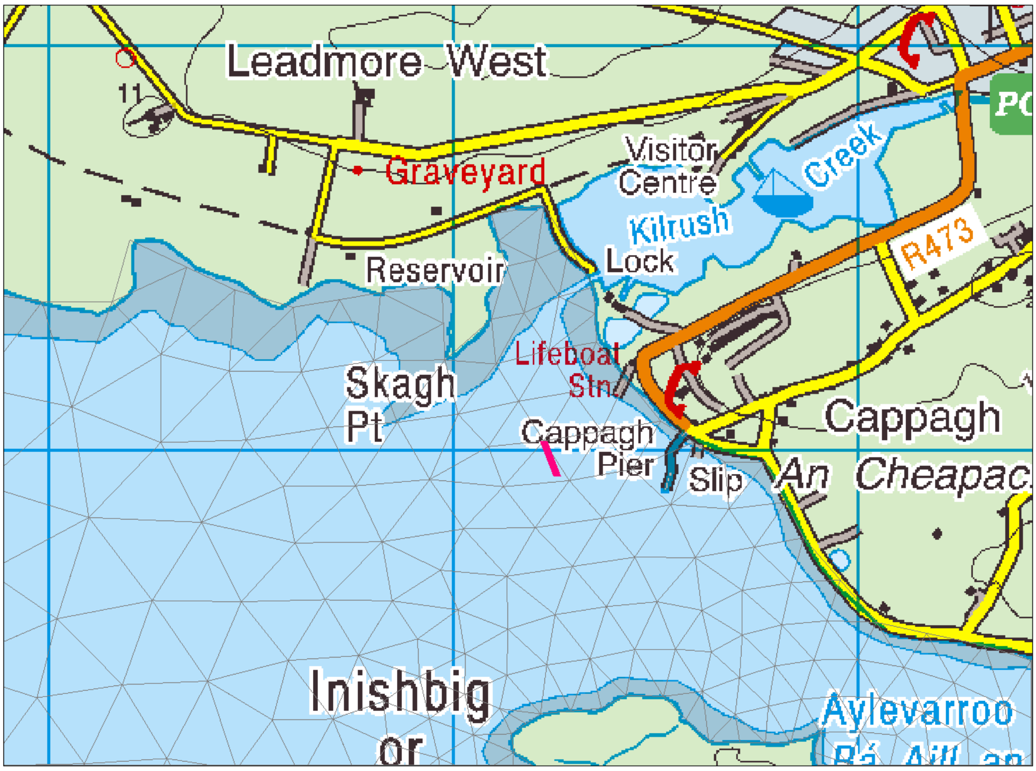
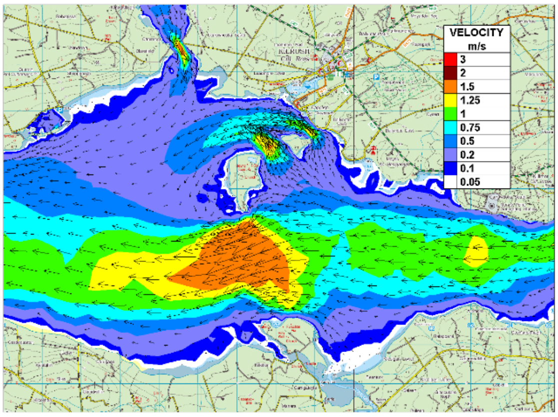
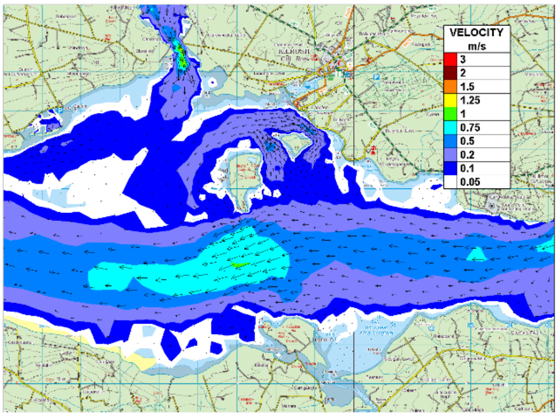


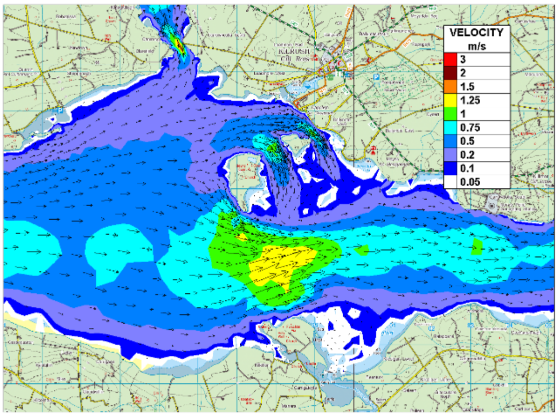
Figure 2-2: Location of dredge disposal via ploughing



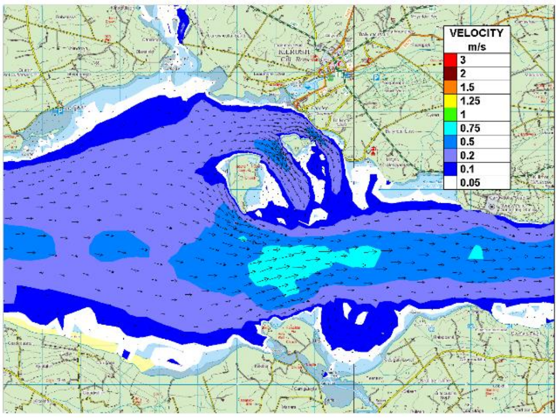
a) Mid-ebb



b) Low water level



c) Mid-flood



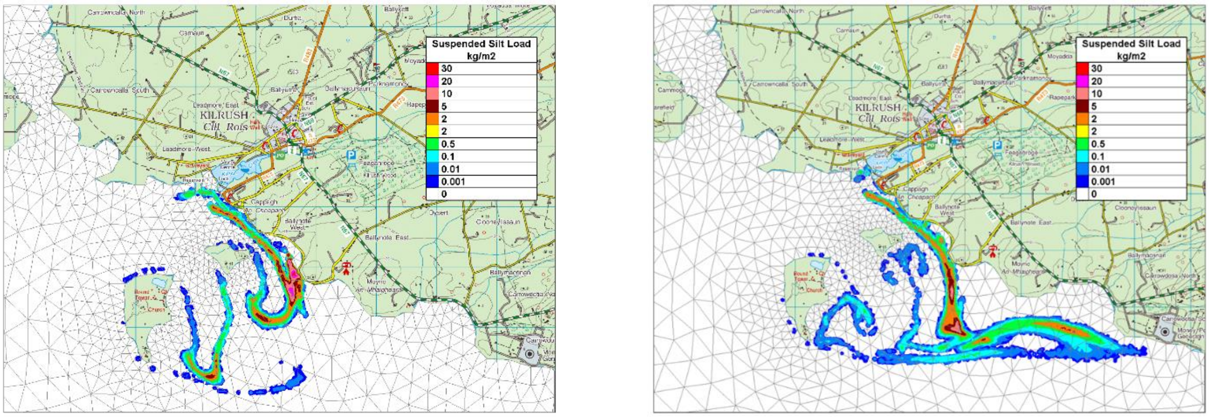
d) High water level

Figure 2-3: Modelled current velocity in the Shannon Estuary off Kilrush Creek at: a). Mid-ebb; b). Low water level; c). Mid-flood and d). High water level.

3. Sediment Transport and Deposition

Estimated ploughing rates range from 40 to 100 m³ per hour, depending on haul length, with operations beginning at the outermost point and progressing inshore as target depths are achieved. In the sediment transport modelling a very fine sand and silt is specified with the dredge material deposited evenly between E98220, N154020 to E98260, N153940. For the purposes of assessing the fate of the sediment a 12hour disposal period with a disposal rate of 100m^3 per hour (73.6kg silt per sec) was modelled with the sediment plume tracked for a further 24hours after the 12hour disposal period. These simulations were carried out for both spring and neap tides.

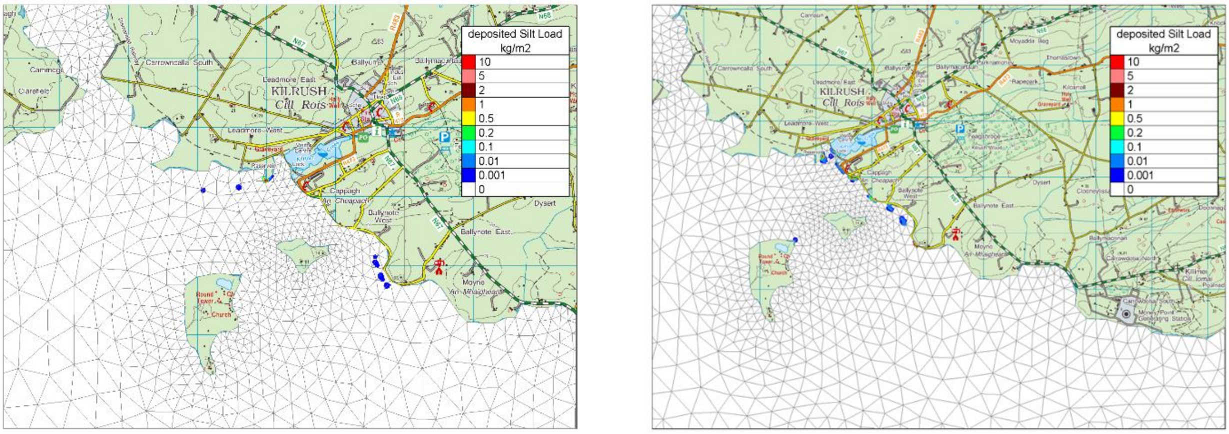
The proposed tonnage of dredging is 8,000 tonnes per campaign. The overall duration of the dredging activities will depend on the actual ploughing rate achieved in practice. Therefore, the sediment deposition after each dredging campaign is estimated to be approximately 2.5 times of that observed in the simulations. Due to the highest release rate and choice of finer particles, the sediment erosion and re-suspension rate at the disposal point is likely to be exaggerated by the model.



a) Neap tide b) Spring tide

Figure 3-1: Suspended silt at end of 12hr ploughing period (ploughing rate 100m^3 per hour): a) Neap Tide; b) Spring tide

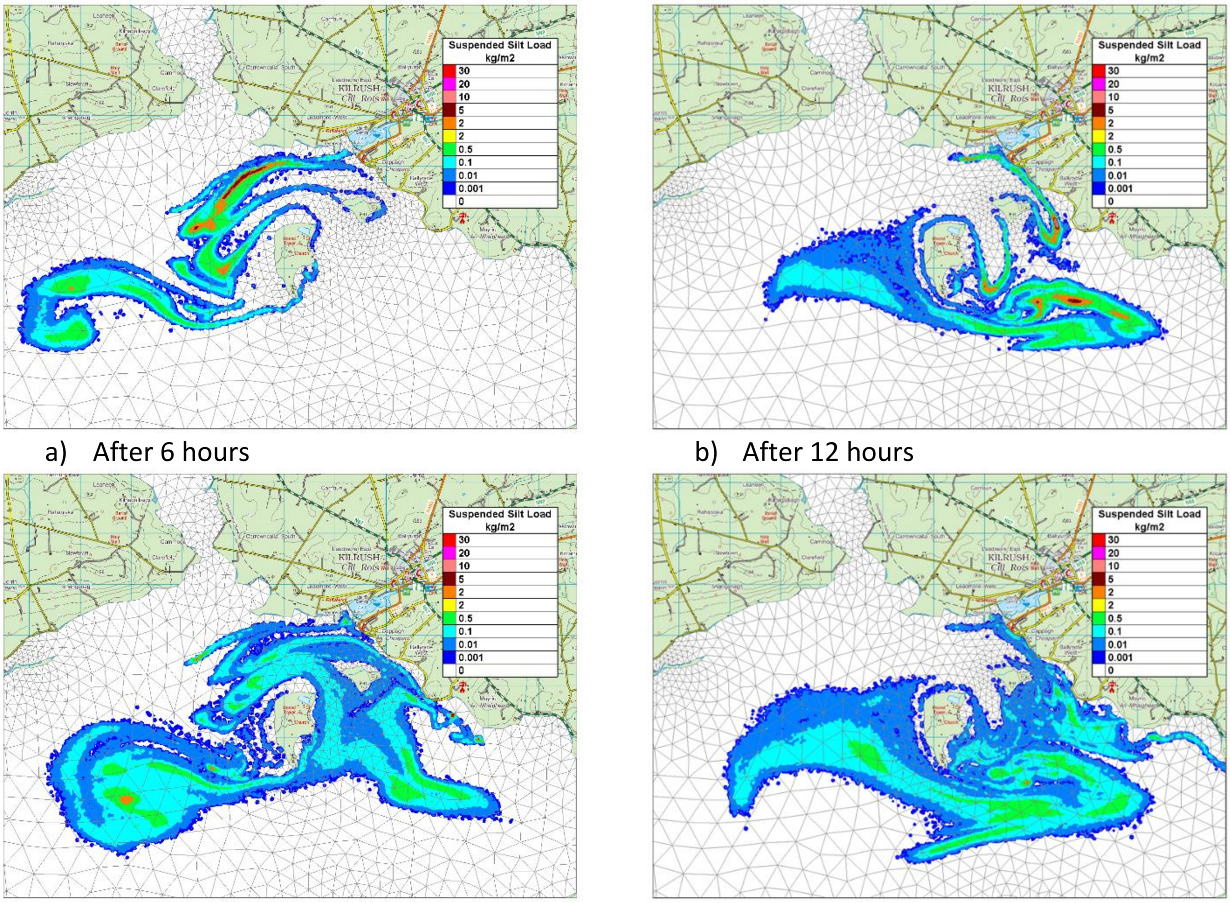
Figure 3-1 shows suspended sediment load in kg per m^2 at the end of 12 hour dredging for both neap and spring tide, during the dredging process under spring tide the suspended sediment was dispersed further than under neap tide.



a) Neap tide b) Spring tide

Figure 3-2: Deposited silts at end of 12hr ploughing period (ploughing rate 100m^3 per hour): a) Neap tide; b) Spring tide

Figure 3-2 shows the sediment deposition at the end of ploughing period under both neap and spring tide. Under both spring and neap tidal conditions, the spatial footprint of the deposited material is limited, sporadic and of a very low deposition load in the estuary.



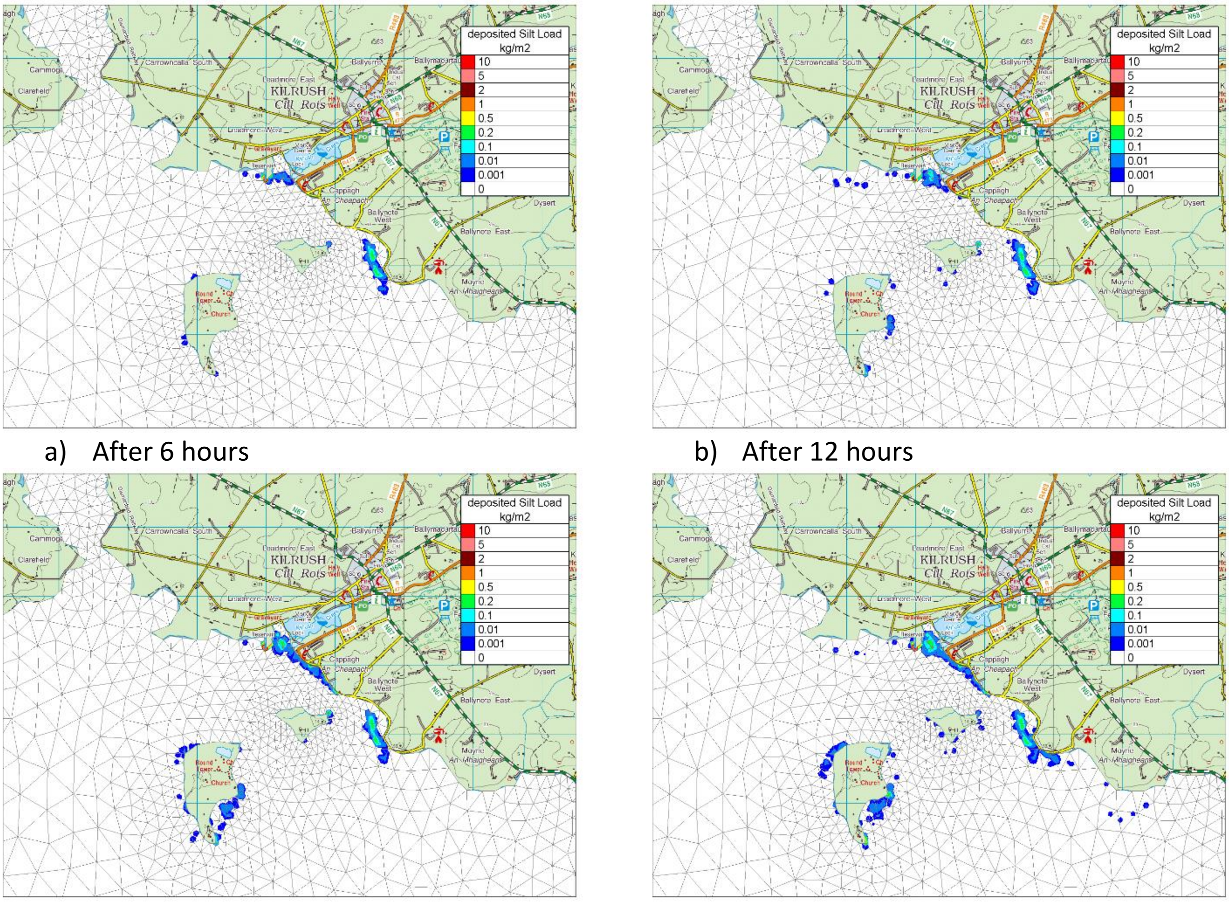
a) After 6 hours

b) After 12 hours

c) After 18 hours

d) After 24 hours

Figure 3-3: Suspended sediment over 24-hour period after neap tide ploughing (100m^3 per hour).



a) After 6 hours

b) After 12 hours

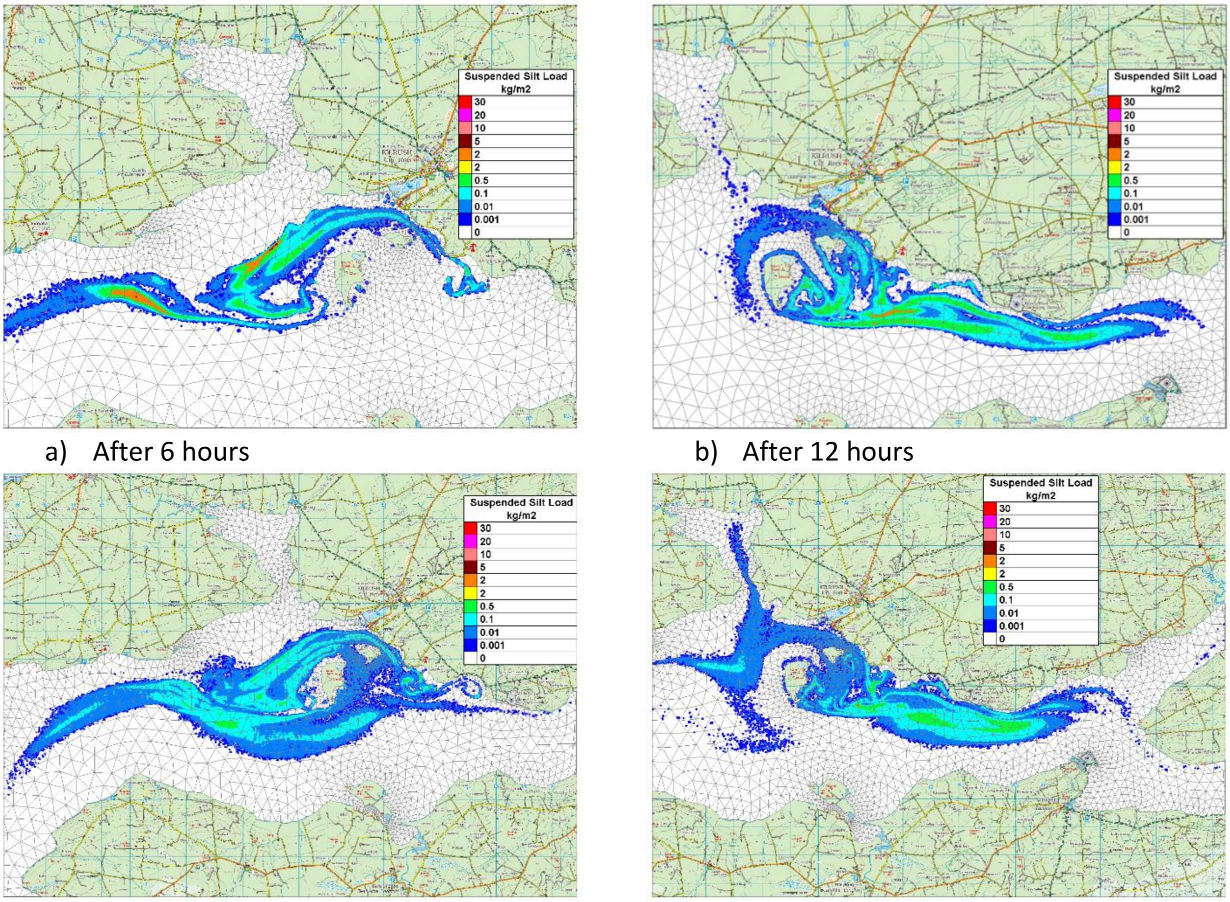
c) After 18 hours

d) After 24 hours

Figure 3-4: Deposition over 24-hour period after neap tide ploughing (100m^3 per hour)

Figure 3-3 and **Figure 3-4** show calculated suspended sediment load and deposited sediment load in kg per m^2 at 6hour intervals after a 12hour dredging activity under neap tide. These figures show reasonably good transport and dispersion of the sediment away from the site on both ebbing and flooding tides and widespread dispersion of the resulting suspended plume within 18hours of the dredging. Shoreline areas with a tendency for slight potential deposition from the dredging activity are back towards the creek channel itself and along the adjacent shoreline area to the east at Cappagh and Ballymote west (Aylevarroo Point) and also some deposition around Slattery Island. Most of the dredge material remains in suspension and will eventually disperse widely throughout the outer and middle estuary area. In general, deposition rates are below 0.2 kg/m^2 under neap tide dredging, corresponding to an estimated sediment depth of about 0.1 mm. However, localized small areas of higher deposition are observed at Skagh Point, with rates reaching up to 5 kg/m^2, equating to a sediment depth of approximately 2.8 mm. These values are based on a sediment density of 1800 kg/m^3, which is considered a reasonably conservative estimate for fine sediments used in the simulation. The sediment deposition after each dredging campaign is estimated to be about 2.5 times that observed in the simulation.

The maximum deposition is estimated to be approximately 35 mm following five planned dredging campaigns over an eight-year period.



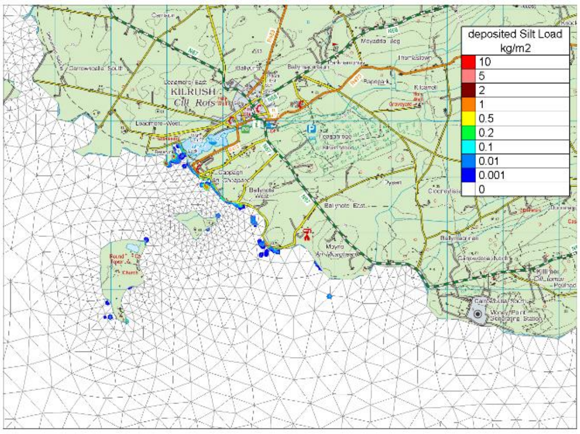
a) After 6 hours

b) After 12 hours

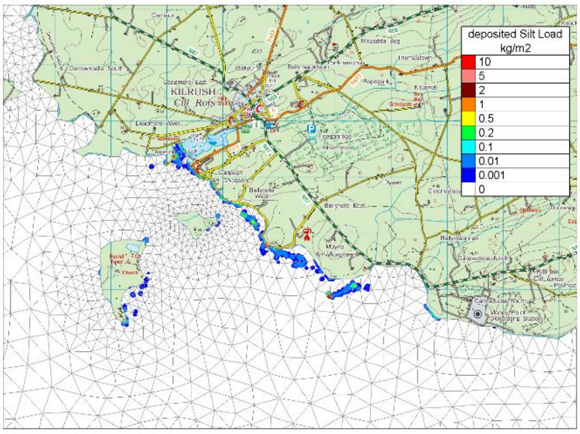
c) After 18 hours

d) After 24 hours

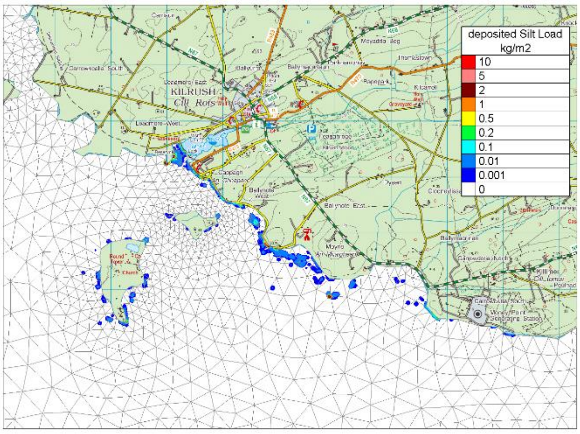
Figure 3-5: Suspended sediment over 24-hour period after spring tide ploughing (100m^3 per hour).



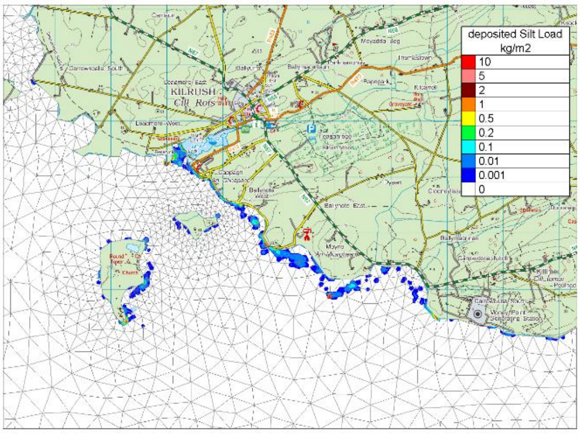
a) After 6 hours



b) After 12 hours



c) After 18 hours



d) After 24 hours

Figure 3-6: Deposition over 24-hour period after spring tide ploughing (100m^3 per hour)

Very similar dispersal patterns under the spring tide dredging are evident, refer to **Figure 3-5** and **Figure 3-6**, which present computed suspended sediment load and deposited sediment load in kg per m^2 at 6hour intervals after a 12 hour dredging under spring tide. The dispersal and transport are stronger with the plume being transported and dispersed more rapidly than the neap tides due to the stronger ebb and flood velocity magnitudes. Shoreline areas with a tendency for potential sediment deposition from this dredge option are back towards the creek channel itself and along the adjacent shoreline area to the east at Cappagh and Ballymote west, Aylevarroo Point, Moyne point and reaching Ballymacrinan Bay and also some deposition around Slattery Island. Like under neap tide condition, deposition rates are below 0.2 kg/m^2, corresponding to an estimated sediment depth of about 0.1 mm under spring tide dredging. However, localized areas of higher deposition are observed at Skagh Point, and head points of Aylevarroo Bay with rates reaching up to 5 kg/m^2, equating to a sediment depth of approximately 2.8 mm. The sediment deposition after each dredging campaign is estimated to be about 2.5 times that observed in the simulation as well. Most of the dredge material remains in suspension and will eventually disperse widely throughout the outer and middle estuary area at a quicker rate compared to neap tide.

4. Conclusions

The sediment transport modelling undertaken for the plough dredging disposal of very fine sand and silt demonstrates effective dispersion and transport of the dredged material under both neap and spring tidal conditions. The simulation, which modelled a 12-hour disposal period followed by a 24-hour tracking phase, indicates that most of the dredged sediment remains in suspension and is widely dispersed throughout the outer and middle estuary.

Under neap tide conditions, sediment is largely removed from the disposal site within 18 hours, with only minor deposition observed near the creek channel, Cappagh, Ballymote West (Aylevarroo Point), and Slattery Island with the maximum deposition is estimated to be approximately 35 mm following five planned dredging campaigns over an eight-year period. Spring tide conditions exhibit even stronger dispersion due to higher tidal velocities, with additional potential deposition areas including Moyne Point and Ballymacrinan Bay.

Overall, the modelling confirms that the plough disposal method results in minimal long-term accumulation at the disposal site, with widespread dispersion reducing the risk of significant localised environmental impact. However, some shoreline areas may experience minor sediment deposition, and these should be considered for targeted monitoring or mitigation if necessary.

5. References

AQUAFACT. 2013. Sediment Transport Study, Kilrush Marina, Co. Clare. Kilrush Marina.

Kilrush Maritime Ltd.

Appendix 2 - Kilrush, Co. Clare

Benthic Ecological Survey Report

Avery Fenton, Catriona McMahon

AQUAFACT Ref: (P17851)

November 2025

Client:	Kilrush Maritime Ltd.
Address:	Kilrush Marina,
	Kilrush,
	Co. Clare,
	Ireland
Reference no:	P00017851
Date of issue:	08/10/2025

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Tax Clearance Number:	559674

Report Approval Sheet

Client	Kilrush Maritime Ltd.
Report Title	Kilrush Benthic Ecological Survey Report
Job Number	P17851
Report Status	Final
Issue Date	November 2025

Rev	Status	Issue Date	Document File Name	Author (s)	Edits	Approved by:
1	Draft	30/09/2025	P17851 Kilrush Benthic Ecological Survey Report_Draftv1	A Fenton	C McMahon	A Long
2	Final	November 2025	P17851_Kilrush_Benthic_Ecological_Survey_Final	A Hearty	BD	E.McCormack

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List of Acronyms/Glossary

CD	Chart Datum
DaS	Dumping at Sea
MARA	Maritime Area Regulatory Authority
MUL	Maritime Usage Licence
SAC	Special Area of Conservation

1. Introduction

AQUAFACT (APEM Group) was commissioned by Kilrush Maritime Ltd. to prepare a Maritime Usage Licence (MUL) application and an accompanying Dumping at Sea (DaS) permit for maintenance dredging of the approach channel to Kilrush Marina. Kilrush Marina is located immediately south of Kilrush town in County Clare, within the sheltered waters of Kilrush Creek, within the Lower Shannon Estuary. The marina provides approximately 120 berths with a maximum vessel draft of 3 m and is protected by lock gates, which prevent direct tidal exchange with the estuary and reduces siltation within the marina basin itself. It serves a range of recreational and small commercial craft, supporting leisure boating, marine tourism, and associated waterfront businesses.

The seabed composition in the approach channel to Kilrush Marina is predominantly gravel and sand with a small muddy component. Historic studies relied on grab surveys for benthic community assessment due to high suspended sediment loading limiting visibility. Bathymetry data indicates that the approach channel is deepest directly in front of the lock gates to the marina (6 m C.D.), depth becomes more uniform and shallow in the remainder of the approach channel (0.8 – 2.5 m C.D.) and deepens towards the main estuary channel to 6 m C.D. Tidal influence is dominant, with semi-diurnal tides producing strong bidirectional flows. The area is exposed to moderate wind and wave action, though relatively sheltered within the Lower Shannon Estuary.

AQUAFACT undertook a benthic ecological survey in the approach channel to Kilrush Marina to inform MARA and the EPA's assessments of the environmental impacts of the maintenance dredging in the approach channel to Kilrush Marina for the required Maritime Usage Licence and Dumping at Sea permits. Station locations mark the start of DDV transects (**Figure 1.1**).

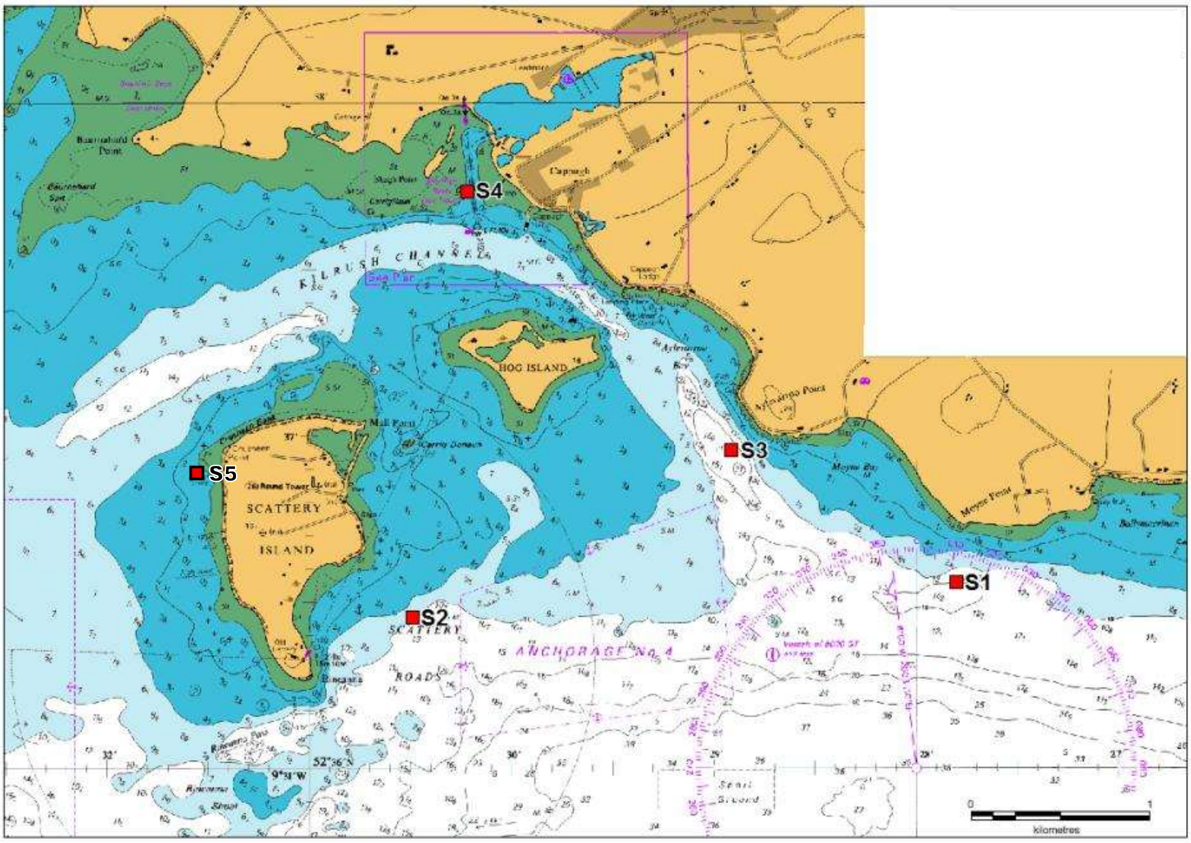

Figure 1.1: DDV station locations

Previous benthic studies undertaken by AQUAFACT in the approach channel to Kilrush Marina provided an important foundation for the planning and design of the current dropdown video surveys. These earlier investigations characterised the spatial distribution, species composition, and ecological condition of benthic communities in the basin. In doing so, the survey design maximised comparability with historic datasets, enabling an effective assessment of potential temporal changes of the benthic community within the approach channel to Kilrush Marina.

The objectives of the benthic ecological survey were to conduct a Drop-Down Video (DDV) survey as part of the Kilrush Marina MUL and DAS permit applications.

This benthic ecological report provides the results of this survey which took place on the 18th August 2025.

2. Materials & Methods

2.1 Video Survey (Drop-Down Video)

As the survey area is located within the Lower Shannon River SAC, there is potential for reef habitat within the survey area.

The video survey was carried out on the 18th of August 2025 from AQUAFACT 1 using the FiFish V6 Expert remotely-operated vehicle (ROV) system. The ROV was manually lowered via tether cable into the water and was piloted using a handheld controller and FiFish mobile application. The live footage was monitored.

At each location the ROV was lowered on vessel approach to the proposed sampling position. The ROV was then piloted over the point and along its transect line and no contact with the seabed occurred. Five DDV transects were carried out.

The start locations of each DDV survey are provided in **Table 2-1** and are displayed in **Figure 2-1.**

Table 2-1: Locations of Drop-Down Video stations.

Station	Latitude	Longitude
1	52.6096	-9.46399
2	52.6097	-9.5088
3	52.6163	-9.48247
4	52.6293	-9.50424
5	52.615265	-9.528037

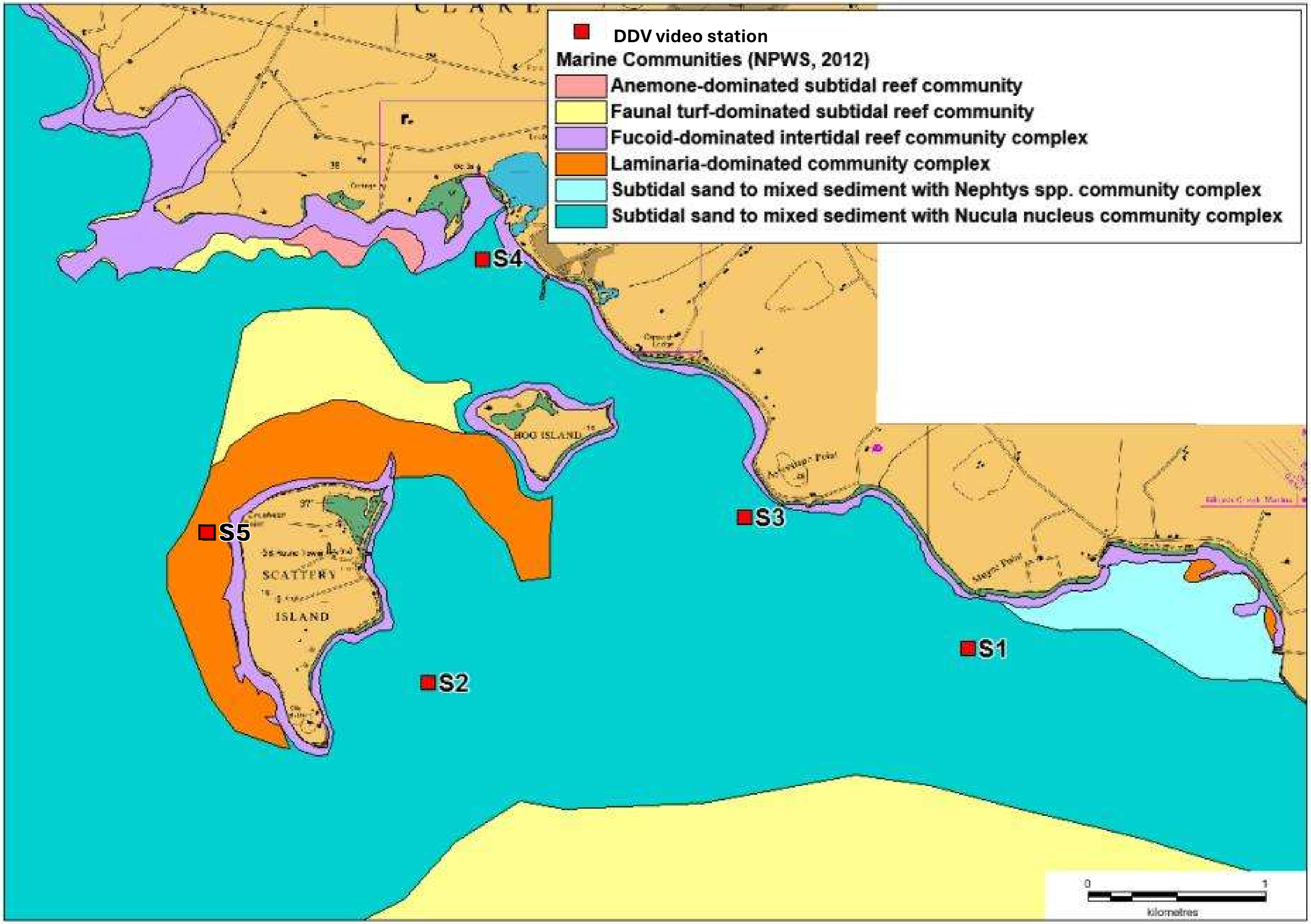

Figure 2-1: DDV station locations marked within the NPWS mapped marine communities of the Lower River Shannon SAC (002165). DDV transects began at marked point.

2.2 Data Analysis

2.2.1 Video & Image Stills Data

The video and stills data were analysed following the JNCC Guidance on Assigning Benthic biotopes using EUNIS or the Marine Habitat Classification of Britain and Ireland (Parry, 2019). However, statistical analyses are not applied to species identified from video and still images data as the species identification and number is qualitative. The video data provides a broader picture of the habitat while the image stills allow identification of smaller and less conspicuous species over smaller areas. The video and stills data capture different sections of the community and as a result they are analysed separately. Generally, for each species identified from the video or stills, both abundance and SACFOR is provided per video section or per still, but sometimes only presence/absence is used.

2.2.2 Assigning Biotopes (JNCC) & EUNIS Assemblage

After analysis, the data from the infauna identified are then matched with the broadscale habitats (EUNIS) data derived from particle size analysis and video/still data and a biotope is assigned according to the Marine Habitat Classification of Britain and Ireland (Parry, 2019). The biotope name assigned to data should accurately describes the physical environment as well as the biological community. The following steps are followed to assign biotope:

(i) Select physical zone for each sampling point based on depths, light, indicator species, geospatial maps (EMODnet Seabed Habitats Map Viewer).

(ii) Define substrate category (rock, coarse, sediment, missed sediment, sand and muddy sand, and mud and sandy mud). The four sediment categories depend on the relative proportions of mud, sand, and gravel as defined in Folk classification (Folk, 1954).

(iii) Check visual samples based on

- Notes logs.
- Raw data -video footage.
- Functional traits of species present giving an indication of the substrate type.

(iv) Select energy /mobility category for each sample.

For each station, the faunal communities are identified which is used to refine the description of the biotope. In the situation where there is any mismatch between the biological community and the habitat type, a number of approaches are taken to clearly indicate that the physical environment differs from the description of the biological community present (Parry, 2019)].

3. Results

3.1 Drop-Down Video

The approach channel to Kilrush Marina and surrounds is a turbid estuarine environment with strong currents and high suspended solid concentrations. As a result, visibility was often poor in the video footage. There were only a few images captured to assess the characteristics of the substrate and biotopes along the transects surveyed.

Images of the seabed were captured from the video footage recorded at each of the stations where DDV was deployed. Analysis of the epibenthic communities based on the video footage along with representative still images is presented below. Full video footage from each recording is available upon request. The photo stills captured from the video transects are poor in resolution due to very high turbidity during the survey. Only usable image stills are presented in this section.

The DDV survey provided sufficient visual details to determine the biotopes in the survey area (see **Table 3-1**). The biotope assigned throughout the stations varied. The biotope distribution is illustrated in Table 3-1**.**

Table 3-1: The biotope classifications (JNCC 2024) identified for each Drop-down video station.

Station	Biotope Code	Biotope Classification	EUNIS Code
DDV01	SS.SCS.CCS	Circalittoral coarse sediment	A5.14
DDV02	SS.SCS.CCS	Circalittoral coarse sediment	A5.14
DDV03	SS.SCS.CCS	Circalittoral coarse sediment	A5.14
DDV04	SS.SSa.IMuSa.ArelSa	*Arenicola marina* in infralittoral fine sand or muddy sand	A5.243
DDV05	IR.MIR.KR.Ldig.Bo	*Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders	A3.2112

Figure 3-1: Biotope from DDV survey within Kilrush Marina, Kilrush, Co. Clare

3.1.1 Station 1

Station 1 was composed of gravelly muddy sand substrate with drift red and green algae. Noticeable fauna included crabs (*Polybius depurator*), bryozoan colonies (*Alcyonidium diaphanum*), burrowing tube anemone (*Synarachnactis lloydii,* formerly *Cerianthus lloydii),* and various sponges and tunicates*.* Keel worms (*Spirobranchus* spp.) were also recorded on rock surfaces. Shells are scattered around the area and visible along the transect. The habitat type can be assigned to the JNCC biotope 'SS.SCS.CCS Circalittoral coarse sediment' (EUNIS code A5.14).

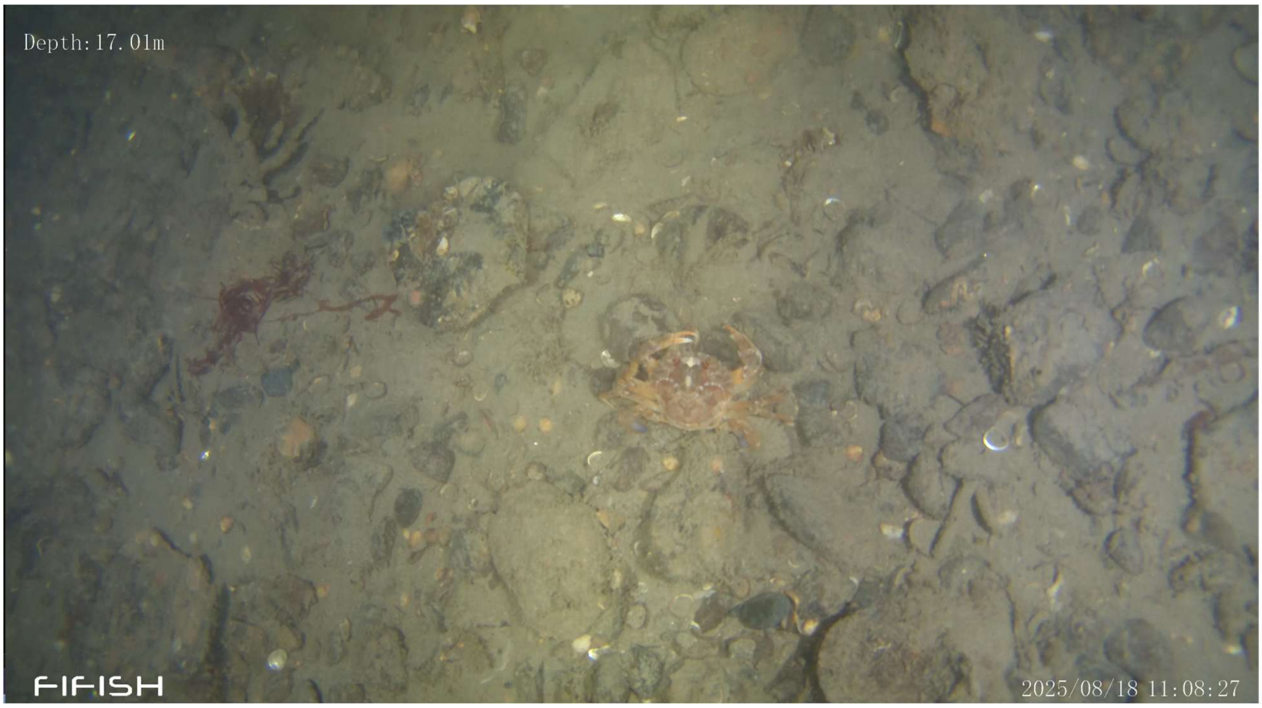

Figure 3.2: Station 1 - Muddy sandy gravel with red macroalgae and *Polybius depurator* (Harbour crab). Hydroids and tunicates present.

Figure 3-2: Station 1 - Muddy gravelly substrate with hydroids and *Suberites* spp. Drift green and red macroalgae present.

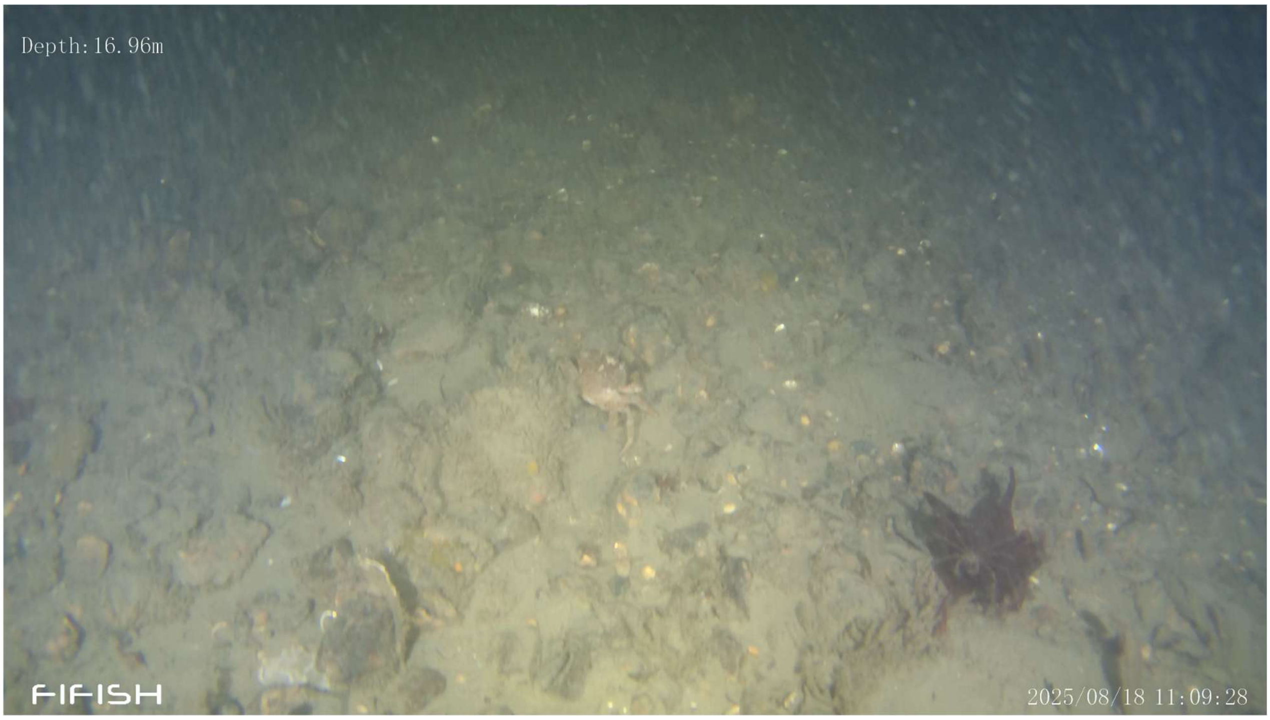

Figure 3-3: Station 1 - Gravel substrate with overlying silt. Red macroalgae and *P. depurator* (harbour crab) present, hydroids established on cobbles and substrate.

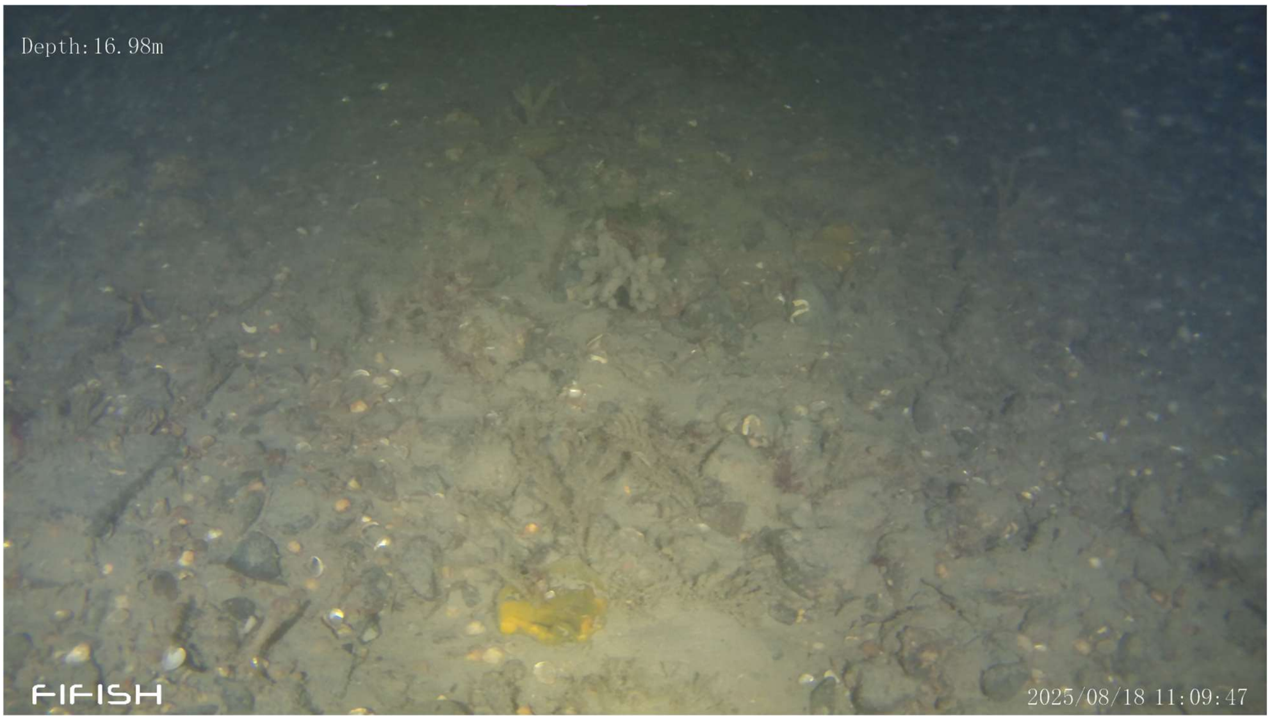

Figure 3-4: Station 1 - Rocky gravel substrate with overlying silt and scattered shells. Hydroids established along transect, keel worms noted on cobbles. *Alcyonidium diaphanum* bryozoan colonies and various sponges and tunicates observed.

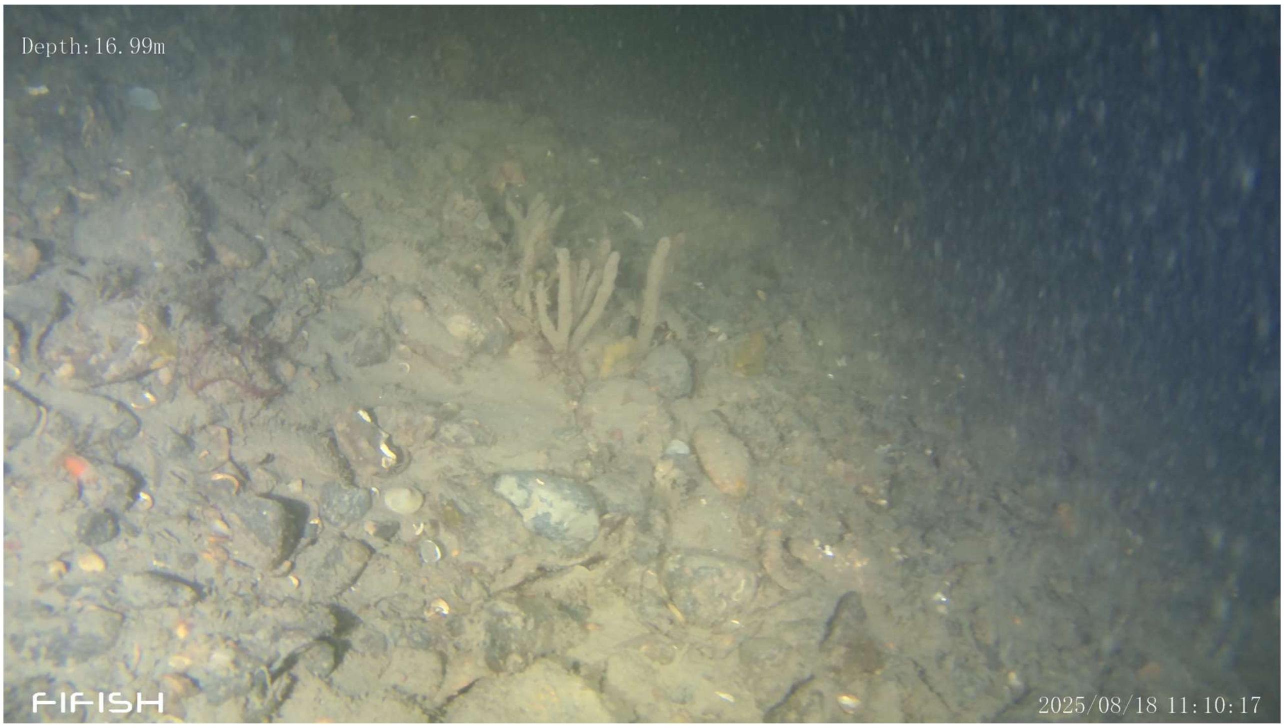

Figure 3.6: Station 1 - Cobble substrate covered in silt with scattered shells and marine litter, keel worms resident on some cobbles. Drift red and green macroalgae and hydroids,. *Alcyonidium diaphanum* bryozoans in view.

Figure 3.7: Station 1 - Cobble substrate with overlying silt and shell debris and red macroalgae. Various sponges, tunicates, and hydroids in view.

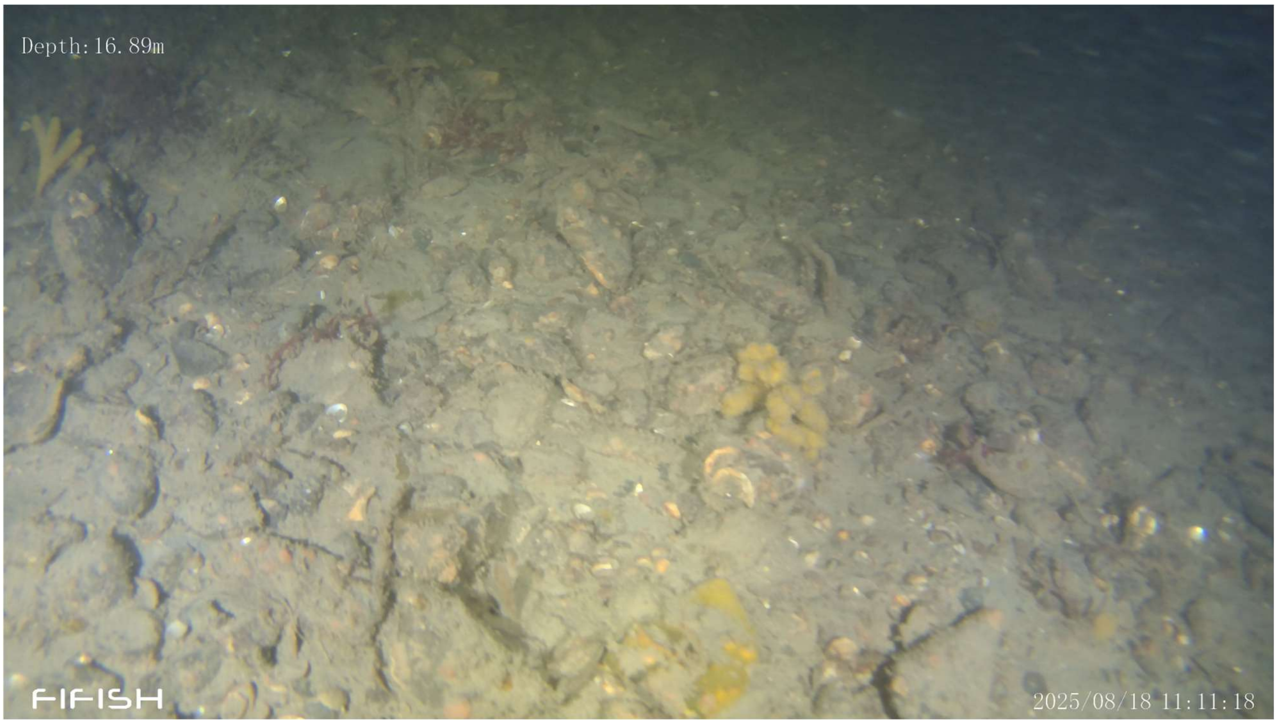

Figure 3.8: Station 1 - Cobble substrate with overlying silt and various shells. Resident and drift green and red macroalgae. *Alcyonium digitatum* (Dead man's fingers) and various sponges.

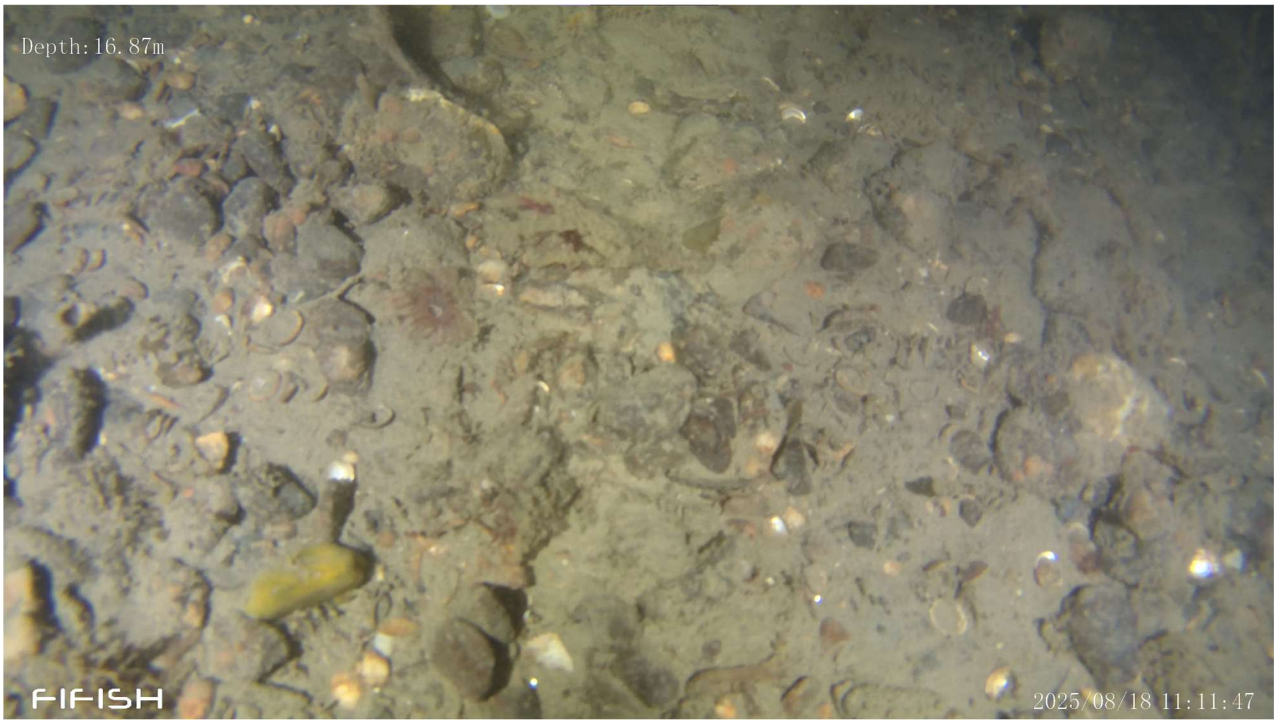

Figure 3.9: Station 1 - Cobble substrate with silt layer. *Synarachnactis lloydii* (burrowing anemone) and sponges present.

Figure 3.10: Station 1 – Silt covered gravel substrate. *Polybius depurator* (harbour crab) and sponges present, as well as marine litter colonised by keel worms. Drift red macroalgae throughout area.

3.1.2 Station 2

Station 2 was composed of large cobbles and boulders in gravelly sand substrate with drift red and green algae. Noticeable fauna included a squat lobster, harbour crabs (*Polybius depurator*), tunicates (*Dendrodoa grossularia*) and hydroids (**Figure 3.** to **Figure 3.**). Marine litter was noted at this station. The habitat type can be assigned to the JNCC biotope 'SS.SCS.CCS Circalittoral coarse sediment' (EUNIS code A5.14).

Figure 3.11: Station 2 - Sandy shell-rich substrate with cobbles and boulders. Sponges and *Dendrodoa grossularia*. resident on boulders, and a squat lobster .

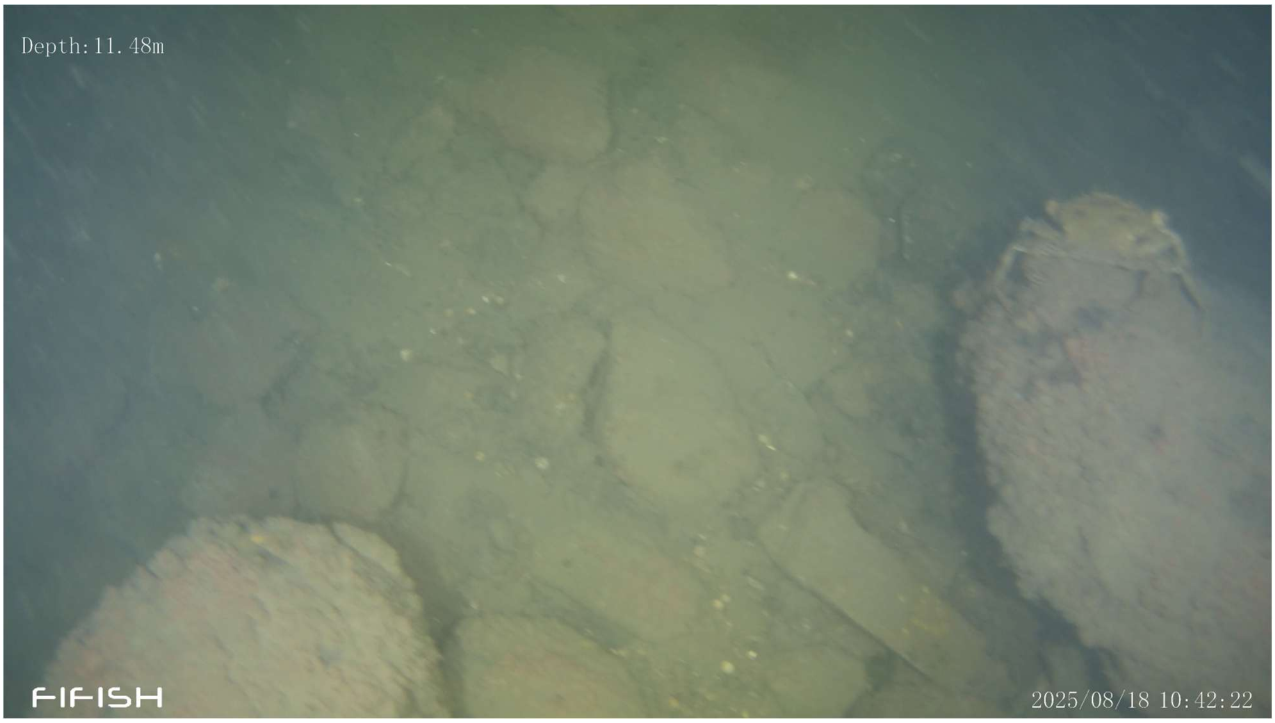

Figure 3.12: Station 2 - Large boulders and cobbles in gravelly sand. Boulders covered in *Dendrodoa grossularia*, hydroids on some cobbles. Harbour crab (*Polybius depurator*) on boulder.

Figure 3.13: Station 2 - Cobbles on gravelly sand. White sea urchin (*Echinus esculentus*) in view.

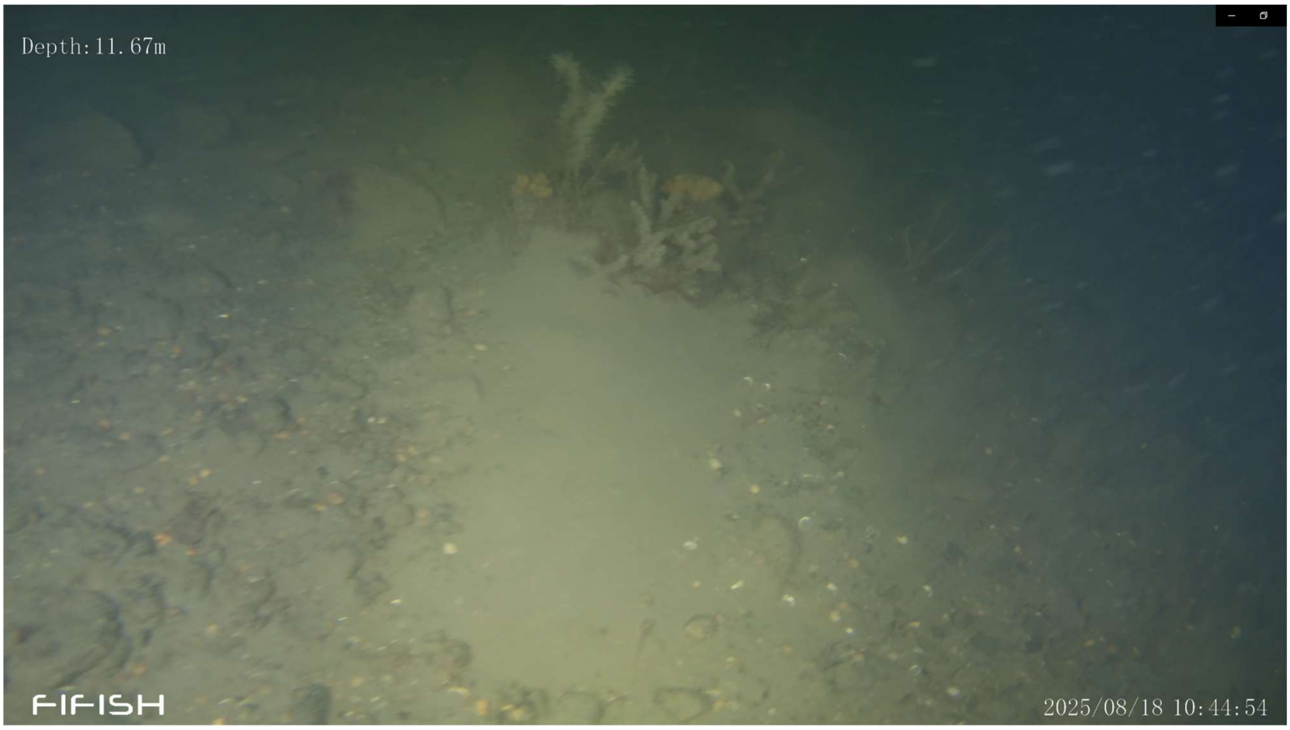

Figure 3.14: Station 2 - Patch of soft silty substrate among gravelly sand. Macroalgae near soft sediment patch hosting sponges and hydroids.

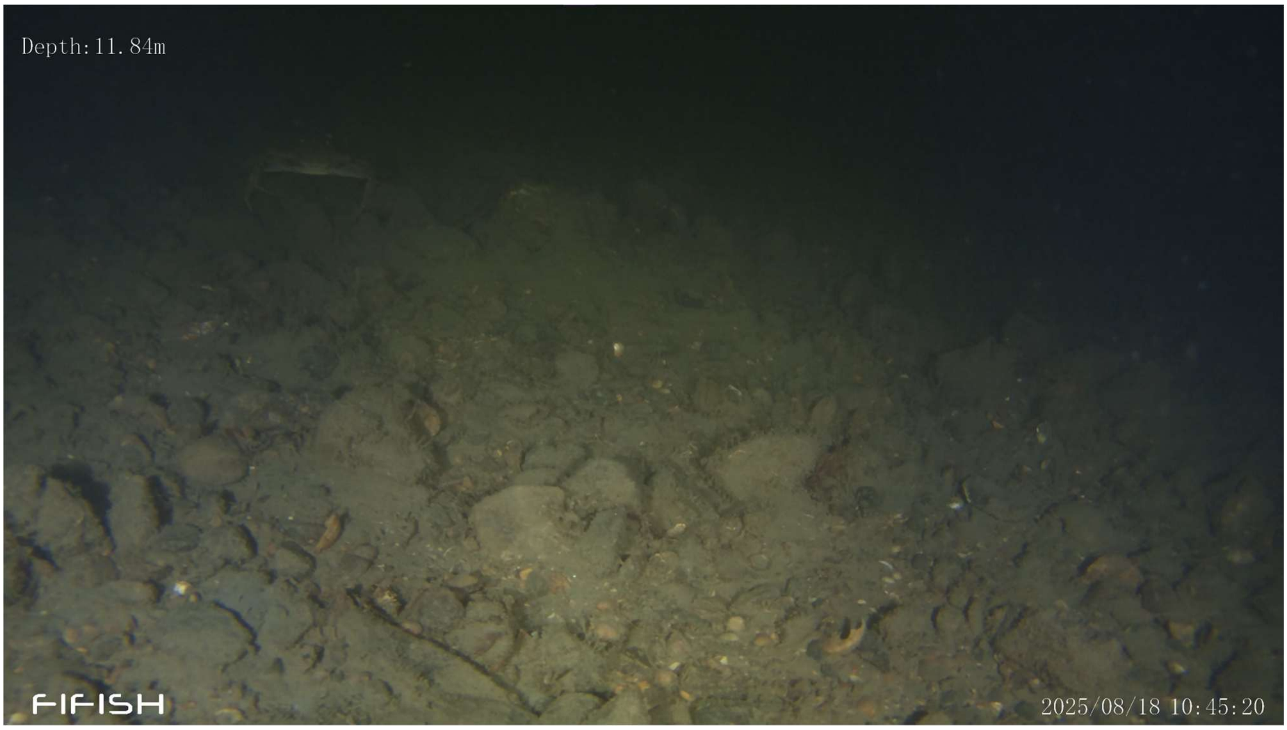

Figure 3.15: Station 2 - Rocky substrate covered in silt with shell debris. Cobbles covered in hydroids and a harbour crab noted (*Polybius depurator*).

Figure 3.16: Station 2 - Silt covered gravelly sand. Marine litter in view.

3.1.3 Station 3

Station 3 was composed of rocky gravelly sandy substrate with drift green and red macroalgae along the transect. Noticeable fauna included harbour crabs (*Polybius depurator*), a velvet swimming crab (*Necora puber*), and a prawn. (**Figure 3.17** to **Figure 3.20**). The habitat type can be assigned to the JNCC biotope 'SS.SCS.CCS Circalittoral coarse sediment' (EUNIS code A5.14). **Figure 3.18** is characteristic of a geogenic reef habitat described as 'Anemone-dominated subtidal reef community' by the NPWS (see **Figure 2.1**).

Figure 3.17: Station 3 - Large boulders and cobbles on gravelly substrate. *Necora puber* (velvet swimming crab) in defensive stance. Hydroids and drift red macroalgae in view.

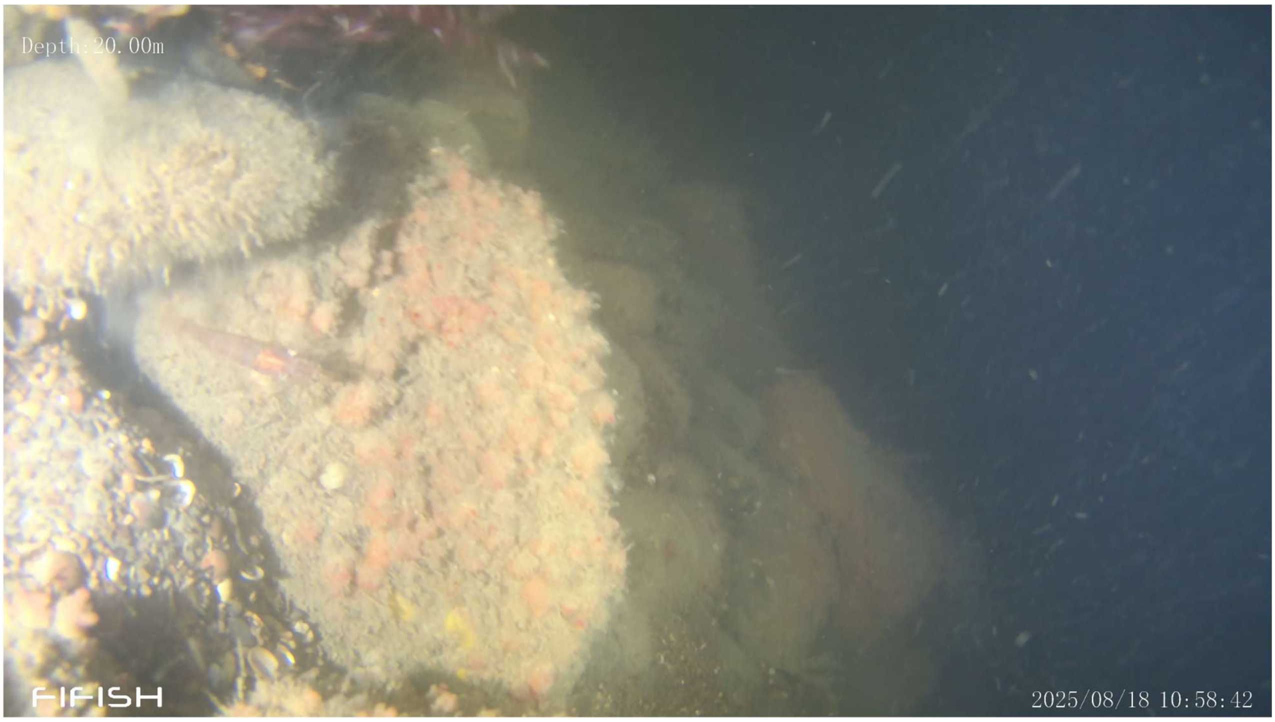

Figure 3.18: Station 3 – Geogenic reef with boulders encrusted with *Dendrodoa grossularia* and hydroids. Red macroalgae in view. A prawn visible on one of the boulders.

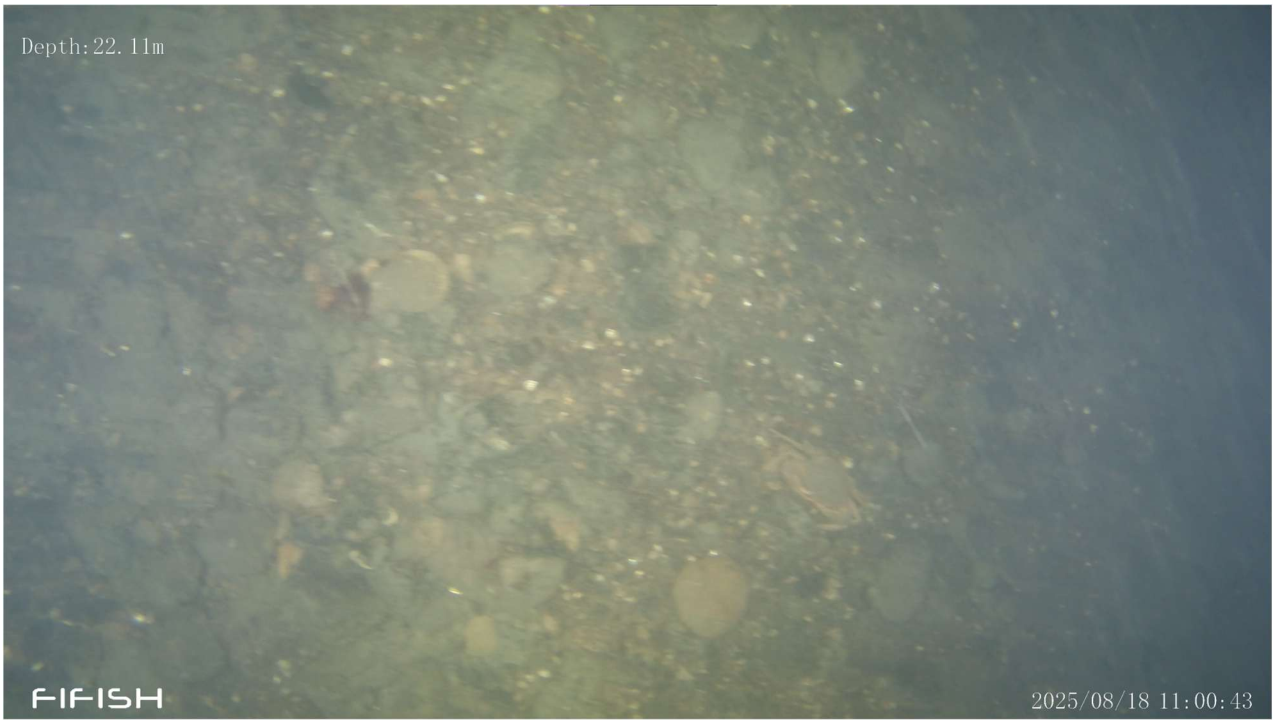

Figure 3.19: Station 3 - Cobbly gravelly substrate with drift red macroalgae. A harbour crab (*Polybius depurator*) is in view.

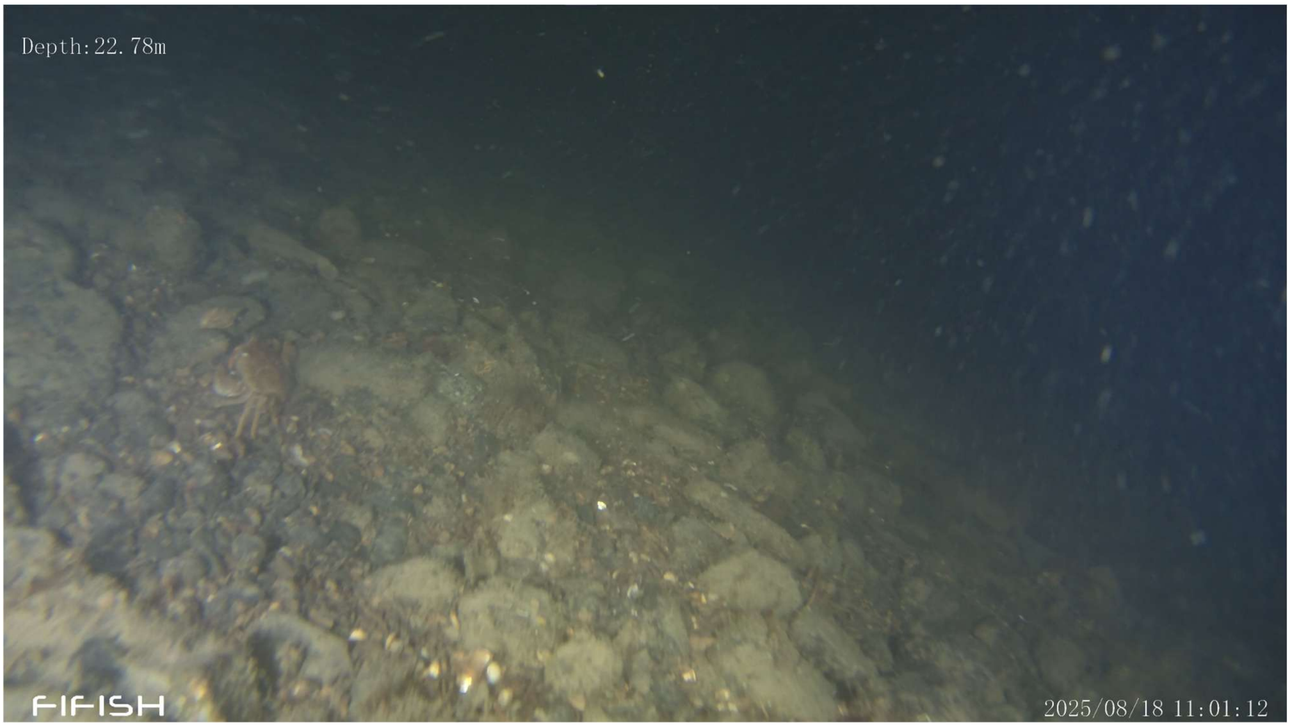

Figure 3.20: Station 3 - Cobbly gravelly substrate. A harbour crab (*Polybius depurator*) is in view.

3.1.4 Station 4

Station 4 was composed of muddy sand substrate. Noticeable fauna included fish (Gobidae), lugworm casts (*Arenicola* spp.*)*, and hermit crabs (Paguridae) (**Figure 3.21** to **Figure 3.23**). The habitat type can be assigned to the JNCC biotope 'SS.SSa.IMuSa.ArelSa *Arenicola marina* in infralittoral fine sand or muddy sand' (EUNIS code A5.243).

Figure 3.21: Station 4 - Muddy sand substrate with evidence of infaunal activity – openings of burrows in sediment surface and disturbed sediment. Fish (Gobidae) along seabed.

Figure 3.22: Station 4 - Muddy sand substrate with burrow holes, disturbed sediment, and lugworm (*Arenicola* spp.) casts. Hermit crab (Paguridae) near lugworm casts.

Figure 3.23: Station 4 - Muddy sand substrate with attached macroalgae. Evidence of disturbed sediment and burrow holes.

3.1.5 Station 5

Station 5 was composed of boulder substrate with well-established macroalgal communities growing in a kelp forest. Fish and evidence of gastropod grazing were evidence of macrofaunal habitation. *Laminaria digitata* dominated the kelp forest and hosted various red, green, and brown macroalgae (**Figure 3.24** to **Figure 3.26**). The habitat type can be assigned to the JNCC 'IR.MIR.KR.Ldig.Bo *Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders' (EUNIS code A3.2112).

Figure 3.24: Station 5 - Kelp forest with distinguishable *Palmaria palmata.*

Figure 3.25: Station 5 - *Laminaria digitata* in kelp forest. Evidence of gastropod grazing on frond.

Figure 3.26: Station 5 – Unidentifiable fish in kelp (*L. digitata*) forest.

4. Discussion

Sediment types were classified as a mix of 'Gravelly Muddy Sand,' 'Gravel,' and 'Muddy Sandy Gravel' according to Folk (1954). Previous analysis of the benthic ecology categorized the infaunal community at Kilrush as 'subtidal sand to mixed sediment with *Nucula nucleus* community complex' as per NPWS classification of community types for stations 1-4 and 'Laminaria-dominated community complex' at Station 5. Visual assessment of the sediment during the 2025 DDV survey confirmed sediment conditions remained unchanged, with the inference that the infaunal community remained consistent within. Historic surveys found extreme variability in visibility during DDV survey attempts, thus epibenthic communities were not previously categorised.

Sediment and epibenthic classification analysis of the DDV recordings and stills provided sufficient evidence to assign JNCC biotope classifications to all the stations. The benthic environment surveyed at Stations 1-3 is consistent with the JNCC biotope 'SS.SCS.CCS Circalittoral coarse sediment'. Station 4 is classified with the JNCC biotope 'SS.SSa.IMuSa.ArelSa *Arenicola marina* in infralittoral fine sand or muddy sand' and Station 5 as 'IR.MIR.KR.Ldig.Bo *Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders'.

The benthic environment of the area is characterised by medium to high-diversity assemblages. The video transects suggest communities resilient to disruption and siltation-tolerant species such as *Arenicola* spp., *Synarachnactis lloydii and Laminaria* spp. Habitats are broadly classified as circalittoral coarse sediments to more specialized infaunal and macrophyte-dominant communities under the EUNIS classification.

A range of potential impacts on benthic biodiversity have been identified which may occur during dredging campaigns. A sensitivity assessment is presented for biotope identified from the video transects at Stations 4 & 5 (see **Table 4-1**). Sensitivity assessment for Stations 1-3 is not distinguishable under the JNCC biotope assigned, though it is apparent from video footage there is considerable natural siltation throughout the area. Any additional siltation as a result of dredging would have minimal impact on the benthos at Stations 1-3. The biotope SS.SSa.IMuSa.ArelSa identified at station 4 was found to be either not sensitive or have low sensitivity to all identified likely pressures. The IR.MIR.KR.Ldig.Bo identified at station 5 has low to medium sensitivity to all likely pressures from maintenance dredging. Note that sediment transport modelling showed that deposition around Scattery Island is minimal so the IR.MIR.KR.Ldig.Bo biotope is unlikely to be impacted by the maintenance dredging campaign or cumulatively over all dredging campaigns combined.

Table 4-1: Sensitivity Assessment of Biotopes based on potential impacts from dredging.

Sensitivity of biotopes to identified likely pressures	Biotopes	
	SS.SSa.IMuSa.ArelSa	IR.MIR.KR.Ldig.Bo
Physical – Smothering & siltation Light siltation (<5cm)	Not sensitive	Low
Physical – Smothering & siltation rate changes (light <5cm)	Not sensitive	Low
Physical – Smothering & siltation rate changes (heavy >5cm)	Low	Medium
Changes in suspended solids (water clarity)	Not sensitive	Low
Abrasion / disturbance of the surface of the substratum or seabed	Not sensitive	Medium
Penetration or disturbance of the substratum subsurface	Low	Medium
Habitat structure changes - removal of substratum (extraction)	Medium	Medium

Dredging operations cause direct physical removal of benthic habitats and fauna within the dredging footprint. Environmental dredging methods are known to reduce but do not eliminate effects. The rate of benthic recovery may vary depending on sediment type and community structure.

Physical – Smothering & siltation - Light siltation (up to 5cm fine material deposit in a single discrete event)

Arenicola marina is a sub-surface deposit feeder that derives the sediment it ingests from the surface, rapidly reworking and mixing sediment. The biotope SS.SSa.IMuSa.ArelSa is by default a high deposition environment and key species therein are highly resistant to siltation and considered 'Not sensitive'. Fluctuations in sedimentation have been shown to have a higher impact on the infaunal community, however juveniles of the species are capable of leaving the immediate vicinity with the tide and settling in more suitable environments (Reise et al., 2001).

Deposition of 5cm of fine material in a single event is unlikely to result in significant mortality before sediments are removed through current and wave action. Resistance to this pressure may vary with tidal state and life stage of macroalgae but is overall classed as having 'Medium' resistance to smothering and siltation. Boulders further protect from siltation by projecting established macroalgal communities above the sediment surface leading to a sensitivity of 'Low' for this biotope.

Physical – Smothering & siltation rate Heavy siltation (up to 30cm fine material deposit in a single discrete event)

Adult *Arenicola marina* may be able to resists smothering by up to 30cm of sediment in a single discrete event. Based on sedimentation rates in the area it is unlikely that an event leading to this level of sedimentation will occur leading to the conclusion of 'Low' sensitivity for the biotope SS.SSa.IMuSa.ArelSa.

Biotope IR.MIR.KR.Ldig.Bo has an overall sensitivity of 'Medium' to heavy siltation, referring to a deposition of over 30cm a single event. Understory algae and germlings are most at risk during a heavy siltation or smothering event. Site-specific hydrodynamic conditions are critical to assessing localized impact of this pressure, with areas of higher tidal influence, such as that found at Station 5, experiencing reduced risk of heavy smothering occurrence.

Changes in suspended solids (water clarity)

The biotope SS.SSa.IMuSa.ArelSa occurs in low energy environments with relatively high siltation and are by default resistant to changes in water clarity. Storm activity or runoff have high seasonal variability which are easily withstood by *Arenicola marina* and characteristic species within the environment, leading to a 'High' resistance to this pressure and an overall classification of 'Not sensitive' for the biotope.

Reductions in suspended solids have been shown to have minimal impact on the core communities within IR.MIR.KR.Ldig.Bo, with primary impact on filter and deposit feeders. Overall sensitivity to increased suspended solids in the water column is 'Low'. Depth habitability is the greatest limiting factor of kelp and *Laminarian* resistance to increased turbidity and reduced light availability. Localized hydrodynamic conditions limit likelihood of increased suspended solids occurring at this location.

Abrasion / disturbance of the surface of the substratum or seabed, Penetration or disturbance of the substratum subsurface.

Abrasion and disturbance of the sediment surface in this area may be influenced by trampling during low tide, or any physical activities (e.g. dredging, anchors) during high tide. *Arenicola marina* and other deep burrowing species characteristic of biotope SS.SSa.IMuSa.ArelSa have been observed in highly abraded and disturbed areas with little impact on the communities (Rees 1978). Overall this biotope is considered 'Not sensitive' to this type of physical disturbance.

Most macroalgae are not physically robust to physical abrasion and damage, particularly in the case of large branching alga such as fucoids (Pinn & Rodgers, 2005). Knock-on effects of reduced canopy on typically protected understory have also been observed (Fletcher & Frid, 1996a, 1996b). Other characterizing species within the area may be most impacted by long term abrasion rather than discrete disruptive events. Resistance of the biotope IR.MIR.KR.Ldig.Bo to abrasion is classed as 'Low' for these reasons, with a 'Medium' resilience and overall sensitivity of 'Medium'.

Penetration or disturbance of the substratum subsurface

Multiple studies on *Arenicola marina* and various deep-burrowers characteristic of biotope SS.SSa.IMuSa.ArelSa have shown extreme resistance and quick rebound following major sediment penetration and disturbance events (Mendonca *et al*. 2008; Rees 1978 cited in Hiscock *et al*. 2002; Fowler 1999). Primary destruction to lugworm habitats were measured after specific *Arenicola marina* dredging (Beukema 1995; Cryer *et al*. 1987; Fowler 1999), which is not currently planned for the Kilrush area. Population rebound is partially a function of initial population density, but overall this biotope has been assessed to have a 'Low' sensitivity to substratum subsurface penetration or disturbance.

Disturbance that leads to movement and overturning of boulders is a key factor in structuring the community, determining species richness (Sousa, 1979), as well as species numbers underneath boulders (McGuiness, 1987). Single events resulting in boulder overturn is likely to alter species composition producing a biotope sensitivity of 'Medium' in IR.MIR.KR.Ldig.Bo environments. Boulders that are rarely over-turned host communities with longer lifespans, which is consistent with the communities observed around Station 5, indicating low boulder disturbance in recent years.

Habitat structure changes - removal of substratum (extraction)

Extraction of sediment to a depth of 30cm would remove the community within the affected area, though this would be naturally mitigated in areas where soft sediments and substratum persist to depth and bedrock is not reached. Sensitivity of SS.SSa.IMuSa.ArelSa is assessed at 'Medium'.

Within the biotope IR.MIR.KR.Ldig.Bo a sensitivity of 'Medium' is assigned, as removal of boulders would defacto result in loss of communities within the habitat. However no dredging work is planned to take place in the mapped area for this biotope and so it will not be impacted.

5. Conclusion

The DDV survey undertaken in 2025 confirms that sediment composition and associated benthic communities in the project area remain broadly consistent with those described in previous surveys, with no evidence of substantial shifts in habitat structure or community type. Stations 1–3 were characterised as circalittoral coarse sediments with naturally high siltation, while Stations 4 and 5 supported more distinct biotopes: SS.SSa.IMuSa.ArelSa (*Arenicola*-dominated infralittoral muddy sand) and IR.MIR.KR.Ldig.Bo (*Laminaria digitata* and under-boulder fauna on the sublittoral fringe), respectively. These communities are diverse, resilient to disturbance, and largely composed of silt-tolerant species.

Sensitivity assessment indicates that the SS.SSa.IMuSa.ArelSa biotope is not sensitive or of low sensitivity to the majority of dredging-related pressures, reflecting its natural adaptation to deposition and physical disturbance. The IR.MIR.KR.Ldig.Bo biotope is of slightly greater sensitivity, particularly in relation to smothering, abrasion, and substratum disturbance, but potential effects are expected to be minor due to the limited extent of this habitat within the Zone of Influence and the low predicted levels of sediment deposition around Scattery Island.

Overall, the benthic habitats within the dredge and disposal areas are assessed as having a low risk of significant long-term impact from the proposed maintenance dredging. Direct removal of sediments and associated fauna within the dredge footprint will occur, but recovery is expected to be rapid given the community composition and prevailing hydrodynamic conditions. Sensitive biotopes at Stations 4 and 5 are unlikely to experience significant adverse effects, either directly or cumulatively, due to the spatially limited footprint of the works and natural resilience of the habitats present.

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Appendix 3 - Maintenance Dredging Activity Kilrush Marina Intertidal Survey – Baseline Report

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November 2025

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Report Approval Sheet

Client	**Kilrush Maritime Ltd.**
Report Title	**Kilrush Intertidal Survey – Baseline Report**
Job Number	**P17581**
Report Status	**Final**
Issue Date	**November 2025**

Rev	Status	Issue Date	Document File Name	Author (s)	Edits	Approved by:
1	Draft	10/10/2025	P17581_Kilrush_Intertidal_Report_Draft_v1	Alanna Mitchell, Brendan Dickerson		E. McCormack
2	Final	November 2025	P17581_Kilrush_Intertidal_Final	Alanna Mitchell, Brendan Dickerson	Brendan Dickerson	E. McCormack

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Appendix 1: Sediment Transport Modelling Study of Kilrush Marina (appendum)

List of Acronyms/Glossary

DaS	Dumping at Sea
SAC	Special Area of Conservation
QL	Quadrat lower shore
QM	Quadrat mid shore
QU	Quadrat upper shore

1. Background

Kilrush Maritime Ltd carried out a dredging operation on the Kilrush Marina approach in 2017 under Dumping at Sea (DaS) Permit No. S0020-01. AQUAFACT International Services Ltd. (part of the APEM Group) was contracted to determine the impacts of the dredging operation on the receiving environment. As part of this assessment, both subtidal and intertidal sampling and analysis were carried out along with the development of a sediment transport model. The objective was to evaluate the potential impacts of the dredging of Kilrush Creek on habitats within the receiving environment, namely those within the Lower River Shannon SAC (002165) and River Shannon and River Fergus SPA (004077).

The project aims to undertake maintenance dredging of the existing access channel on the seaward approaches to Kilrush Creek, Kilrush, County Clare. The works involve the removal of accumulated sediments that have reduced the navigability of the channel leading to Kilrush Marina and the inner harbour area. The dredged material is proposed to be disposed of at a licensed offshore dumping site in accordance with relevant environmental legislation and permitting requirements. The project is essential to ensure the continued safe access for vessels using the marina and to maintain the operational functionality of the harbour.

LM Keating is now seeking an eight year DaS permit with permission to dredge 8,000 tonnes per campaign and this document provides an updated assessment to accompany the application.

The dredging operation will result in a temporary short-term increase in suspended solid concentrations in the water column which will be dispersed by water movements, and some will ultimately settle to the seafloor. There is the potential for impacts on the Special Areas of Conservation (SAC) as a result of this. The purpose of this study is to establish the baseline conditions at the site for the intertidal and the subtidal.

Compared to the initial proposal, which involved dredging of 6,000 tonnes, the revised plan increases the dredged volume to 8,000 tonnes. The original AQUAFACT (2013) study assessed the potential impacts of dredging over a full tidal cycle (12 hours) under both spring and neap tide conditions. As part of the assessment, subtidal and intertidal sampling and analysis were carried out along with the development of a sediment transport model. The model was developed using a conservative approach, applying the highest plausible sediment release rate during dredging. In the previous model, sediment transport was simulated based on the rate of sediment release during a single tidal cycle, rather than the total volume of sediment. Under the revised proposal, the dredging and disposal procedures will remain the same, meaning the existing model remains representative of the new plan. The primary difference is that the overall dredging duration will increase proportionally to accommodate the larger volume. Therefore, the AQUAFACT (2013) report remains a valid and representative study for assessing the potential impacts of the updated dredging proposal on suspended sediment concentrations and sediment deposition.

The intertidal and subtidal studies carried out in 2013 in the predicted area of impact are also applicable to the current assessment as they cover an area in excess of what will be impacted by the proposed dredging. The intertidal sites visited in 2013 were revisited in 2025 for the current application. Site selection is based on the model outcome of where sediment would accumulate and potentially impact marine benthic communities.

2. Dredging Operation

The proposed method is plough dredging, whereby sediments are redistributed as the plough passes over the seabed until the desired depth is achieved. The plough pushes material to the sides of the marina approach channel, with some sediment particles resuspended into the water column. Works will be carried out *c.* two hours after low tide, enabling the plough to redistribute sediments into the deeper waters of the main Shannon Estuary channel and thereby avoiding re-deposition in intertidal zones. As a result, the dredge site itself also functions as the dumpsite, with sediments deposited along the margins of the approach channel to Kilrush Marina, between the lock gates and the fairway buoy. This approach is consistent with previous maintenance dredging campaigns at Kilrush, which were accepted under earlier Dumping at Sea permits. The dredge area is a 20 m wide channel lowered to -2.5 m C.D. This dredged material would be ploughed out to beyond the fairway buoy in the main E – W channel at approximately -4 m C.D. Estimated ploughing rates are 100 m^3 per hour, depending on haul length, with operations beginning at the outermost point and progressing inshore as target depths are achieved.

A hydrodynamic model was run to determine the fate of a sediment 12-hour disposal period, with a disposal rate of 100 m^3 per hour (73.6 kg/second), with the sediment plume tracked for a further 24 hours after the disposal period (

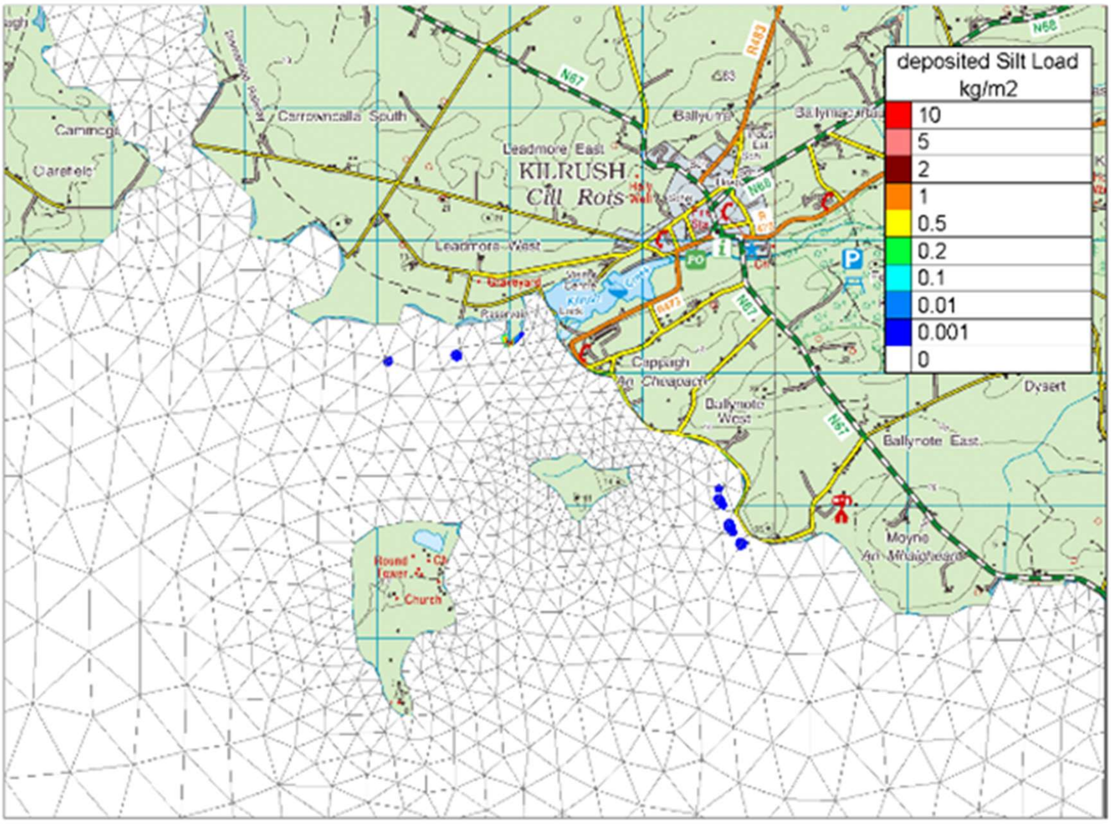

Figure 2-1 and **Figure 2-2** for neap and spring tides, respectively).

The model (**Appendix 1**) shows that under both spring and neap tidal conditions, the spatial footprint of the deposited material is limited, sporadic and of a very low deposition load in the estuary.

The proposed tonnage of dredging is 8,000 tonnes per campaign, with overall duration of dredging activities depending on the ploughing rate achieved. The licence is requested for a duration of 8 years, with 5 campaigns planned, spaced out approx. every 2 years for a total of 40,000T dredged material over the licence duration.

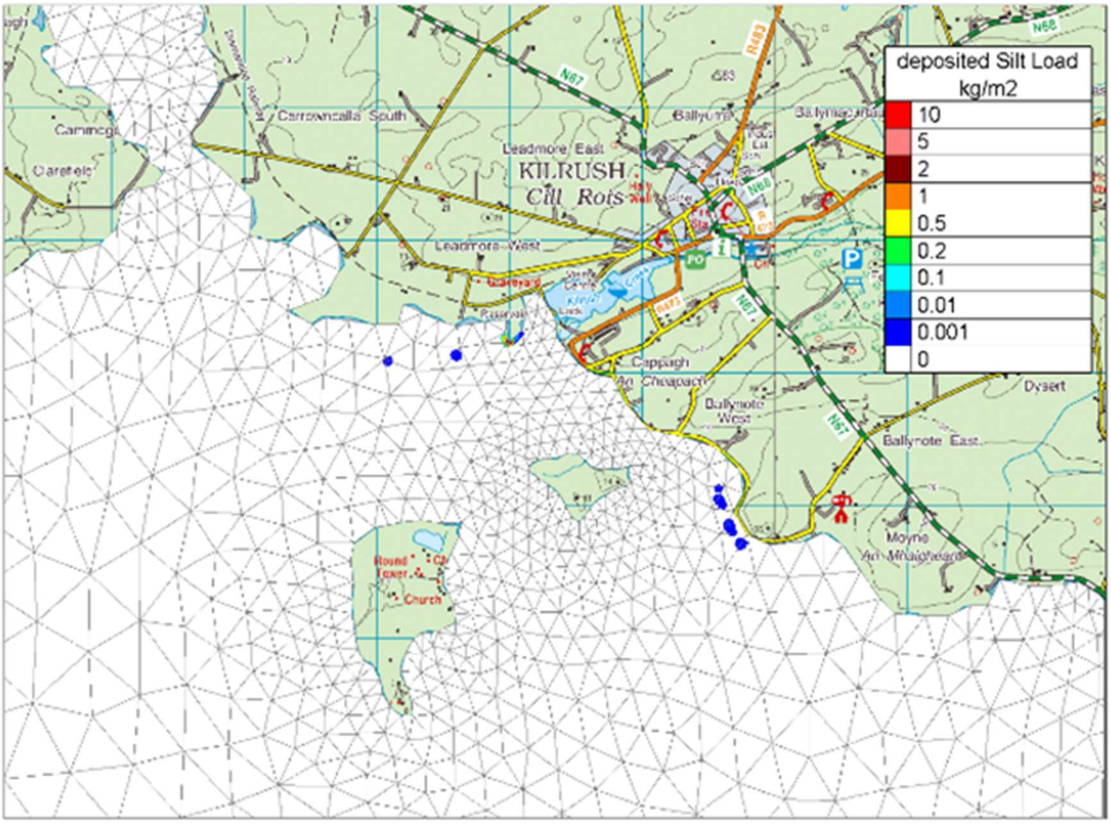

Figure 2-1: Estimated deposited silt load in kg/m² (ploughing rate 100 m³ per hour) at the end of 6-hour dredging for neap tides.

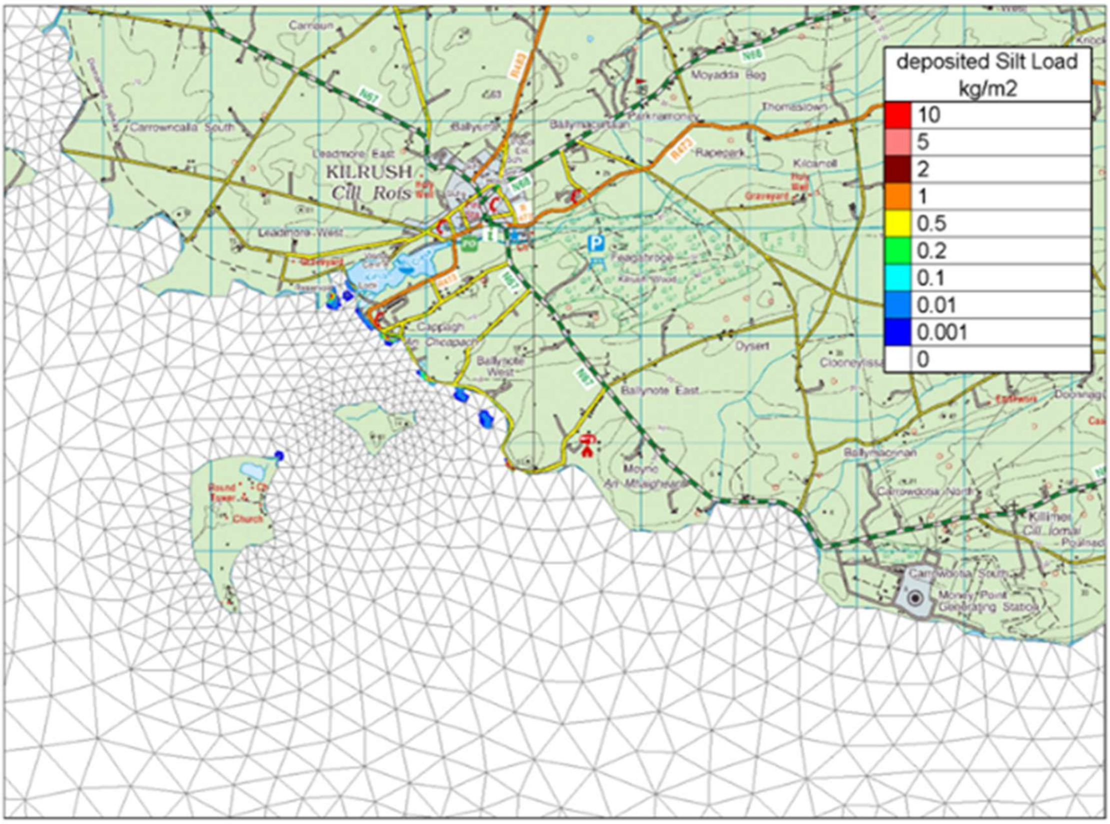

Figure 2-2: Estimated deposited silt load in kg/m² (ploughing rate 100 m³ per hour) at the end of 6-hour dredging for spring tides.

3. Intertidal Survey

The NPWS conservation objectives (NPWS, 2012) outline the broad marine communities of the intertidal zone for the Kilrush area within the Lower River Shannon SAC. **Figure 3-1** illustrates the location of intertidal survey locations within these communities. They are located in areas described as 'Fucoid-dominated intertidal reef community complex'. The aim of the intertidal survey is to describe in more detail the biotopes present at each of the transects located in the zones of maximum sedimentation deposition, as identified through modelling.

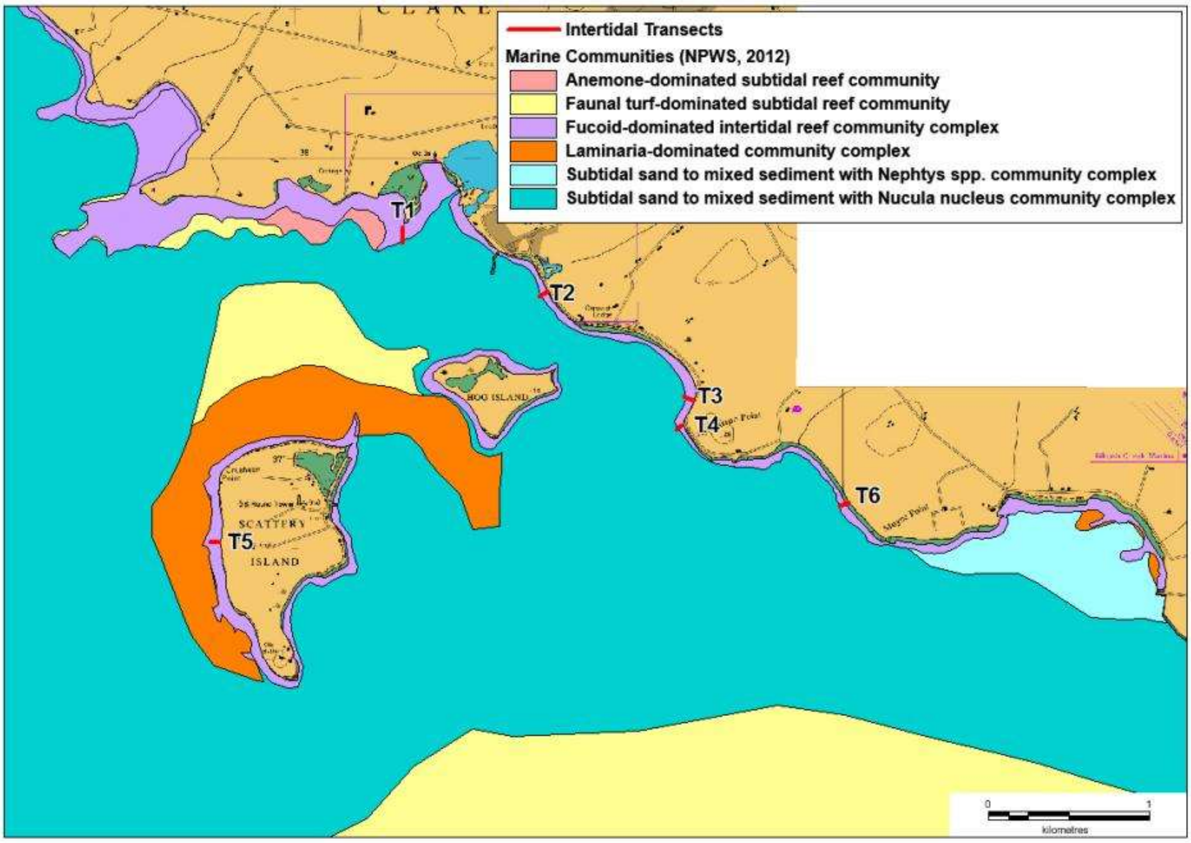

Figure 3-1: Intertidal transect locations within the NPWS mapped marine communities of the Lower River Shannon SAC.

3.1 Intertidal Survey Technique

All stations for each individual transect were surveyed on the same day. Each transect was surveyed from high water down the shore to the low water mark. Determination of the shore zones (strand line, upper/mid/lower shore) were based on slope, differences in the substrata, and biological communities. Within each zone identified, a 0.25 m^2 quadrat was randomly placed in an area representative of the zone. Within this quadrat, a record was made of species present, their abundance, and the substrata. Abundance was recorded as percentage cover where possible. Photographs were taken within each zone, of the quadrat, and a photograph of the overall view of the transect line was also taken.

An engineer's level (LevelMark 75055) and staff was used to calculate the mid water shore level (at 50% of the mean range of the spring tide) as well as the height at intermediate locations along the transect to determine the slope of the shore. Horizontal distances were measured using a measuring tape.

Intertidal surveys of the Shannon Estuary within the vicinity of Kilrush, Co. Clare were conducted on the 22nd of September 2025 for Scattery Island (T5), 23rd of September 2025 for Skagh Point (T1) and Aylevaroo Point (T3 and T4), and on the 24th of September for Cappagh Beach (T2) and Moyne Point (T6). The locations of these transects are seen in **Figure 3-1** above and the coordinates are presented in **Table 3-1**.

Table 3-1: Intertidal survey quadrat coordinates (upper, mid, and lower shore) surveyed around Kilrush, Co. Clare on the 22nd, 23rd, and 24th of September 2025.

Quadrat	Latitude	Longitude
Skagh Point. T1 upper shore	52.62973	-9.5077
Skagh Point. T1 mid shore	52.62944	-9.5081
Skagh Point. T1 lower shore	52.62879	-9.50897
Cappagh Beach T2 upper shore	52.62612	-9.49443
Cappagh Beach T2 mid shore	52.62604	-9.49473
Cappagh Beach T2 lower shore	52.626	-9.49474
Aylevarroo Point T3 upper shore	52.62023	-9.48095
Aylevarroo Point T3 mid shore	52.62026	-9.48123
Aylevarroo Point T3 lower shore	52.6203	-9.48171
Aylevarroo Point T4 upper shore	52.61852	-9.48177
Aylevarroo Point T4 mid shore	52.6185	-9.48197
Aylevarroo Point T4 lower shore	52.61846	-9.48207
Scattery Island T5 upper shore	52.61211	-9.52447
Scattery Island T5 mid shore	52.61205	-9.52479
Scattery Island T5 lower shore	52.612	-9.52537
Moyne Point T6 upper shore	52.61451	-9.46679
Moyne Point T6 mid shore	52.61447	-9.46709
Moyne Point T6 lower shore	52.61442	-9.46737

3.2 Intertidal Results

Each quadrat was assessed against the Marine Habitat Classification for Britain and Ireland (Connor *et al.*, 2004; Parry *et al.*, 2015; JNCC, 2022), a hierarchical system to classify marine intertidal habitats created through empirical analysis of benthic survey data, scientific literature, and marine experts.

3.2.1 Transect 1 Skagh Point

3.2.1.1 Rocky Shore

Coordinates: 52.6292º N, 9.50618º W

This shore was surveyed on 23rd September 2025. Predicted low water on the day of the survey was at 13:20 (0.9 m) on a spring tides cycle with a tidal range of 3.7 m. The survey began at 11:00. A single transect and a general walk over of the remainder of the shore was carried out. The location and extent of the shore transect is illustrated in **Figure 3-2**. A shore overview is presented in **Figure 3-3** and a view of the shore transect from the upper and lower shore is visible in **Figure 3-4**. Pacific oyster (*Crassostrea gigas*) and native oyster (*Ostrea edulis*) were identified at this shore.

The shore is a moderately exposed mixed substrata shore, dominated by boulders and cobbles.

Figure 3-2: Aerial view of Transect 1, Skagh Point.

Figure 3-3: Overview of extent of shore at Skagh Point at low water with exposed sandy shore visible in right of image, where sediment shore quadrat sampling was conducted.

Figure 3-4: Vertical transect of Skagh Point including view from upper (left) and lower (right) shores.

Transect 1, Quadrat 1. Upper Shore.

The upper shore station was located approximately 8.3 metres from the strandline (**Figure 3-5**). The substrate consisted of cobbles/pebbles with larger stones intermixed. Flora included *Pelvetia canaliculata, Fucus vesiculosus,* and *Chondrus crispus*. Fauna included Talitridae, Isopoda, Nemertea, *Austrominius modestus*, *Littorina littorea*, and *Axelsonia littoralis*. The JNCC biotope at this location can be classified as 'LR.MLR.BF.PelB *Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock' (EUNIS MA1241) (Perry and Garrard, 2020).

Figure 3-5: Skagh Point. Transect 1, Quadrat 1 (upper shore).

Transect 1, Quadrat 2, Mid shore.

The mid shore station was located approximately 50 metres from the strandline. The substrate here was composed of cobbles/pebbles and boulders on gravel (**Figure 3-6**). Approximately 25% of the substrate was covered with *Fucus vesiculosus* (20%) and *Fucus serratus* (5%) and *C. crispus*, *Hildenbrandia rubra* (20%) and *Wahlenbergiella mucosa* (5%) were also present. Fauna included *Patella vulgata*, *Carcinus maenas*, *Littorina littorea*, *Steromphala umbilicalis*, *Littorina obtusata*, *Chthamalus* spp, *Austrominius modestus,* and *Phorcus lineatus*. The JNCC biotope here is classified as 'LR.LLR.F.Fves *Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock' (EUNIS MA123D) (Perry *et al*., 2024a).

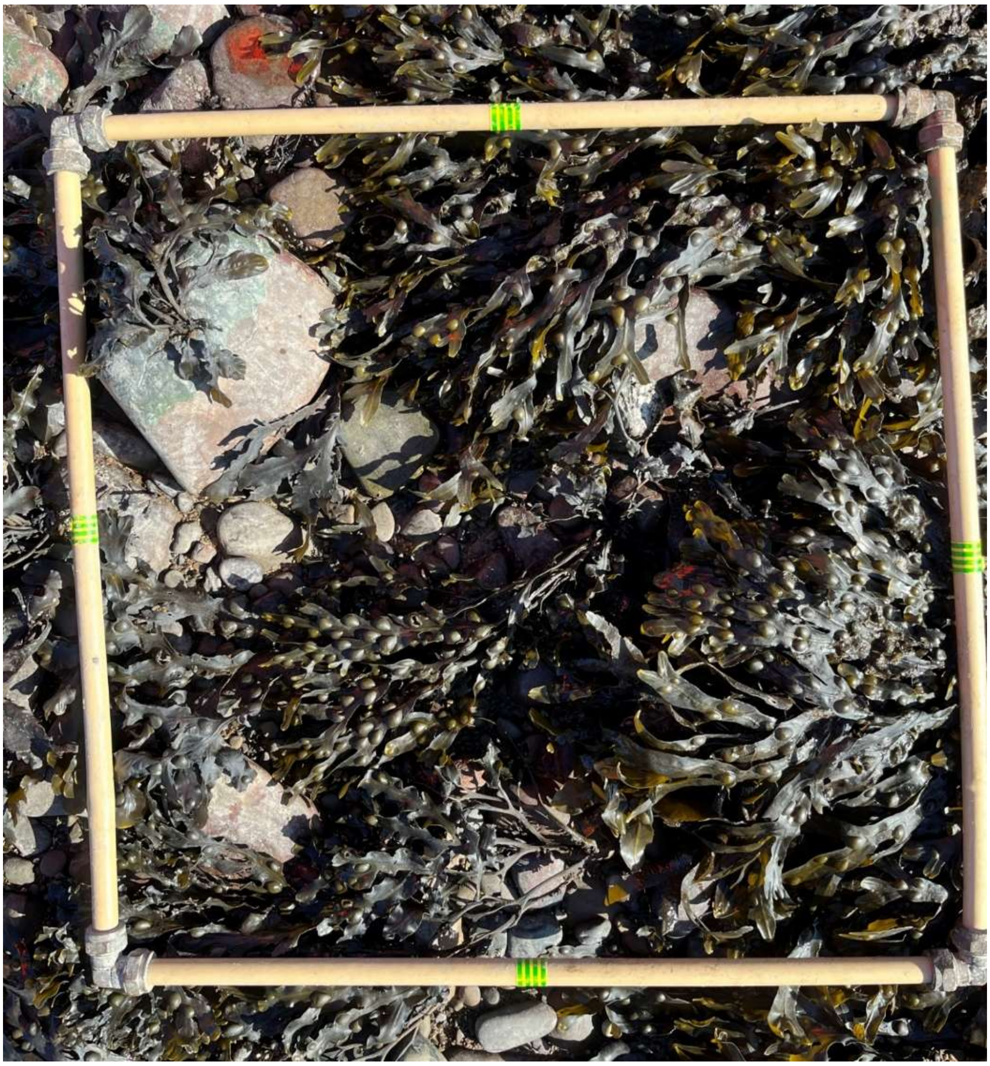

Figure 3-6: Skagh Point Transect 1, Quadrat 2 (mid shore).

Transect 1, Quadrat 3, Lower shore

The lower shore station was located approximately 143.5 metres from the strandline. The substrate consisted of cobbles and boulders on sand (**Figure 3-7**). *Fucus serratus* was dominant (100%) and other flora included *Enteromorpha* sp., *C. crispus*, *Mastocarpus stellatus*, encrusting *Lithothamnion* and *H. rubra*. The faunal species present were Bryozoa (on *F. serratus*), Hydrozoa (on *F. serratus*), *Spirorbis* sp, Paguridae, *Porcellana platycheles*, *P. vulgata*, *Xantho pilipes*, Amphipoda, *Littorina littorea*, *Steromphala umbilicalis*, and *Littorina obtusata*. The biotope at this station on the lower shore can be classified as the JNCC biotope 'LR.MLR.BF.Fser.Bo *Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders' (EUNIS MA12442) (Tillin *et al*., 2024).

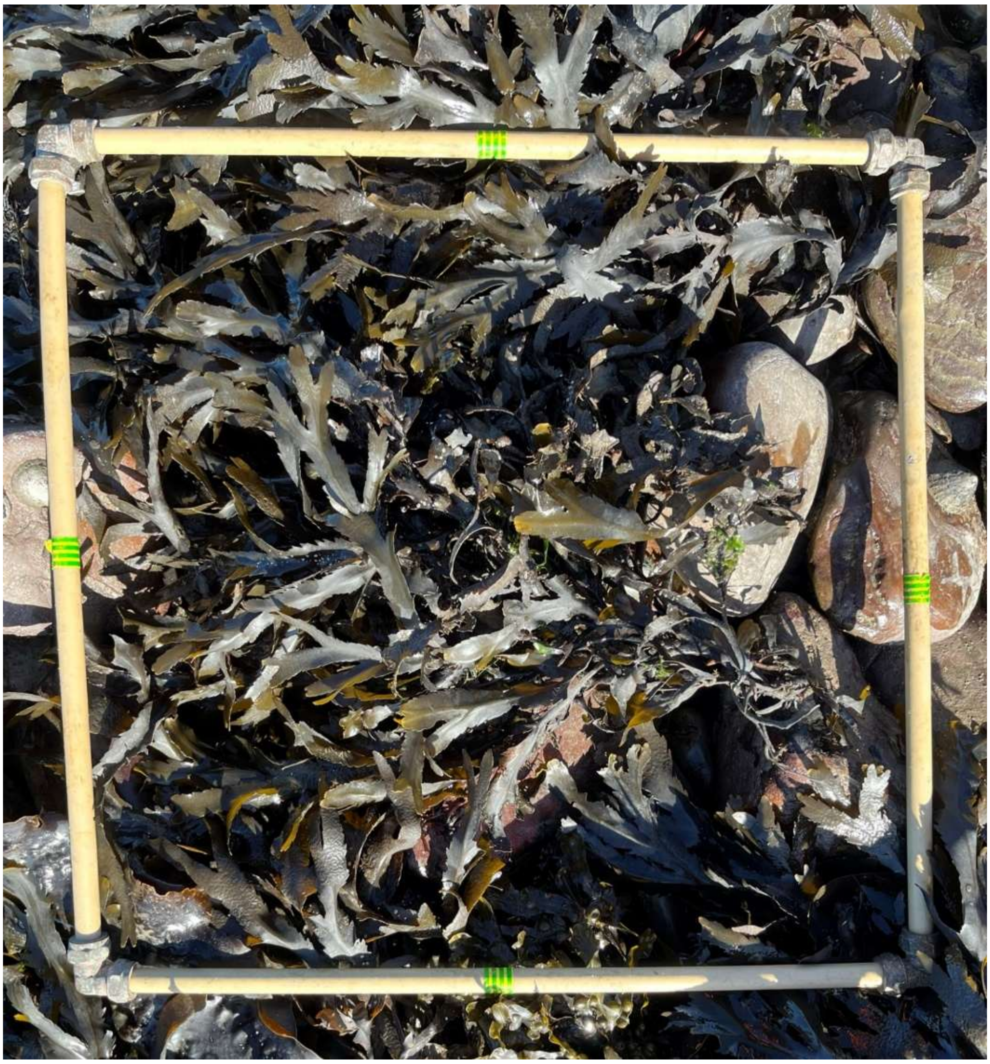

Figure 3-7: Skagh Point. Transect 1, Quadrat 3 (lower shore).

During the walk over of the shore, other fauna noticed included Gracilariaceae, *M. stellatus*, *Ulva* and sponges. The kelp zone was visible beyond the lower shore accessible on the day of the survey (*Laminaria* sp and *Saccharina latissima*). In the mid and lower shores, fronds of *F. vesiculosus* and *F. serratus* were encrusted with filamentous brown algae. The extent of the algal bands were measured from the upper to the lower shore and are presented in **Table 3-2** below, however a mosaic of fucoids was present in the lower shore with no distinct bands. During the walk over of the shore, other fauna noticed included *Arenicola marina* (feeding casts noticed in lower shore) and in the mid shore many of the fronds of *Fucus vesiculosus* were encrusted with the tubes of spirorbid polychaetes. An image of the shore in profile as well as the slope of the shore are presented in **Figure 3-8** and **Figure 3-9** respectively.

Table 3-2: Extent of algal bands along Transect 1.

Species	Extent and distance of algal band from upper shore(m)
Pelvetia canaliculata	5.9 – 13.78 m
Fucus spiralis	10.7 –21.4 m
Fucus vesiculosus	1.4 – 67 m
Ascophyllum nodosum	28.3 (infrequent)
Fucus serratus	35.8 – lower shore
Ulva	Present from 86.3 m
Palmaria palmata	Lower shore
Laminaria sp.	Subtidal

Figure 3-8: Skagh Point shore profile.

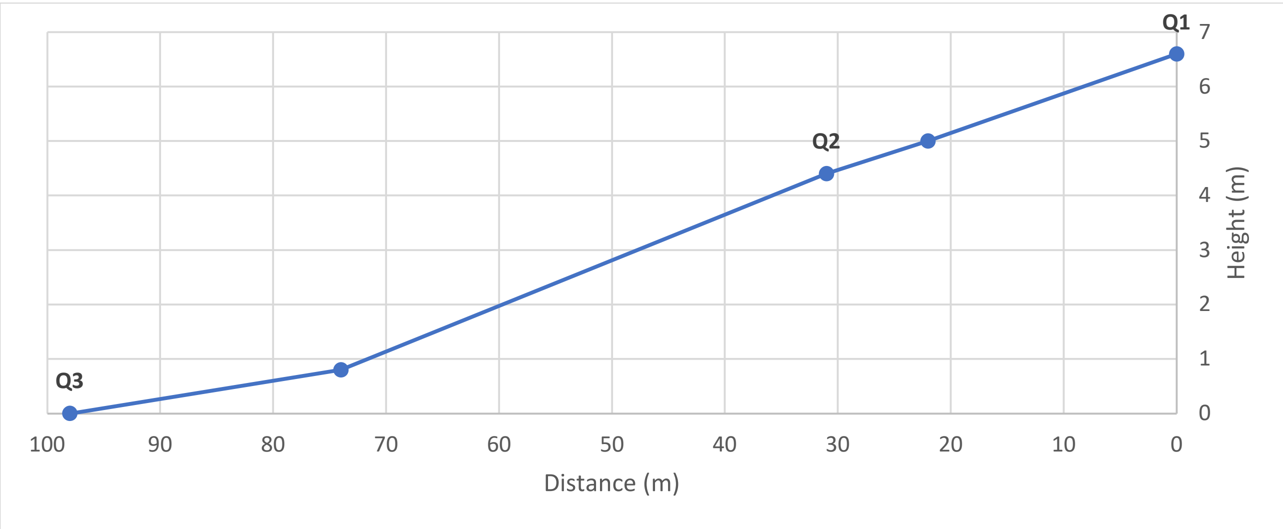

Figure 3-9: Skagh Point shore profile slope

3.2.1.2 Sediment Shore

Coordinates: 52.63088⁰ N, 9.50870⁰ W

At the upper shore (**Figure 3-10**), the first replicate (T.1 upper) quadrat recorded *Arenicola marina* (four individuals) and *Galathowenia* sp. (34 individuals) and at the second replicate (T1.2 upper) recorded *A. marina* (one individual), *Galathowenia* sp. (40 individuals) and one *Lanice conchilega*. The biotope at this location is classified as the JNCC biotope 'SS.SSa.IMuSa.AreISa *Arenicola marina* in infralittoral fine sand or muddy sand' (EUNIS MB5237) (Tyler-Walters *et al*., 2023).

Figure 3-10: Sediment shore transect. Upper shore quadrats T1.1 (left) and T1.2 (right).

At the mid shore (**Figure 3-11**), the first replicate (T.1. mid) quadrat recorded *Arenicola marina* (9 individuals) and at the second replicate (T1.2 mid) recorded *A. marina* (8 individuals). The biotope at this station is classified as the JNCC biotope 'SS.SSa.IMuSa.AreISa *Arenicola marina* in infralittoral fine sand or muddy sand'(EUNIS MB5237) (Tyler-Walters *et al*., 2023).

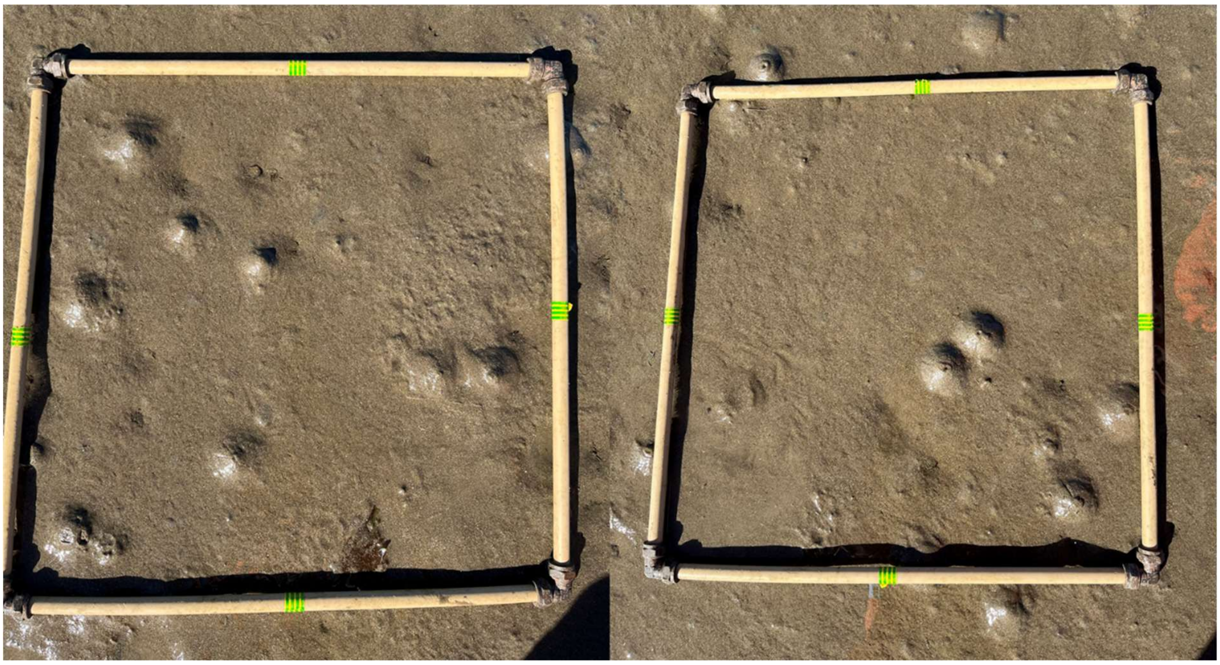

Figure 3-11: Sediment shore transect. Mid shore quadrats T1.1 (left) and T1.2 (right).

At the lower shore (**Figure 3-12**), the first replicate (T.1. lower) quadrat recorded *Arenicola marina* (23 individuals) and at the second replicate (T1.2 lower) recorded *A. marina* (17 individuals). The biotope at this location is classified as the JNCC biotope 'SS.SSa.IMuSa.AreISa *Arenicola marina* in infralittoral fine sand or muddy sand'(EUNIS MB5237) (Tyler-Walters *et al*., 2023).

Figure 3-12: Sediment shore transect. Lower shore quadrats T1.1 (left) and T1.2 (right).

3.2.2 Transect 2. Cappagh Beach.

Coordinates: 52.62663ºN, 9.49509ºW

This shore was surveyed on 24th September 2025. Predicted low water on the day of the survey was at 13:39 on a spring tides cycle (0.9 m) with a tidal range of 3.6 m. The survey began at 13:47. A single transect and a general walk over of the remaining shore was carried out. The location and extent of the shore transect is illustrated in **Figure 3-13**. A shore overview is presented in **Figure 3-14** and a view of the shore transect from the upper and lower shore is visible in **Figure 3-15**. Pacific oyster (*C. gigas*) was identified at this shore.

The shore is a moderately exposed mixed substrata shore, dominated by cobbles and with sand in the lower shore and sub tidally.

Figure 3-13: Aerial view of Transect 2, Cappagh Beach.

Figure 3-14: Overview of extend of shore at Cappagh Beach during low water.

Figure 3-15: Vertical transect of Cappagh Beach including view from upper (left) and lower (right) shores.

Transect 2, Quadrat 1, Upper shore.

The upper shore station was located approximately 14.5 metres from the strandline (**Figure 3-16**). The substrate at this station consisted of cobbles. Flora recorded included *F. vesiculosus* (< 5%), *F. spiralis*, and green filamentous algae (*Ulva* sp.). Fauna included Talitridae, Oligochaeta, and *Littorina* juveniles. The biotope at this station can be classified as the JNCC biotope 'LR.LLR.F.Fspi.X *Fucus spiralis* on full salinity upper eulittoral mixed substrata' (EUNIS MA123C2) (Perry and d'Avack, 2015a).

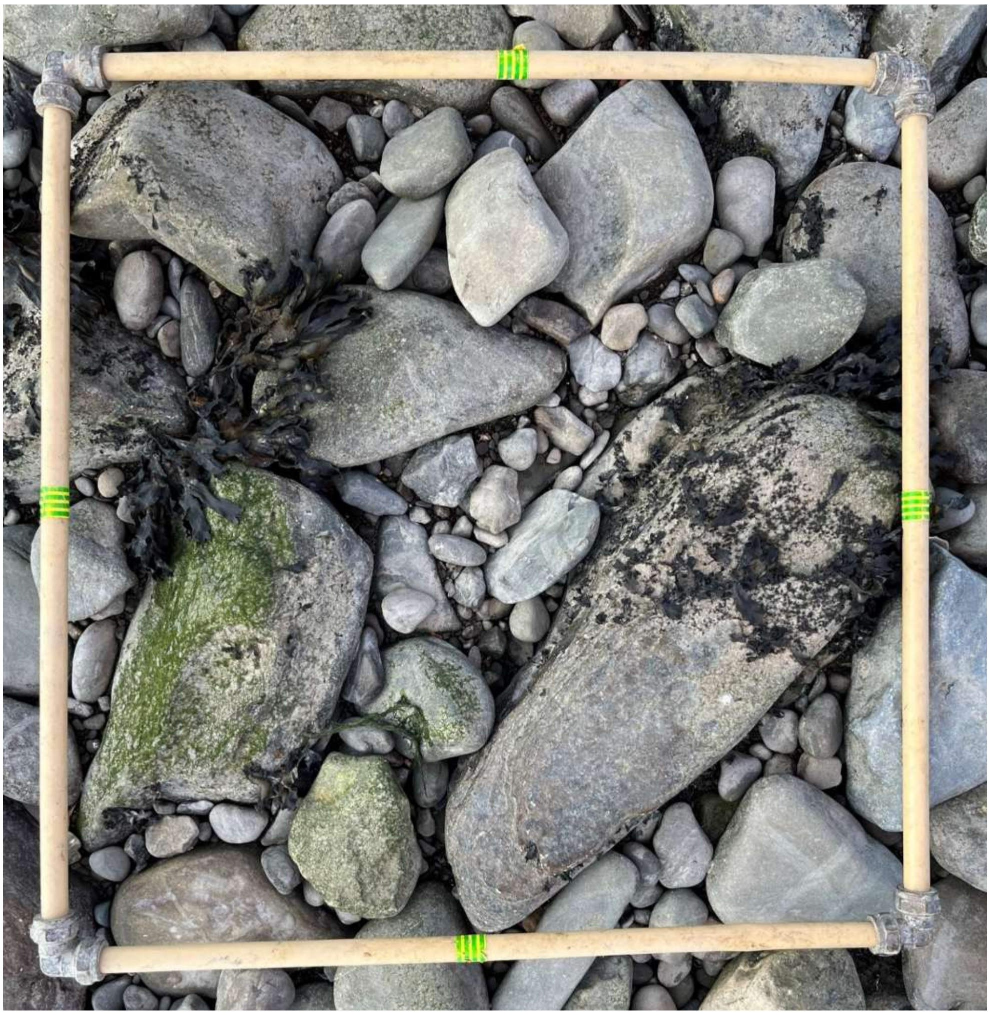

Figure 3-16: Cappagh Beach. Transect 2, Quadrat 1 (upper shore).

Transect 2, Quadrat 2 (mid shore).

The middle shore station was located approximately 36.4 metres from the strandline. The substrate at this station consisted of boulders and cobbles on gravel (**Figure 3-17**). Flora in this quadrat consisted of *F. vesiculosus* (35-40%), *F. serratus* (25%), *C. crispus, W. mucosa, H. rubra,* and encrusting *Lithothamnion*. Fauna included *A. modestus,* Actiniaria, *Porcellana platycheles, Xantho pilipes, P. vulgata, L. littorea, L. obtusata, S. umbilicalis,* and a whelk. The biotope at this station can be classified as the JNCC biotope 'LR.MLR.BF.FvesB *Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock' (EUNIS MA1243) (Perry and Watson, 2024).

Figure 3-17: Cappagh Beach. Transect 2, Quadrat 2 (middle shore).

Transect 2, Quadrat 3 (lower shore)

The lower station is located approximately 42.6 metres from the strandline. The sediment at this station consists of gravel on a muddy substrate with cobbles (**Figure 3-18**). Flora in this quadrat included *F. serratus* (40%), *M. stellatus, C. crispus, Gelidium pulchellum* and *Enteromorpha* sp. Faunal species included *Spirorbis* spp., Bryozoa, *A. modestus, Spirobranchus* sp, Paguridae, *L. Littorina, L. obtusata, S. umbilicalis, and Steromphala cineraria*. The biotope at this station can be classified as the JNCC biotope 'LR.MLR.BF.Fser *Fucus serratus* on moderately exposed lower eulittoral rock' (EUNIS MA1244) (d'Avack *et al*., 2024a).

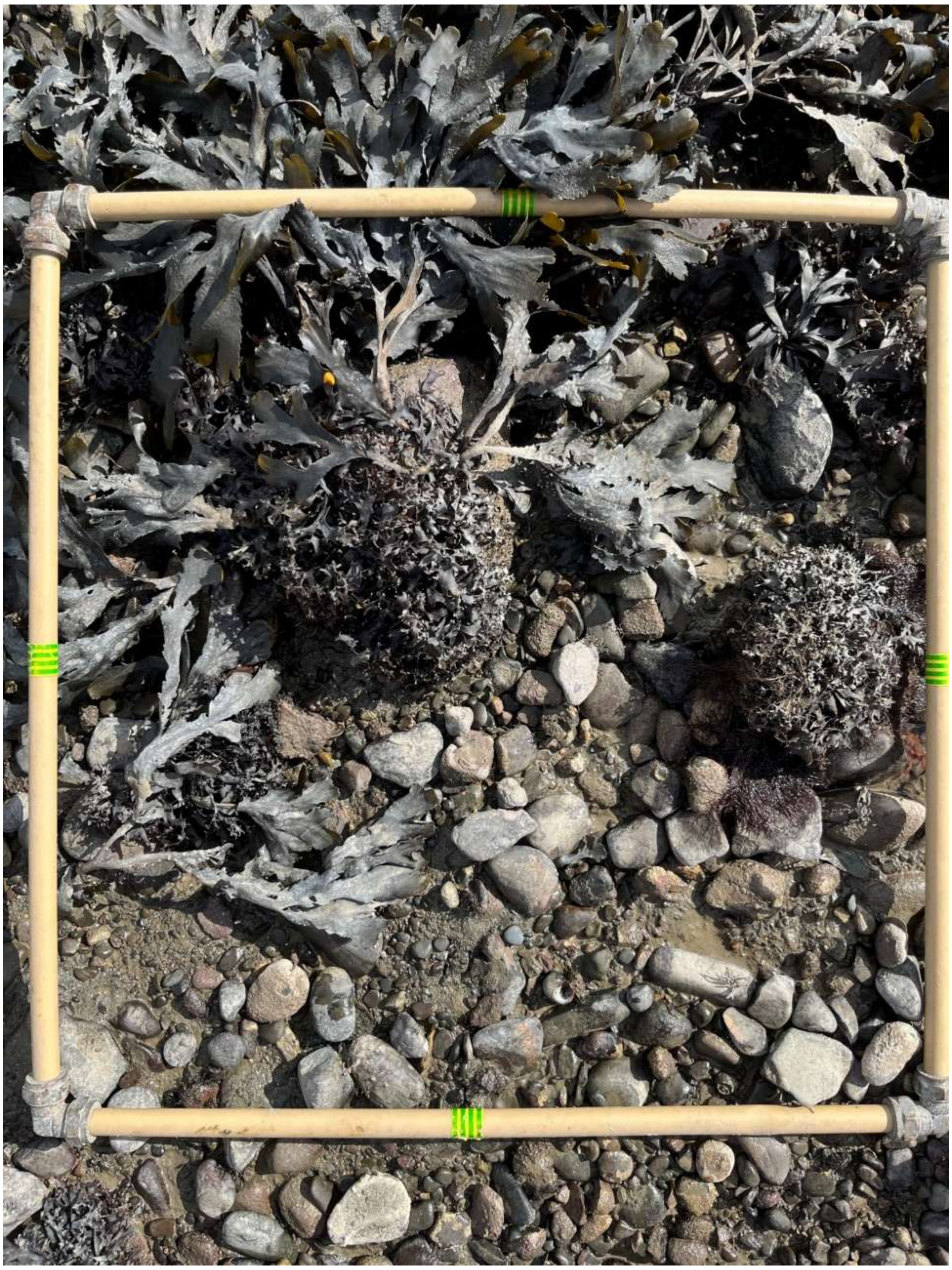

Figure 3-18: Cappagh Beach. Transect 2, Quadrat 3 (lower shore).

During a walk over of the beach the algal bands were recorded along the vertical transect from the upper to the lower shore. The extent of these is presented in **Table 3-3** below. An image of the shore in profile as well as the slope of the shore are presented in **Figure 3-19** and **Figure 3-20**, respectively.

Table 3-3: Extent of algal bands along Transect 2.

Species	Extent and distance of algal band from upper shore(m)
Fucus vesiculosus	11.4 – 43.2 m
Fucus spiralis	14.1 – 35.8 m
Fucus serratus	26.9 – 56 m
Chondrus crispus	24 –56m
Laminaria spp.	subtidal

Figure 3-19: Cappagh Beach shore profile.

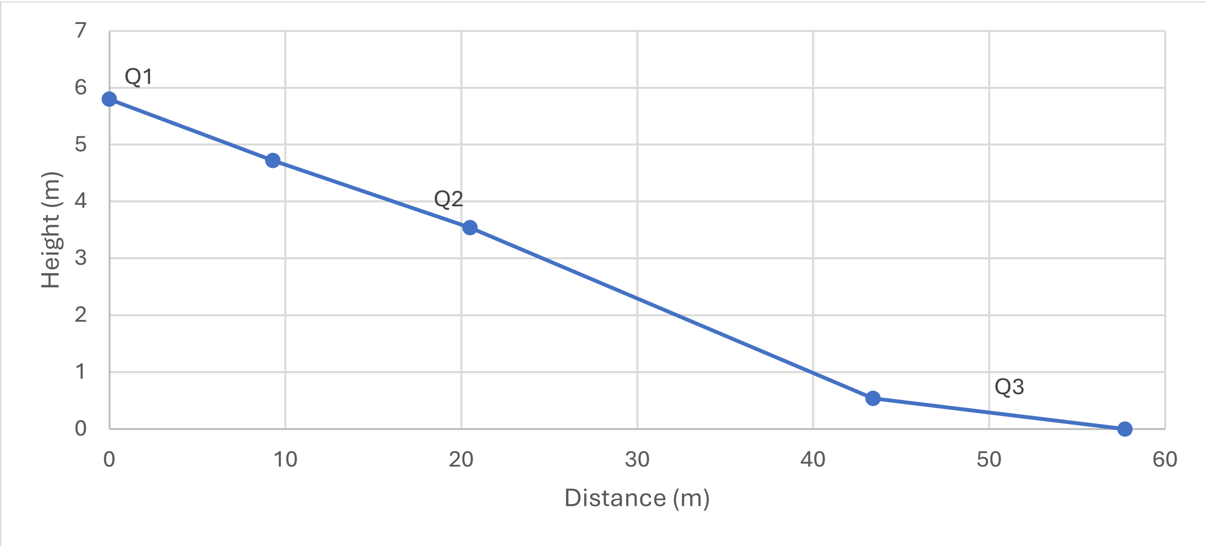

Figure 3-20: Cappagh Beach shore profile slope.

3.2.3 Transect 3, Aylevarroo Point.

Coordinates : 52.61963ºN, 9.48171ºW

This shore was surveyed on 23rd September 2025. Predicted low water on the day of the survey was at 13:20 (0.9 m) on a spring tides cycle with a tidal range of 3.7 m. The survey began at 13:56. A single transect and a general walk over of the remainder of the shore was carried out. The location and extent of the shore transect is illustrated in **Figure 3-21**. A shore overview is presented in **Figure 3-22** and a view of the shore transect from the upper and lower shore is visible in **Figure 3-23**.

The shore is a moderately exposed mixed substrata shore, dominated by cobbles and boulders in the upper shore, bedrock in the mid shore and with boulders over cobbles and mud in the lower shore. Large patches of *A. nosodum* were observed through the mid shore and the lower fringes of the upper shore. Overall, the fucoids were variable and mixed, with little zonation present.

Figure 3-21: Aerial view of Transects 3 and 4, Aylevarroo Point.

Figure 3-22: Overview of extend of shore at Transect 3, Aylevarroo Point during low water.

Figure 3-23: Vertical transect of Aylevarroo Point (Transect 3) including view from upper (left) and lower (right) shores.

Transect 3, Quadrat 1 (Upper Shore)

The upper shore station was located *c.* 0.5 m from the strandline (**Figure 3-24**). The substrate consisted of bedrock at the station. Flora recorded included *P. canaliculata* (20%), *F. spiralis* (30-40%), *Lichina pygmaea* (20%), and *H. rubra* (5%). Fauna was limited to *P. vulgata* and one barnacle was recorded (one individual). The biotope at this station can be classified as the JNCC biotope 'LR.LLR.F.Fspi.FS *Fucus spiralis* on full salinity sheltered upper eulittoral rock' (EUNIS M123C1) (Perry and d'Avack, 2015b). This zone usually lies below one dominated by *P. canaliculata.*

Figure 3-24: Aylevarroo Point. Transect 3, Quadrat 1 (upper shore).

Transect 3, Quadrat 2 (mid shore)

The mid shore station was located 19.4 metres from the strandline. The substrate at this station consisted of cobbles, pebbles, and gravel over muddy sediment (**Figure 3-25**). Flora included *F. vesiculosus* (< 5%), *F. serratus* (50%), *Cladophora rupestris* (< 10%), *Polysiphonia* sp., *C. crispus*, *Lithothamnion* encrusting, *W. mucosa*, and *Hydropunctaria. maura*. Fauna included *C. maenus, Nucella lapillus, L. littorea, L. obtusata, S. umbilicalis, P. vulgata, Spirorbis* sp., and Amphipoda. The biotope at this station can be classified as the JNCC biotope 'LR.MLR.BF.Fser *Fucus serratus* on moderately exposed lower eulittoral rock' (EUNIS MA1244) (d'Avack *et al*., 2024a).

Figure 3-25: Aylevarroo Point. Transect 3, Quadrat 2 (mid shore).

Transect 3, Quadrat 3 (lower shore)

The lower shore station is located 50 metres from the strandline. The substrate at the lower shore station consisted of boulders and cobbles over muddy sediment (**Figure 3-26**). The flora recorded in this quadrat included *F. serratus* (100%), *C. crispus*, *Lithothamnion* encrusting, and *H. rubra*. Fauna included *P. vulgata*, *S. umbilicalis, Spirorbis* sp., *L. littorea, L. obtusata, Paguridae* sp., *Tritia reticulata*, Bryozoa and Hydrozoa. Due to the lack of red seaweeds identified in the quadrat, this station can be classified as the JNCC biotope 'LR.MLR.BF.Fser *Fucus serratus* on moderately exposed lower eulittoral rock' (EUNIS MA1244) (d'Avack *et al*., 2024a), however some red seaweeds such as *Palmaria palmata* were observed during the walk over survey.

Figure 3-26: Aylevarroo Point. Transect 3, Quadrat 3 (lower shore).

During a walk over of the beach the algal bands were recorded along the vertical transect from the upper to the lower shore. The extent of these is presented in **Table 3-4** below. The Laminaria zone continues sub tidally from approximately 57 to 65+ metres and consists of *Laminaria digitata*. An image of the shore in profile as well as the slope of the shore are presented in **Figure 3-27** and **Figure 3-28**, respectively.

Table 3-4: Extent of algal bands along Transect 3

Species	Extent and distance of algal band from upper shore(m)
Fucus spiralis	0 – 18m
Pelvetia canaliculata	0 – 1.2 m
Chondrus crispus	6 – 65.5m
Fucus serratus	18.5 – lower shore
Fucus vesiculosus	0.3 – 52 m
Ascophyllum nodosum	0.3 – 19.9 m
Vertebrata lanosa	Epiphytic on *Ascophyllum nodosum*
Laminaria digitata	57.3 – 65.5m+ subtidal
Palmaria palmata	Lower shore
Lomentaria articulata	60 – 65.5m

Figure 3-27: Aylevarroo Point. Transect 3, shore profile.

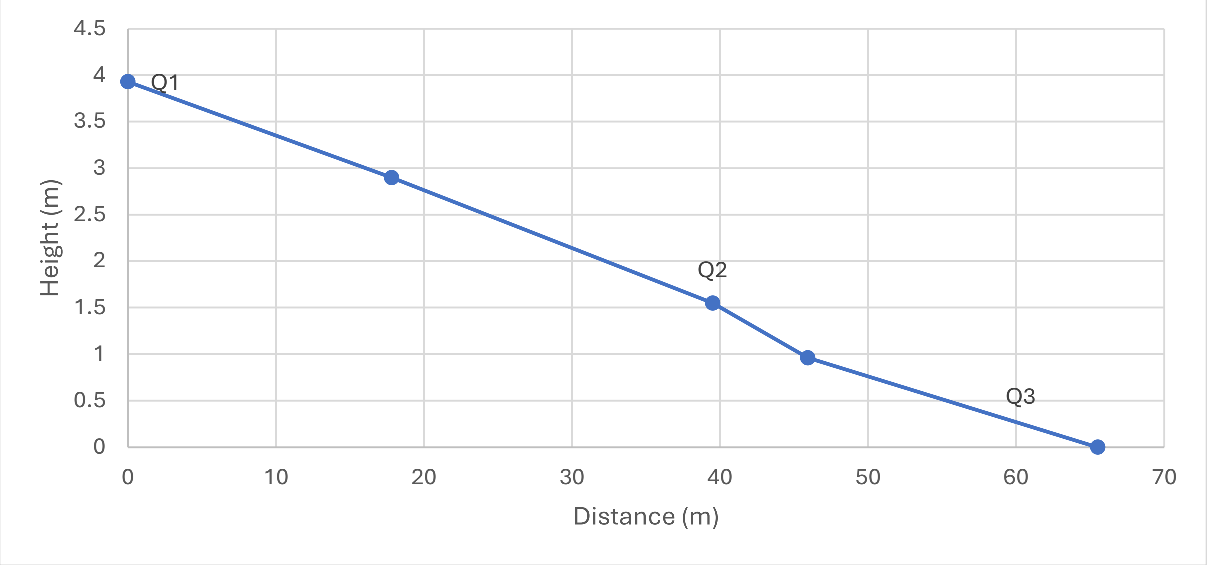

Figure 3-28: Aylevarroo Point. Transect 3 shore profile slope.

3.2.4 Transect 4, Aylevarroo Point.

Coordinates : 52.61891ºN, 9.48184ºW

This shore was surveyed on 23rd September 2025. Predicted low water on the day of the survey was at 13:20 (0.9 m) on a spring tides cycle with a tidal range of 3.7 m. The survey began at 13:06. A single transect and a general walk over of the remainder of the shore was carried out.

The location and extent of the shore transect is illustrated in **Figure 3-21** above. A shore overview is presented in **Figure 3-29** and a view of the shore transect from the upper and lower shore is visible in **Figure 3-30**. Pacific oysters (*Crassostrea gigas*) were identified at this shore.

The shore is a moderately exposed mixed substrata shore, dominated by bedrock in the upper shore boulders and cobbles from the mid to the lower shore and sub tidally. The shore is backed by a *c.* 7 m high cliff composed of layers of sedimentary rock.

Figure 3-29: Overview of extend of shore at Transect 4, Aylevarroo Point during low water.

Figure 3-30: Vertical transect of Aylevarroo Point (Transect 4) including view from upper (left) and lower (right) shores.

Transect 4, Quadrat 1 (upper shore)

The upper shore quadrat was located 0.8 m from the high-water mark on a shelf of bedrock (**Figure 3-31**). The species recorded were *Pelvetia canaliculata* (50%), *L. littorea* and *Chthamalus* sp. This upper shore biotope can be classified as the JNCC biotope 'LR.LLR.F.Pel *Pelvetia canaliculata* on sheltered littoral fringe rock' (EUNIS MA123B) (Perry, 2015).

Figure 3-31: Aylevarroo Point. Transect 4, Quadrat 1 (upper shore)

Transect 4, Quadrat 2 (mid shore)

The middle shore quadrat was located 12.3 m from the high water mark (**Figure 3-32**). The substrate consisted of boulders and cobbles. The floral coverage was of the lichens *W. mucosa* (< 50%), *Hydropunctaria maura* (25%), and *Pyrenocollema halodytes* (on barnacles) and the algae *Vertebrata lanosa* (5%) was also recorded. Fauna included *Nucella. lapillus*, *P. vulgata, A. modestus, Chthamalus* sp., *L. littorina* and *S. umbilicalis*. The biotope here can be classified as the JNCC biotope 'LR.HLR.MusB.Cht.Cht *Chthamalus* spp. on exposed upper eulittoral rock' (EUNIS MA12221) (Tillin and Watson, 2024).

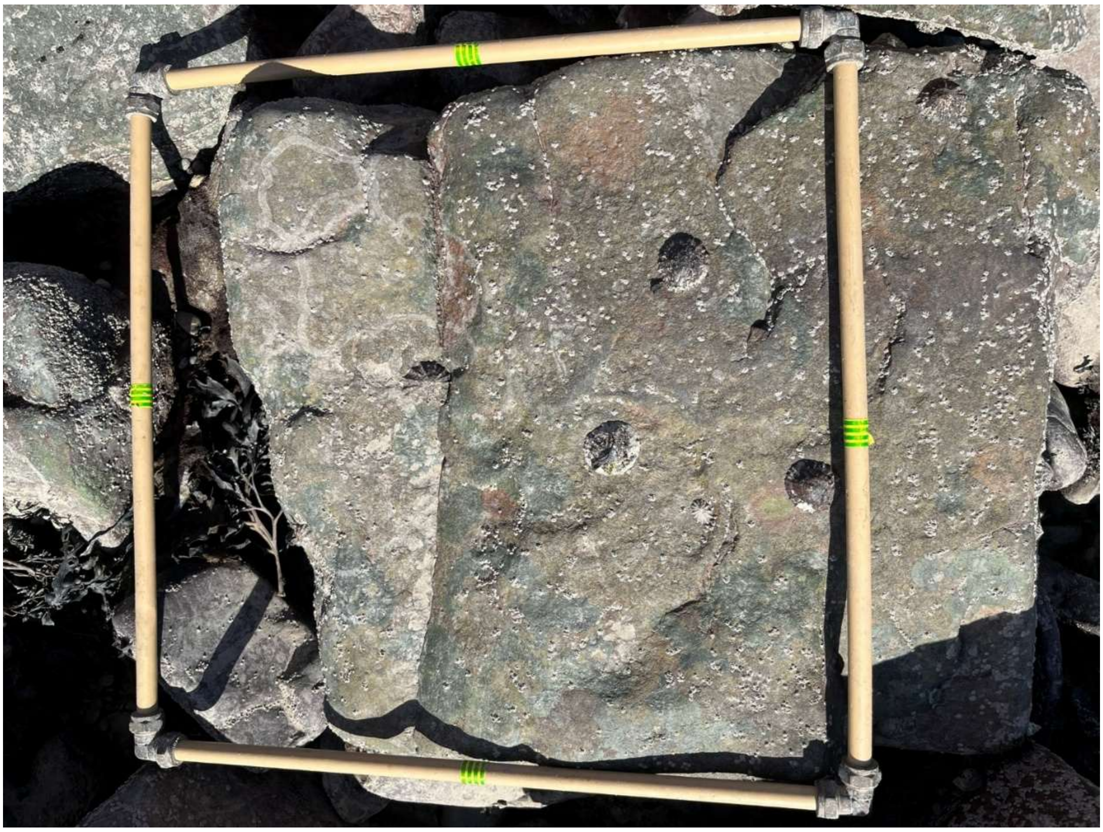

Figure 3-32: Aylevarroo Point. Transect 4, Quadrat 2 (mid shore).

Transect 4, Quadrat 3 (lower shore).

The lower shore station is located 20.3 metres from the strandline. The substrate at this station (**Figure 3-33**) was of large boulders encrusted with red algae (*Polysiphonia* sp., and Corallinacaea). Flora included *F. serratus* (5-10%), *C. crispus* (15%), *Lomentaria articulata, Osmundea pinnifitada, Corallina officinalis, Cryptopleura ramosa,* and encrusting *Lithothamnion*. Fauna included Nereididae, Bryozoa, Hydrozoa, *P. vulgata, L. littorina,* and *S. umbilicalis*. The biotope at this station can be classified as the JNCC biotope 'LR.MLR.BF.Fser.R *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock' (EUNIS MA12441) (d'Avack *et al*., 2024b).

Figure 3-33: Aylevarroo Point. Transect 4, Quadrat 3 (lower shore).

During a walk over of the beach the algal bands were recorded along the vertical transect from the upper to the lower shore. The extent of these is presented in **Table 3-5** below. The Laminaria zone continues from approximately 32 m to the subtidal zone and consists of *Laminaria* digitata. An image of the shore in profile as well as the slope of the shore are presented in **Figure 3-34** and **Figure 3-35** respectively.

Table 3-5: Extent of algal bands along Transect 4.

Species	Extent and distance of algal band from upper shore(m)
Pelvetia canaliculata	0.2 – 2.5 m
Enteromorpha sp	0 – 1.3 m
Fucus spiralis	0.6 –30 m
Fucus vesiculosus	4.2 – 40 m
Fucus serratus	5.7 – 50 m
Vertebrata lanosa	@ 4.1 m
Osmundea pinnatifida	From 3.9 m
Palmaria palmata	Lower shore
Laminaria digitata	Subtidal

Figure 3-34: Aylevarroo Point. Transect 4 shore profile.

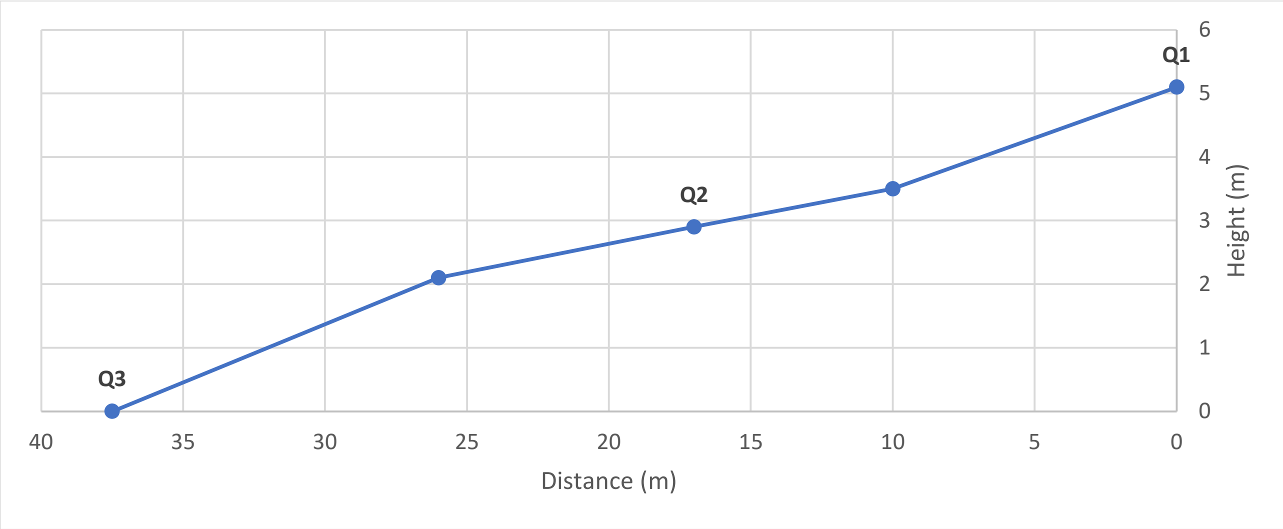

Figure 3-35: Aylevarroo Point. Transect 4, shore profile slope

3.2.5 Transect 5, Scattery Island.

Coordinates : 52.61234⁰N, 9.5248⁰W

This shore was surveyed on 22nd September 2025. Predicted low water on the day of the survey was at 12:22 (0.9 m) on a spring tide cycle with a tidal range of 3.7 m. The survey began at 11:40. A single transect and a general walk over of the remainder of the shore was carried out. The location and extent of the shore transect is illustrated in **Figure 3-36**. A shore overview is presented in **Figure 3-37** and a view of the shore transect from the upper and lower shore is visible in **Figure 3-38**. . Pacific oyster (*C. gigas*) was identified at this shore

The shore is a moderately exposed mixed substrata shore, dominated by cobbles and with sand in the lower shore and sub tidally. The shore is backed by a *c.* 6 m high cliff composed of layers of clay and mud.

Figure 3-36: Aerial view of Transect 5, Scattery Island.

Figure 3-37: Overview of extend of shore at Transect 5, Scattery Island, during low water

Figure 3-38: Vertical transect of Scattery Island (Transect 5) including view from upper (left) and lower (right) shores

Transect 5, Quadrat 1 (upper shore)

The upper shore quadrat was located 17.2 metres from the strandline on a cobble and pebble substrate (**Figure 3-39**). Flora recorded at this quadrat included young fucoid species (*Fucus* spp.) and *Ulva* sp. Fauna included *L. littorea* and Talitridae. The biotope here can be classified as the JNCC biotope LS.LCS.Sh.Bar.Sh Barren littoral shingle (EUNIS MA3211) (Tillin *et al.*, 2019).

Figure 3-39: Scattery Island. Transect 5, Quadrat 1 (upper shore).

Transect 5, Quadrat 2 (mid shore)

The mid shore station is located 40.8 metres from the strandline. The substrate at this station consists of cobbles and boulders (**Figure 3-40**). The flora recorded in this quadrat (Figure 4.36 above) includes *F. vesiculosus* (50%), *F. serratus* (< 5%), *C. crispus*, and encrusting *Lithothamnion*. Fauna included *Spirorbis* sp. (on rock and *F. vesiculosus*), *A. modestus, P. vulgata, Spirobranchus* sp. *(on rock), N. lapillus, L. obtusata, S. umbilicalis,* and Bryozoa (on *C. crispus*). The biotope at this station can be classified as the JNCC biotope 'LR.LLR.F.Fves.X *Fucus vesiculosus* on mid eulittoral mixed substrata' (EUNIS MA123D2) (Perry *et al.,* 2024b).

Figure 3-40: Scattery Island. Transect 5, Quadrat 2 (mid shore).

Transect 5, Quadrat 3 (lower shore)

The lower shore station is located 82.2 metres from the strandline. The substrate at this station was mixed substrata of cobbles and pebbles. Flora recorded in this quadrat (**Figure 3-41**) included *S. latissima* (20%), *C. crispus* (20%), encrusting *Lithothamnion* (10%), *C. officinalis, P. palmata, H. rubra, O. pinnatifida, Membranoptera alata, Gelidium pulchellum,* and *Ulva* sp. Fauna included *Spirobranchus* sp., *S. umbilicalis,* and Bryozoa (on *C. crispus*). The dominant flora in the quadrat was *Saccharina latissima*. It was observed during the walkover that the lower shore was dominated by *F. serratus* with some *S. latissima*, and as such the lower shore can be classified as the JNCC biotope 'LR.MLR.BF.Fser.R *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock' (EUNIS MA12441) (d'Avack *et al*., 2024b).

Figure 3-41: Scattery Island. Transect 5, Quadrat 3 (lower shore).

During a walk over of the beach the algal bands were recorded along the vertical transect from the upper to the lower shore. The extent of these is presented in **Table 3-6** below. The Laminaria zone continues from approximately 79.9 m to the subtidal zone and consists of *Laminaria* sp. An image of the shore in profile as well as the slope of the shore are presented in **Figure 3-42** and **Figure 3-43**, respectively.

Table 3-6: Extent of algal bands along Transect 5.

Species	Extent and distance of algal band from upper shore(m)
Fucus spiralis	13.2 -22 m
Ulva sp	@ 24.8 m
Fucus vesiculosus	13.2 – lower shore
Fucus serratus	47.7 to lower shore
Saccharina latissima	59 - subtidal
Chondrus crispus	53.7 – lower shore
Osmundea pinnatifida	59.9 – lower shore
Laminaria digitata	79.9 to subtidal
Palmaria palmata	69.3 to lower shore
Gelidium sp.	@ 66.3
Ceramium sp.	Lower shore

Figure 3-42: Scattery Island. Transect 5, shore profile.

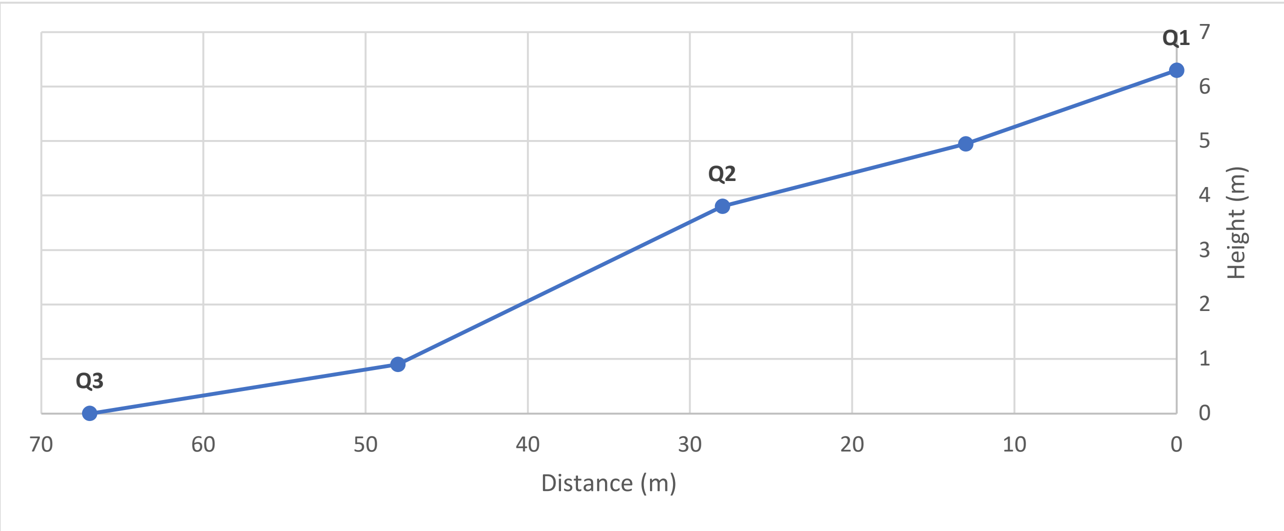

Figure 3-43 Scattery Island. Transect 5, shore profile slope.

3.2.6 Transect 6, Moyne Point

Coordinates: 52.61452ºN, 9.46671ºW

This shore was surveyed on 24th September 2025. Predicted low water on the day of the survey was at 13:39 on a spring tides cycle (0.9 m) with a tidal range of 3.6 m. The survey began at 12:20. A single transect and a general walk over of the remainder of the shore was carried out. The location and extent of the shore transect is illustrated in **Figure 3-44**. A shore overview and a view of the shore transect from the upper and lower shore is visible in **Figure 3-46**. Pacific oyster (*C. gigas*) was identified at this shore

The shore is a moderately exposed mixed substrata shore, dominated by cobbles, boulders and bedrock and with sand in the lower shore and sub tidally.

Figure 3-44: Aerial view of Transect 6, Moyne Point.

Figure 3-45: Overview of extend of shore at Transect 6, Moyne Point, during low water.

Figure 3-46: Vertical transect of Moyne Point (Transect 6) including view from upper (left) and lower (right) shores

Transect 6, Quadrat 1 (upper shore)

The upper shore station was located 9.7 m from the upper shoreline (**Figure 3-47**). The substrate at this station consisted of cobbles and boulders over bedrock. Flora included *F. spiralis* (20%), *P. canaliculata* (< 10%) and *Ulva* sp. (15%). Fauna included *A. littoralis, L. littorea, C. maenus,* Talitridae and Isopoda (Sphaeromatidae). The biotope at this station can be classified as the JNCC biotope 'LR.LLR.F.Fspi.X *Fucus spiralis* on full salinity upper eulittoral mixed substrata' (EUNIS MA123C2) (Perry and d'Avack, 2015a).

Figure 3-47: Moyne Point. Transect 6, Quadrat 1 (upper shore).

Transect 6, Quadrat 2 (mid shore)

The mid shore station is located 29.8 metres from the strandline. The substrate at this station consists of bedrock and cobble (**Figure 3-48**). The quadrat was located 29.8 metres from the upper shoreline. Flora included *F. serratus* (60%), *Polysiphonia* sp. (40%), encrusting *Lithothamnion* (25%), *Enteromorpha* sp., *Cladophora* sp., *C. crispus*, and *C. officinalis,* Fauna included *S. umbilicalis, P. vulgata,* and Hydrozoa. The biotope here can be classified as the JNCC biotope 'LR.MLR.BF.Fser.R *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock' (EUNIS MA12441) (d'Avack *et al*., 2024b).

Figure 3-48: Moyne Point. Transect 6, Quadrat 2 (mid shore).

Transect 6, Quadrat 3 (lower shore)

The lower shore station is located 143.5 metres from the strandline. The substrate of this lower shore station is of bedrock encrusted with Corallinaceae red algae (**Figure 3-49**). The flora recorded in the quadrat (Figure 4.45 above) were *F. serratus* (70%), encrusting *Lithothamnion* (70-80%), *C. crispus, H. rubra,* and *P. cruenta*. Fauna included *Spirorbis* sp., *S. umbilicalis, P. vulgata, L. littorea, L. obtusata,* Paguridae, and Isopoda (Sphaeromatidae). The biotope here can be classified as the JNCC biotope 'LR.MLR.BF.Fser.R *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock' (EUNIS MA12441) (d'Avack *et al*., 2024b).

Figure 3-49: Moyne Point. Transect 6, Quadrat 3 (lower shore).

During a walk over of the beach the algal bands were recorded along the vertical transect from the upper to the lower shore. The extent of these is presented in **Table 3-7** below. An image of the shore in profile as well as the slope of the shore are presented in **Figure 3-50** and **Figure 3-51** respectively.

Table 3-7: Extent of algal bands along Transect 6.

Species	Extent and distance of algal band from upper shore(m)
Pelvetia canaliculata	7.9 –11.1m
Enteromorpha sp.	8.3 –17.85m
Polysiphonia sp.	13.4 to lower shore
Fucus spiralis	7.6 –27.3m
Fucus serratus	22.1 m lower shore
Fucus vesiculosus	20 m –lower shore
Chondrus crispus	Lower shore

Figure 3-50: Moyne Point. Transect 6, shore profile

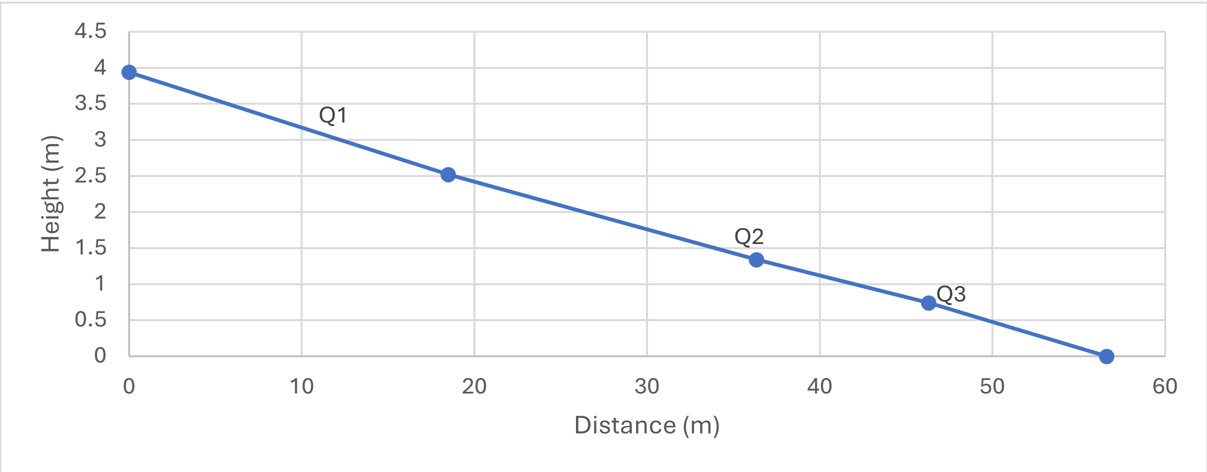

Figure 3-51 Moyne Point. Transect 6, shore profile slope.

3.3 Summary of Biotopes

Table 3-8 summarises the biotopes recorded along the transects at each of the intertidal survey locations. These locations fall under the broad NPWS community category 'Fucoid-dominated intertidal reef community complex'. Each of the locations can also be described as having moderately exposed shores.

Table 3-8:Summary of the biotopes recorded at each of the intertidal transect locations.

Site; Transect; Quadrat	Biotope Code	Biotope name	EUNIS
Skagh Point rocky shore; T1; upper shore quadrat	LR.MLR.BF.PelB	*Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock	MA1241
Skagh Point rocky shore; T1; mid shore quadrat	LR.LLR.F.Fves	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock	MA123D
Skagh Point rocky shore; T1; lower shore quadrat	LR.MLR.BF.Fser.Bo	*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders	MA12442
Skagh Point sediment shore; T1; upper shore quadrats	SS.SSa.IMuSa.ArelSa	*Arenicola marina* in infralittoral fine sand or muddy sand	MB5237
Skagh Point sediment shore; T1; mid shore quadrats	SS.SSa.IMuSa.ArelSa	*Arenicola marina* in infralittoral fine sand or muddy sand	MB5237
Skagh Point sediment shore; T1; lower shore quadrats	SS.SSa.IMuSa.ArelSa	*Arenicola marina* in infralittoral fine sand or muddy sand	MB5237
Cappagh Beach; T2; upper shore quadrat	LR.LLR.F.Fspi.X	*Fucus spiralis* on full salinity upper eulittoral mixed substrata	MA123C2
Cappagh Beach; T2; mid shore quadrat	LR.MLR.BF.FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	MA1243
Cappagh Beach; T2; lower shore quadrat	LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	MA1244
Aylevarroo Point; T3; upper shore quadrat	LR.LLR.F.Fspi.FS	*Fucus spiralis* on full salinity sheltered upper eulittoral rock	M123C1
Aylevarroo Point; T3; mid shore quadrat	LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	MA1244
Aylevarroo Point; T3; lower shore quadrat	LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	MA1244
Aylevarroo Point; T4; upper shore quadrat	LR.LLR.F.Pel	*Pelvetia canaliculata* on sheltered littoral fringe rock	MA123B
Aylevarroo Point; T4; mid shore quadrat	LR.HLR.MusB.Cht.Cht	*Chthamalus* spp. on exposed upper eulittoral rock	MA12221
Aylevarroo Point; T4; lower shore quadrat	LR.MLR.BF.Fser.R	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock	MA12441
Scattery Island; T5; upper shore quadrat	LS.LCS.Sh.Bar.Sh	Barren littoral shingle	MA3211
Scattery Island; T5; mid shore quadrat	LR.LLR.F.Fves.X	*Fucus vesiculosus* on mid eulittoral mixed substrata	MA123D2
Scattery Island; T5; lower shore quadrat	LR.MLR.BF.Fser.R	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock	MA12441
Moyne Point; T6; upper shore quadrat	LR.LLR.F.Fspi.X	*Fucus spiralis* on full salinity upper eulittoral mixed substrata	MA123C2
Moyne Point; T6; mid shore quadrat	LR.MLR.BF.Fser.R	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock	MA12441
Moyne Point; T6; lower shore quadrat	LR.MLR.BF.Fser.R	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock	MA12441

4. Discussion

Under the hierarchical classification system (JNCC, 2022), the sensitivity of the specific habitats (biotopes) to different pressures (climatic, physical, hydrological, chemical, biological, and invasive species) are provided including resilience and resistance parameters. Sensitivity is defined as the likelihood of change when a pressure is applied to a feature, which is a function of the ability of the feature to tolerate or resist change (resistance) and its ability to recover from an impact (resilience).

The overall sensitivity score ranges from 'Not sensitive', 'Low', 'Medium', to 'High'. In terms of the effect of the proposed activity (*i.e.,* dredging) on intertidal habitats, the physical pressure of smothering and siltation rate changes is assessed using these scores, following information at https://www.marlin.ac.uk/habitats/biotopes.

The pressure 'Smothering and siltation rate changes' is assessed under two levels, 'light' which is defined as 'deposition of up to 5 cm of fine material added to the seabed in a single discrete event' and heavy, defined as 'deposition of up to 30 cm of fine material added to the seabed in a single discrete event'. The model indicates that the level or smothering and siltation would be in the range of 'light' (less than 5 cm) and is assessed as such, however heavy siltation (up to 30 cm) is also provided for each biotope identified and assessed below. The biotopes and the transects/quadrats they occur in are provided in **Table 4-1**.

It is important to note while smothering itself can be a stressful event and cause mortality, this can lead to other effects such as oxygen depletion, habitat loss, scouring, and may inhibit feeding practices.

Table 4-1: Summary of biotopes identified during the 2025 survey and their sensitivity to light and heavy smothering and siltation rate changes.

Biotopes	Biotope name	Transect/ Quadrat	Light (< 5 cm)	Heavy (< 30 cm)
LS.LCS.Sh.Bar.Sh	Barren littoral shingle	T5QU	Not sensitive	Not sensitive
LR.HLR.MusB.Cht.Cht	*Chthamalus* spp. on exposed upper eulittoral rock	T4QM	Medium	Medium
LR.LLR.F.Fspi.FS	*Fucus spiralis* on full salinity sheltered upper eulittoral rock	T3QU	Low	Medium
LR.LLR.F.Fspi.X	*Fucus spiralis* on full salinity upper eulittoral mixed substrata	T2QU; T6QU	Low	Medium
LR.LLR.F.Fves	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock	T1QM;	Medium	Medium
LR.LLR.F.Fves.X	*Fucus vesiculosus* on mid eulittoral mixed substrata	T5QM	Medium	Medium
LR.LLR.F.Pel	*Pelvetia canaliculata* on sheltered littoral fringe rock	T4QU	Medium	Medium
LR.MLR.BF.Fser	*Fucus serratus* on moderately exposed lower eulittoral rock	T2QL; T3QL; T3QM	Low	High

Biotopes	Biotope name	Transect/ Quadrat	Light (< 5 cm)	Heavy (< 30 cm)
LR.MLR.BF.Fser.Bo	*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders	T1QL	Low	Medium
LR.MLR.BF.Fser.R	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock	T4QL; T5QL; T6QL; T6QM	Low	High
LR.MLR.BF.FvesB	*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock	T2QM	Medium	Medium
LR.MLR.BF.PelB	*Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock	T1QU;	Medium	Medium
SS.SSa.IMuSa.ArelSa	*Arenicola marina* in infralittoral fine sand or muddy sand	T1.Sediment;QU: QM: QL	Not sensitive	Low

The biotopes identified during the intertidal survey are generally able to resist light smothering and their sensitivity ranges from 'Not sensitive' to 'Low', and the most sensitive biotopes identified were within the 'Medium' sensitivity category; no biotopes identified were classified as having a 'High' sensitivity to smothering under light deposition (< 5 cm). Deposition of less than 5 cm is unlikely to result in a significant effect before sediments are removed through natural processes such as current and wave action. Resistance may vary with tidal state and life stages of the species. Recovery is dependent on many factors including the biology of the characterising species, the season and the level of impact, and the disturbance regime. Sedimentation as a result of the proposed dredging activity is not expected to cause a persistent, chronic perturbation and as such enables recovery potential. All six shores surveyed were of moderate exposure. Sedimentation will only occur on intertidal zones covered by the tide at the time of the impacting activity, hence seaweeds, algae, and associated fauna will only be under sedimentation impacts when they are upright in the water column. Natural processes such as currents, wave action, and tides will generally redistribute sediment over several tide cycles on moderately exposed shores. The dredging activities will be carried out on two hours after low tide, enabling the plough to redistribute sediments into the deeper waters of the main Shannon Estuary channel and thereby avoiding re-deposition in intertidal zones.

<u>LS.LCS.Sh.BarSh Barren littoral shingle</u>

This biotope is characterised by a barren shingle or gravel shore, typically on exposed coasts in full marine conditions. This biotope supports very little macrofauna, except for some that may be washed into the habitat, and the sensitivity assessment is based on abiotic habitat conditions. The biotope is unlikely to be impacted by deposition rates under light and heavy criterium and as such, this biotope is classified as 'Not sensitive' to both. The addition of fine sediment deposition due to the proposed activity, which will be removed by wave action, will not impact and/or alter this biotope.

LR.HLR.MusB.Cht.Cht *Chthamalus* spp. on exposed upper eulittoral rock

This biotope is characterised by barnacles, a filter feeding sessile organism. In terms of sensitivity, the *Chthmalus* barnacle is the key species for this biotope. Limpet *P. vulgata* and lower shore barnacle species *S. balanoides* are more sensitive, however any impact will be temporary, and recovery may occur rapidly after sediment is redistributed over subsequent tidal cycles. Many barnacle species can tolerate partial burial and resume feeding once the sediment is removed.

Under both light and heavy deposition rates, this biotope is classified as having a 'Medium' sensitivity. While it's resistance to smothering/siltation effects are 'Low' to 'None', it has 'Medium' resilience, indicating its recovery potential (Tillin and Watson, 2024).

LR.LLR.F.Fspi.FS *Fucus spiralis* on full salinity sheltered upper eulittoral rock

Under light deposition rates, this biotope is classified as having a 'Low' sensitivity and a 'High' resilience, indicating a large recovery potential; resistance is classified as 'Medium'. *Fucus spiralis* is an ecosystem engineer in this habitat, providing protection to underlying fauna. Sedimentation impacts will be temporary and sediment will be redistributed by natural processes, particularly on a moderately exposed shore. Burial or partial burial may lower survival of algal species and likely impact germination rates of spores and early life stages of *F. spiralis*, however once the sediment is redistributed, recovery potential is high. The species present are generally tolerant. While immobile, filter-feeding organisms are likely to experience the largest impacts, most can withstand partial burial and recolonisation can occur. No long-term negative impacts are expected, particularly considering dredging has been ongoing and the species present are likely habituated to a level of sedimentation (Perry and d'Avack, 2015b).

When considered under heavy deposition rates, this biotope has a 'Medium' sensitivity, resistance, and resilience (Perry and d'Avack, 2015b). At the rate of deposition expected and the intermittent dredging schedule, and considering natural redistribution vectors (wave action, tides, currents), the biotope has high recovery potential.

LR.LLR.F.Fspi.X *Fucus spiralis* on full salinity upper eulittoral mixed substrata

Under light deposition rates, this biotope is classified as having a 'Low' sensitivity and a 'High' resilience, indicating a large recovery potential; resistance is classified as 'Medium'. *Fucus spiralis* is an ecosystem engineer in this habitat, providing protection to underlying fauna. Sedimentation impacts will be temporary and sediment will be redistributed by natural processes, particularly on a moderately exposed shore. Burial or partial burial may lower survival of algal species and likely impact germination rates of spores and early life stages of *F. spiralis*, however once the sediment is redistributed, recovery potential is high. The species present are generally tolerant. While immobile, filter-feeding organisms are likely to experience the largest impacts, most can withstand partial burial and recolonisation can occur. No long-term negative impacts are expected, particularly considering dredging has been ongoing and the species present are likely habituated to a level of sedimentation.

When considered under heavy deposition rates, this biotope has a 'Medium' sensitivity and resilience, and sheltered sites have a 'Low' resistance (Perry and d'Avack, 2015a), however this is due to the increased time it will take natural processes to remove this sediment via wave action. At the rate of deposition expected and the intermittent dredging schedule, and considering natural redistribution vectors (wave action, tides, currents), high sedimentation is not anticipated, and the biotope has high recovery potential (Perry and d'Avack, 2015a).

<u>LR.LLR.F.Fves *Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock</u>

This biotope is characterised by *F. vesiculosus*, which is a resilient species able to re-grow from damaged holdfasts. Smothering impacts from dredging will occur when the biotope and fucoids are submerged and would not experience complete burial. Moderately exposed shores will recover quicker from smothering/siltation effects due to wave action, allowing the redistribution of material. Adult plants may experience reduced growth, and germlings and early life stages may experience mortality, however these impacts are temporary, and recovery will occur after the pressure is removed through natural processes (wave action). This biotope is classified as having a 'Medium' sensitivity and resilience to smothering at both light and heavy deposition rates, and it's classified resistance is 'Medium' and 'Low' for light and heavy deposition, respectively (Perry *et al*., 2024a).

<u>LR.LLR.F.Fves.X *Fucus vesiculosus* on mid eulittoral mixed substrata</u>

This biotope is characterised by *F. vesiculosus*, which is a resilient species able to re-grow from damaged holdfasts. Smothering impacts from dredging will occur when the biotope and fucoids are submerged and would not likely experience complete burial. Moderately exposed shores will recover quicker from smothering/siltation effects due to wave action, allowing the redistribution of material. Adult plants may experience reduced growth, and germlings and early life stages may experience mortality, however these impacts are temporary, and recovery will occur after the pressure is removed through natural processes (wave action). This biotope is classified as having a 'Medium' sensitivity and resilience to smothering at both light and heavy deposition rates, and it's classified resistance is 'Medium' and 'Low' for light and heavy deposition, respectively (Perry *et al*., 2024b).

LR.LLR.F.Pel *Pelvetia canaliculata* on sheltered littoral fringe rock

This biotope is characterised by *P. canaliculata*, which is a resilient species and the fronds of which may reach 15 cm in length. Smothering impacts from dredging will occur when the biotope and fucoids are submerged and would not likely experience complete burial. Moderately exposed shores will recover quicker from smothering/siltation effects due to wave action, allowing the redistribution of material. Adult plants may experience reduced growth, and germlings and early life stages may experience mortality, however these impacts are temporary, and recovery will occur after the pressure is removed through natural processes (wave action). While 5 cm of sediment would likely smother small species within this biotope, some species may withstand partial burial and sediment is redistributed over tidal cycles, allowing for recovery once the pressure is removed. This biotope is classified as having a 'Medium' sensitivity and resilience to smothering at both light and heavy deposition rates, and it's classified resistance is 'Medium' and 'Low' for light and heavy deposition, respectively (Perry, 2015).

LR.MLR.BF.Fser *Fucus serratus* on moderately exposed lower eulittoral rock

This biotope is characterised by *F. serratus*. Smothering impacts from dredging will occur when the biotope and fucoids are submerged and would not likely experience complete burial. Moderately exposed shores will recover quicker from smothering/siltation effects due to wave action, allowing the redistribution of material. Adult plants may experience reduced growth, and germlings and early life stages may experience mortality, however these impacts are temporary, and recovery will occur after the pressure is removed through natural processes (wave action). Smothering will cause direct mortality in the associated community, particularly sessile organisms, however due to the moderate exposure of the shores, recovery will be rapid once the pressure is alleviated. This biotope is classified as having a 'Low' sensitivity to smothering at light deposition rates and a 'High' sensitivity at heavy deposition rates (d'Avack *et al*., 2024a), which are not expected to occur.

LR.MLR.BF.Fser.Bo *Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders

Smothering impacts from dredging will occur when the biotope and algae are submerged and are unlikely to experience complete burial. Moderately exposed shores will recover quickly from smothering/siltation effects due to wave action, allowing for the redistribution of material. Adult plants may experience reduced growth, and germlings and early life stages may experience mortality, however these impacts are temporary, and recovery will occur after the pressure is removed through natural processes (wave action). Some red algal species, such as *C. officinalis*, have been observed on shores with high rates of sedimentation and Coralline turfs have the ability to trap sediment. Red filamentous algae have shown increased abundance during sedimentation experiments, while grazers and corallines were more sensitive. Deposition of 5 cm of fine material in a single event is unlikely to result in significant mortality due to the removal of sediments by natural processes (wave action and currents). Any impact on this biotope due to the proposed activity is not expected to cause significant effects. This biotope is classified as having a 'Low' sensitivity to smothering at light deposition rates and a 'Medium' sensitivity at heavy deposition rates (Tillin *et al*., 2024), which are not expected to occur.

LR.MLR.BF.Fser.R *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock

Smothering impacts from dredging will occur when the biotope and algae are submerged and are unlikely to experience complete burial. Moderately exposed shores will recover quickly from smothering/siltation effects due to wave action, allowing the redistribution of material. Adult plants may experience reduced growth, and germlings and early life stages may experience mortality, however these impacts are temporary, and recovery will occur after the pressure is removed through natural processes (wave action). Some red algal species, such as *C. officinalis*, have been observed on shores with high rates of sedimentation and Coralline turfs have the ability to trap sediment. Red filamentous algae have also shown increased abundance during sedimentation experiments, while grazers and corallines were more sensitive. Deposition of 5 cm of fine material in a single event is unlikely to result in significant mortality due to the removal of sediments by natural processes (wave action and currents). Any impact on this biotope due to the proposed activity is not expected to cause significant effects. This biotope is classified as having a 'Low' sensitivity to smothering at light deposition rates and a 'High' sensitivity at heavy deposition rates (d'Avack *et al*., 2024b), which are not expected to occur.

LR.MLR.BF.FvesB *Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock

This biotope is characterised by *F. vesiculosus*, which is a resilient species able to re-grow from damaged holdfasts. Smothering impacts from dredging will occur when the biotope and fucoids are submerged and are not expected to experience complete burial. Moderately exposed shores will recover quicker from smothering/siltation effects due to wave action, allowing the redistribution of material. Adult plants may experience reduced growth, and germlings and early life stages may experience mortality, however these impacts are temporary, and recovery will occur after the pressure is removed. Deposition of 5 cm of fine material in a single event is unlikely to result in a significant mortality event due to the removal of sediments by natural processes (wave action and currents). Any impact on this biotope due to the proposed activity is not expected to cause significant effects. This biotope is classified as having a 'Medium' sensitivity to smothering at both light and heavy deposition rates (Perry and Watson, 2024).

LR.MLR.BF.PelB *Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock

This biotope is characterised by *P. canaliculata*, which is a resilient species and the fronds of which may reach 15 cm in length. Smothering impacts from dredging will occur when the biotope and fucoids are submerged and are not likely to experience complete burial. Moderately exposed shores will recover quicker from smothering/siltation effects due to wave action, allowing the redistribution of material. Adult plants may experience reduced growth, and germlings and early life stages may experience mortality, however these impacts are temporary, and recovery will occur after the pressure is removed through natural processes (wave action). While 5 cm of sediment would likely smother small species within this biotope, the sediment is redistributed over tidal cycles, allowing for recolonisation and recovery. This biotope is classified as having a 'Medium' sensitivity to smothering at both light and heavy deposition rates (Perry and Garrard, 2020).

SS.SSa.IMuSa.AreISa *Arenicola marina* in infralittoral fine sand or muddy sand

Arenicola marina is a deposit feeding organism that rapidly reworks and mixes sediments. It is unlikely to be impacted by light deposition rates and as such, this biotope is classified as 'Not sensitive' to smothering at light deposition rates. Under heavy deposition, the biotope is classified as 'Low' sensitivity. Adult *Arenicola marina* may be able to resists smothering by up to 30 cm of sediment in a single discrete event. Based on sedimentation rates in the area it is unlikely that an event leading to this level of sedimentation will occur leading to the conclusion of 'Low' sensitivity for the biotope SS.SSa.IMuSa.ArelSa (Tyler-Walters *et al*., 2023).

5. Conclusion

There are naturally high suspended solid concentrations in the Shannon Estuary as a result of the large size of the Shannon catchment. Dredging operations have been occurring since 2014 and the biotopes present are adapted to a high level of natural sedimentation. There are relatively high current speeds and volumes of river runoff associated with the Shannon Estuary, and the suspended solid load moves with the tides and currents to ultimately settle on the seafloor. This creates an environment and communities adapted to and tolerant of a level of sediment deposition on the seafloor.

The intertidal biotopes recorded during this survey, which can be found in a summary table above (**Table 3-8**), fall under the broad NPWS community category 'Fucoid-dominated intertidal reef community complex' and are tolerant to sporadic and seasonal variation in sediment loads. At most, the biotopes identified experience a 'Medium' sensitivity to light levels of deposition, as are predicted in the zone of influence identified through modelling.

The hydrodynamic models demonstrate effective transport and dispersion of sediment away from the site during both ebbing and flooding tides, with the resulting suspended plume dispersing widely within approximately 18 hours of dredging activities. Areas exhibiting a slight potential for sediment deposition are located primarily towards the creek channel and along the adjacent shoreline to the east at Cappagh and Ballymote West (Aylevarroo Point), as well as localized deposition around Scattery Island.

The majority of dredged material remains suspended and is anticipated to disperse extensively throughout the outer and middle estuary regions (see **Appendix 1** for Sediment Transport Modelling Study of Kilrush Marina (appendum)). Deposition rates are generally below 0.2 kg/m^2 during neap tide dredging, which corresponds to an estimated sediment thickness of approximately 0.1 mm. However, localised hotspot areas such as Skagh Point record higher deposition rates of up to 5 kg/m^2, equivalent to a sediment depth of around 2.8 mm. These estimates are based on a sediment density of 1800 kg/m^3, a conservative value for fine sediments used in the simulations. The sediment deposition after each dredging campaign is estimated to be about 2.5 times that observed in the simulation. The maximum deposition is estimated to be approximately 35 mm following five planned dredging campaigns over an eight-year period. Under spring tide conditions, similar dispersal patterns are evident, including sediment deposition levels.

It should be noted that sediment deposition after each dredging campaign is likely to be approximately twice the modelled values. Nevertheless, over the duration of the proposed dredging project, it is unlikely that sediment deposition will have a significant adverse effect on the structure and function of the intertidal biotopes. The continual action of flooding and ebbing tides will minimise the potential for sustained deposition on the rocky shore habitats. The operations will be undertaken two hours after low tide, which allows for better dispersal and a reduced magnitude of effects. The biotopes are generally resilient and have a high recovery potential. The intertidal habitats within the impact footprint are assessed as having a low risk of significant long-term impact from the proposed maintenance dredging. Smothering and siltation effects may occur, however recovery is expected rapidly due to the moderate exposure and natural processes (tides, wave action, currents) redistributing any settled sediment. Sensitive biotopes at light deposition rates ('Medium' sensitivity) at stations within T1 (QM; QU), T2 (QM), T4 (QM; QU), and T5 (QM) are unlikely to experience significant adverse effects, either directly or cumulatively, due to the spatially limited footprint of the works, the recovery potential of the biotopes and species present, and natural resilience of the habitats present. Furthermore, the dredge works are expected to occur two hours after low tide, and at the level of sedimentation expected, natural processes will redistribute any settled sediment.

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