Shell Island Dredging

Shell Island Maintenance Dredging and Disposal Works - Environmental Report

B5016100/01| Rev 1

11 June 2026

Shell Island Maintenance Dredge

Project No:	B5016100
Document Title:	Shell Island Maintenance Dredging and Disposal Works - Environmental Report
Document No.:	B5016100/01
Revision:	Rev 1
Document Status:	Final
Date:	11/06/2026
Client Name:	Shell Island
Client No:	Shell Island 2026
Project Manager:	Michael Stickley
Author:	Isabel Lee-Elliott
File Name:	Environmental Report Shell Island 2026

Jacobs UK Ltd
Cottons Centre
Cottons Lane
London
SE1 2QG

www.jacobs.com

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
1	11/06/2026	Final	IL-E	TD	JB	BS

Contents

Figures

Tables

Plates

Executive Summary

This document considers potential environmental impacts arising from proposed maintenance dredging works on the marine environment around Shell Island, with particular reference to the features of the Morfa Harlech a Morfa Dyffryn SAC (Special Area of Conservation), Pen Llyn a'r Sarnau SAC and Morfa Dyffryn SSSI (Site of Special Scientific Interest), in addition to the Gogledd Bae Ceredigion SPA (Special Protection Area), which is immediately adjacent to the dredge disposal site.

The impacts of the localised, short term works at Shell Island are considered to be negligible, non-existent or potentially beneficial for individual ecological features and resources in and around the site, particularly those features relevant to the designation of the SPA, the two SACs and SSSI in the area. Dredging and disposal of sandy materials will be conducted so as to potentially enhance eroding dune habitats to the north of the works. All transport of materials will be conducted over existing roads and existing corridors along the beach to avoid damage to adjacent habitats, such as saltmarsh and Sabellaria reef. There will be some loss of non-designated intertidal habitats from the works, but it is expected that these areas will rapidly recover and be recolonised by invertebrates. The dynamic nature of the site, with seasonal variations in wave action combined with freshwater inputs leading to strong natural variations in suspended sediment levels, means that the relative impact of this small maintenance dredging operation will be negligible overall.

1. Project background

Shell Island (Mochras) is situated on the western coast of North Wales to the south of the Afon Artro estuary. Shell Island provides marina facilities for approximately 30 boats and is a significant source of input into the local tourist economy.

Maintenance dredging works (hereafter referred to as 'the works') are required at regular intervals to return the water levels to their original depths and allow craft to navigate safely. Dredging and disposal of sandy sediments will occur in the subtidal areas of the entrance channel utilising land based plant as opposed to vessels. It is important to note that dredging within the tidal basin has occurred over the past 20 years (last occurrence in March 2020). Disposal of dredged materials will follow the previously consented methodology of 2020 (Marine licence reference DML1961) and materials will be carried along existing slipways and predetermined routes over the foreshore and deposited on Bar Newydd.

This report is supplemented by a Habitats Regulations Assessment (HRA) (Jacobs, 2026) and presents a summary of the general marine environmental baseline, potential impacts of the works and any requirements for mitigation or monitoring.

2. Designated sites

The works are within European and nationally designated sites for nature conservation. There are two Special Areas of Conservation (SACs), a Special Protection Area (SPA) and a Site of Special Scientific Interest (SSSI) in the immediate vicinity of the works (Figure 1). The European Sites are considered in more detail in the HRA report (Jacobs, 2026).

The Morfa Dyffryn a Morfa Harlech SAC is designated for the presence of the following Annex I Habitats:

- Embryonic shifting dunes;
- Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes`);
- Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*);
- Fixed coastal dunes with herbaceous vegetation ("grey dunes")" * Priority feature; and,
- Humid dune slacks.

It is also designated for the following Annex II species:

- Petalwort (*Petalophyllum ralfsii*).

The Pen Llyn a'r Sarnau SAC is designated for the presence of the following Annex I Habitats:

- Estuaries;
- Coastal lagoons;
- Large shallow inlets and bays;
- Reefs;
- Mudflats and sandflats not covered by seawater at low tide;
- Salicornia and other annuals colonising mud and sand;
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); and,
- Submerged or partially submerged sea caves.

It is also designated for the following Annex II species:

- Bottlenose dolphin (*Tursiops truncatus*);
- Grey seal (*Halichoerus grypus*); and,
- Otter (*Lutra lutra*)

These features, along with the features listed below, are also the basis for the site's designation as a SSSI, and it supports a number of nationally notable flora. In addition, the following ecological features may be of conservation concern:

- Saltmarsh habitats;
- Breeding birds (redshank (*Tringa totanus*), ringed plover (*Charadrius hiaticula*), curlew *(Numenius arquata*));
- Over wintering and migratory birds (primarily wildfowl);
- Migratory fish;
- Marine mammals (bottlenose dolphin, grey seal); and,
- Otter.

The Morfa Dyffryn SSSI is of special interest for its terrestrial and marine intertidal as well as geomorphological features. In addition to the sand dunes (which back the majority of the coastline), the sea shore, saltmarsh and grassland, it is also notified for its nationally rare and scarce plants, mosses and liverworts, nationally rare and scarce invertebrates, great crested newts, and *Sabellaria* reefs. The majority of the coastline is backed by sand dunes, with some till cliffs. Extending offshore from the northern end of the site is Sarn Badrig, one of three glacial Sarnau (unique rocky reefs extending out within Cardigan Bay).

The Gogledd Bae Ceredigion SPA contains an Article 4.1 Qualification (79/409/EEC), for regularly supporting and overwintering in the area, the following:

- Red-throated diver (*Gavia stellata*) - 1,186 individuals representing 7% of the wintering population in Great Britain (2001/02-2003/04).

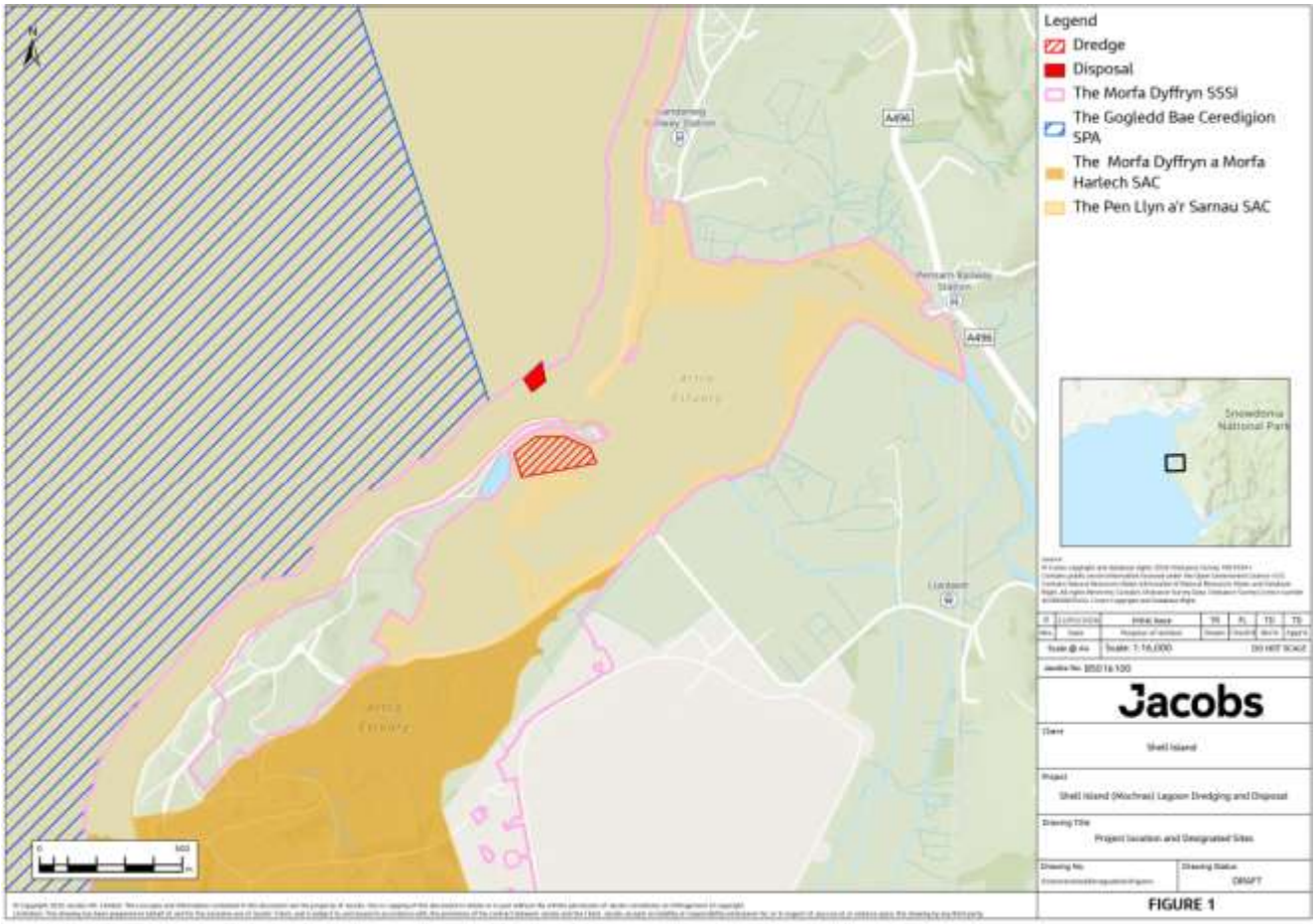

Figure 1 Designated sites in the vicinity of the works.

3. Marine habitats and species

The area is an important site for geomorphology, originally being a spit across the mouth of the Afon Arto to the north of the works. Morfa Dyffryn south of the Afon Arto (and the area of works) comprises a narrow fringing beach of shingle, cobbles and sand at the southern end with low dunes. The dunes are wider and higher moving north, enclosing large slacks. At Mochras, where the works are to occur, the shoreline is formed of low till cliffs and a cobble-boulder beach (providing protection from northwest wave action). Dune migration in the area is apparent and there is likely limited supply of sand from the north or south. Morfa Dyffryn, although similar, shows many differences to Morfa Harlech (to the north), forming a sandy beach aligned towards the south-west swell (CCW, 2001).

3.1 Dunes

Dune habitats are present in the wider area around the works. The SSSI Citation includes the following information about the dune habitats (CCW, 2001).

The dune system of Morfa Dyffryn to the south of the works site is highly dynamic and supports marram grass (*Ammophila arenaria*) with developed mobile dune vegetation but becoming less frequent inland. The nationally scarce Portland spurge (*Euphorbia portlandica*) can also be found here. Other species include sand couch (*Elytrigia juncea*), red fescue (*Festuca rubra*) smooth meadow-grass (*Poa pratensis*), sand sedge (*Carex arenaria*) and herbs such as cat's ear (*Hypochoeris radicata*), rest harrow (*Ononis repens*) and wild pansy (*Viola tricolor*). Annual species including sea mouse-ear (*Cerastium diffusum*), thyme-leaved sandwort (A*renaria serpyllifolia*) and the nationally scarce dune fescue (*Vulpia fasciculata*) are also present. Sand dune mosses (*Tortula ruralis* ssp. *ruraliformis*, *Homalothecium lutescen* and *Brachythecium albicans*) are locally abundant. This site supports a wide range of fungi species including the nationally notable *Inocybe vulpinella, Cyathus stercoreus, Geastrum schmidelii* and *Tulostoma brumale*.

Moving landward, fixed-dune vegetation includes grassland with frequent red fescue, birds foot trefoil (*Lotus corniculatus*), lady's bedstraw (*Galium verum*) and common restharrow (*Ononis repens*). In some areas, particularly the fringes of the airfield, there is more acid grassland. South of Mochras there are areas of neutral grassland with frequent crested dog's-tail (*Cynosurus cristatus*) and common knapweed (*Centaurea nigra*). Younger slacks within the mobile dunes support nationally scarce petalwort (*Petalophyllum ralfsii*), the nationally scarce liverwort (*Moerckia hibernica*) and the nationally scarce variegated horsetail (*Equisetum variegatum*). Six nationally rare Bryum moss species, have also been recorded from Morfa Dyffryn.

Older slacks are dominated by creeping willow (*Salix repens*) with damp slacks supporting common sedge (*Carex nigra*), silverweed (*Potentilla anserina*), moss (*Calliergon cuspidatum*) and creeping bent (*Agrostis stolonifera*). Orchids and the nationally scarce green-flowered helleborine (*Epipactis phyllanthes*) are also present. Several other nationally scarce plants are also present including sharp rush (*Juncus acutus*) within the dune slacks, marshy grassland and upper saltmarsh.

The dunes support invertebrates (including 15 nationally rare or scarce) and sand dune specialists including, a robberfly (*Pamponerus germanicus*), a carrion beetle (*Hypocaccus rugiceps*), the silver spiny digger wasp (*Oxybelus argentatus*) and the dune tiger beetle (*Cicindela maritima*). Great crested newt (*Triturus cristatus*) is found in water supply ponds at Llanbedr airfield, its only known location in Meirionnydd.

3.2 Saltmarsh and intertidal habitat

Saltmarsh and intertidal habitat encompass the works area within the lagoon. The SSSI Citation includes the following information about the saltmarsh and intertidal habitats (CCW, 2001).

Areas of saltmarsh within the Artro Estuary are relatively species-rich with the nationally scarce lax flowered sea-lavender (*Limonium humile*) present as well as species such as sea arrowgrass (*Triglochin maritim*a), sea plantain (*Plantago maritima*), common saltmarsh-grass (*Puccinellia maritima*), greater sea spurrey (*Spergularia media*), common cord-grass (*Spartina anglica*), annual sea-blite (*Suaeda maritima*), annual glasswort (*Salicornia* sp.),

saltmarsh rush (*Juncus gerardii*), thrift (*Armeria maritima*) and sea-milkwort (*Glaux maritima*). Other areas support the nationally scarce perennial glasswort (*Sarcocornia perennis*). In terms of habitats immediately around the vicinity of the dredging works, these comprise Atlantic salt meadows and *Salicornia* (Figure 2).

The intertidal zone (mid and lower shore) encompassing the works disposal site from north of Llandanwg extending to the southern end of Mochras at Morfa Dyffryn supports areas of nationally important honeycomb worm (S*abellaria alveolata*) biogenic reefs. The reefs provide rockpool habitat and the boulders within the reefs are covered with bladder wrack (*Fucus vesiculosus*) and toothed wrack (*F. serratus*). The rockpools support the red algae (*Corallina officinalis*) and (*Lithophyllum* spp.), winkles (*Littorina littorea*) and the Irish moss (*Mastocarpus stellatus*). Although the works include transport corridors across the intertidal area where reefs have been recorded, the access routes and disposal area themselves do not support biogenic reefs, as evidenced by Plate 1 (photograph taken in April 2026) and the habitat mapping (Figure 2).

Historically, there was concern that the area may have supported piddocks (boring bivalves) and *Pectenogammarus planicrurus*; however, specific surveys for these taxa indicated that the habitat (e.g., grain size) was not suitable, and this was confirmed by an absence of records (Hebog Environmental, 2005).

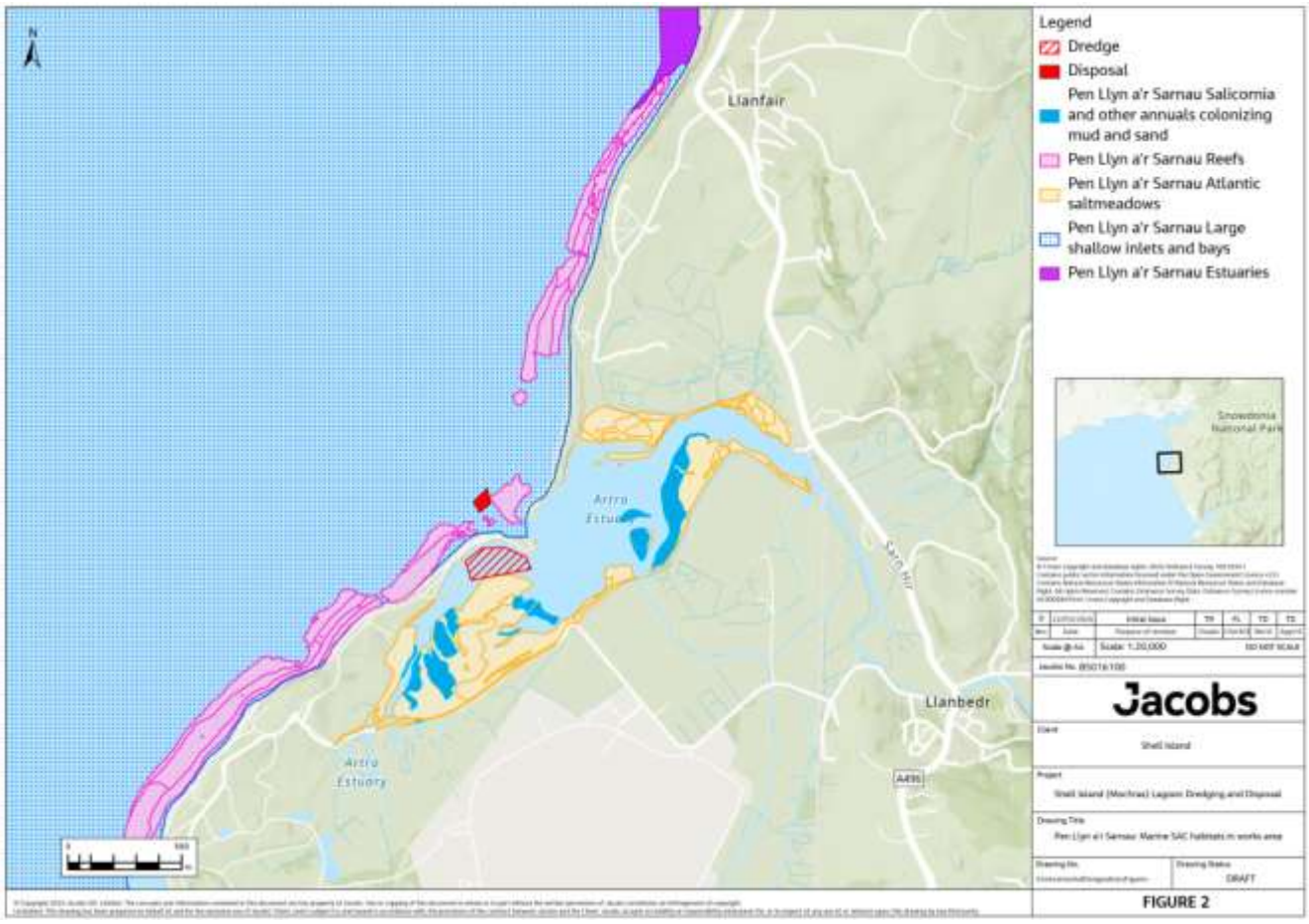

Figure 2 SAC Habitats around the works area.

Plate 1 Vehicular access route through the sand (centre of photograph) to the disposal site.

3.3 Marine invertebrates

The SSSI Citation includes general information about the marine invertebrates inhabiting the area (CCW, 2001).

The boulders on the upper shore of the Artro Estuary support barnacles (*Chthalamus montagui*) and (*C. stellatus*), and the limpet (*Patella vulgata*). Landawg beach to the north of the mouth of the Artro Estuary supports sea-kale (*Crambe maritima*).

Artro Estuary sediments support the lugworm (*Arenicola marina*), the ragworm (*Hediste diversicolor*) sandmason worm (*Lanice conchilega*), cockles (*Cerastoderma edule*), gaper clam (*Mya arenaria*) and peppery furrow shell (*Scrobicularia plana*).

The estuary is colonised by wracks such as egg wrack Ascophyllum nodosum and spiral wrack (*Fucus spiralis*). Coarse sand, cobbles and boulders form a band along the length of the site, supporting sand hoppers (Tallitridae) in the strand line. The isopod (*Eurydice pulchra*), amphipod (*Haustorius arenarius*) and polychaete (*Scololepis squamata*) are found in the exposed sand of the mid shore in a wide band along the length of the site south of the Afon Artro. A band of finer sand on the lower shore supports razor shell (*Ensis siliqua*) and heart urchin (*Echinocardium cordatum*).

According to NBN (https://records.nbnatlas.org) no Invasive Non Native Species (INNS) have been recorded in the dredge or disposal areas.

3.4 Birds

In addition to the presence of red throated diver, of which this area is of European importance, this area is of local importance for breeding, wintering and passage birds. The SSSI Citation indicates that in the sand dunes there are significant populations of breeding species such as skylark (*Alauda arvensis*), whitethroat (*Sylvia communis*), wheatear (*Oenanthe oenanthe*) and sedge warbler (*Acrocephalus schoenobaenus*). The upper saltmarsh supports breeding redshank (*Tringa totanus*) and lapwing (*Vanellus vanellus*). Chough (*Pyrrhocorax pyrrhocorax*) and hen harrier (*Circus cyaneus*) have been recorded in the dunes and reedswamp areas, respectively. The beach and estuary is used on passage by waders.

3.5 Fish

The Afon Artro supports a sea trout (*Salmo trutta*) and Atlantic salmon (*Salmo salar*) fishery. In 2024, 10 sea trout were caught based on catch returns records[1]. Other migratory fish species are also expected to be present, e.g., European eel (*Anguilla anguilla*) and River lamprey (*Lampetra fluviatilis*).

In the area local to the works there are expected to be typical inshore marine fish communities consisting of small species such as gobies, blennies and some commercial species.

3.6 Mammals

As well as otter, which utilise the drains, tidal creeks, ponds and swamp areas of Morfa Dyffryn; and water vole (*Arvicola amphibius*) and brown hare (*Lepus europaeus*) are also known to inhabit/breed in the area.

In terms of marine mammals, as outlined in the designated sites section, the waters off this area of coast are utilised by bottlenose dolphin and grey seal. The nearest breeding colony of grey seal is approximately 50 km to the west. Recent Seawatch sightings off the west coast of Wales indicate that species such as harbour porpoise (*Phocoena phocoena*) and common dolphin (*Delphinus delphis*) are also utilising the area[2].

[1] https://www.gov.uk/government/publications/salmonid-and-freshwater-fisheries-statistics-for-2024/salmonid-and-freshwater-fisheries-statistics-for-2024#eel-smelt-and-lamprey-catches
[2] https://www.seawatchfoundation.org.uk/recent-sightings/

4. Potential impacts and mitigation

Works are planned for November-December 2026, and will be localised and over a short period (2 weeks). Sandy material will be dredged at low tide from the subtidal area of the entrance channel to the main tidal basin with a 'Hymak' tracked excavator and three 25 tonne capacity trucks. The depth of sandy material removed by the dredge will be approximately 0.29 m, and will allow boats to just float in the water at low tide. Sandy sediments will be deposited on Bar Newydd at low tide. This will involve the use of 3 tipper trucks being driven over existing slipways from the dredge area, to avoid unnecessary damage to intertidal habitats.

Each tipper truck will carry 25 tonnes of sandy material dredged from the subtidal part of the estuary, i.e. 75 tonnes will be deposited per trip from the estuary to the disposal site. The landowner estimates that 3 trips can be made per hour of work. With a working window of 2.5 hours per tide, this will result in 7 or 8 truck loads of sand being deposited on Bar Newydd per tide, i.e. 200 tonnes per tide or 400 tonnes per day. Assuming that each truck has a volume of 15 m^3, and spreads this over an area of 75 m^2 (3 m x 25 m), eight truck loads would cover an area of 600 m^2 (0.06 ha) per tide, with a depth of 0.2 m. The total amount of sandy material to be deposited in this way is 4000 tonnes, which is the same volume of sand consented for the previous dredging of the site in 2013. At 400 tonnes per day, this will involve 10 days of works.

Impact pathways from the disposal methods would be as follows (no SAC features are present under the footprint of the dredge area):

- physical damage to species or habitats from vehicular access;
- smothering from dredge material deposition (directly or carried in suspension);
- general disturbance to fauna from vehicles and plant working in the intertidal zone; and,
- depositing sandy materials adding material to eroding habitats using the littoral drift system (potential beneficial).

Features potentially affected by the works and the potential impacts affecting them, mitigation and residual impacts are outlined in Table 4-1. Note that European sites potentially affected by the works are considered in more detail in the HRA (Jacobs, 2026).

In summary, potential impacts range from none/negligible to potentially beneficial, as a result of the works.

Table 4-1 Potential impacts and mitigation on ecological features.

Ecological Features	Potential impact	Mitigation	Residual impacts
Dunes (all types present)	No direct impact, but materials can be transported northwards in the littoral drift system and may deposit on eroding dunes	No mitigation required	Potentially Beneficial: Depositing sandy materials on Bar Newydd and Dinghy beach to ensure transport into natural littoral drift system could add material to eroding dunes north of the dredge site using the littoral drift system responsible for formation of the dune habitats

Ecological Features	Potential impact	Mitigation	Residual impacts
Benthic fauna including *Sabellaria alveolata* reefs	Physical damage to benthic organisms (including reefs) from access route.	No mitigation required. The access route is planned to be along an established narrow strip of the beach where there is no reef, and substrate is coarse, therefore likely a low density of fauna	Negligible
	Disturbance, loss of habitats, smothering of habitats and reefs.	No mitigation required. There would be rapid recolonisation of dredged area by fauna within 3-4 months. Sand will be disposed so that it re-enters the northerly littoral drift system and further avoids smothering southern reefs, potentially travelling in suspension to feed northern reefs. *Sabellaria* requires some sand in suspension to build its reefs and has a relatively high tolerance to sedimentation.	Negligible (potentially minor beneficial but not proven)
Intertidal substrate	Temporary smothering of habitats from deposition; loss of habitats	None possible for habitat loss as works are required to return levels to previous navigable depths. However, leaving intervals between depositions of sandy material at disposal sites will minimise the depth of build-up of materials on existing habitats; work is proposed only to occur at low tide. Disposed material is likely to be a similar grade to the same as the *in situ* material. The dredge area is likely to be recolonised very rapidly, within 3-4 months, and represents less than 1% of the total area of available feeding habitat for birds and fish.	Negligible
Vegetated intertidal habitats (Saltmarsh and Atlantic salt meadows (these form the upper	Sandy material transported in suspension could initially be deposited on vegetated habitats	None required; Given the amounts of sand that will be deposited on Bar Newydd beach or disturbed during dredging (minimal), before being suspended by incoming tides, it is unlikely that vegetated habitats within	Negligible

Ecological Features	Potential impact	Mitigation	Residual impacts
reaches of salt marshes); *Salicornia*		the estuary will be affected by sand deposition	
Breeding, wintering and passage birds	Temporary disturbance to birds, temporary loss of feeding habitats.	No mitigation required. Works conducted outside breeding season and noise will be limited to excavator any tipper trucks. Works will be conducted on only a temporary basis during the winter period; wintering birds are also not a primary or secondary feature for SAC selection. Works conducted so as to ensure negligible losses to feeding habitats (see Intertidal habitats above). Access routes between dredging and disposal sites will also use existing roads/beach corridor to minimise disturbance to birds.	Negligible
Fish	Temporary disturbance to fish, temporary loss of feeding habitats, increased suspended sediments.	No mitigation required. Works conducted in the dry; materials disposed so as to be dispersed in natural littoral drift system as quickly as possible. Works conducted so as to ensure negligible losses to feeding habitats (see Intertidal habitats above).	Negligible
Benthic fauna and habitats including *Sabellaria alveolata* reefs	Disturbance, loss of habitats, smothering of habitats and reefs.	No mitigation required. The site is dynamic in nature, with seasonal variations in wave action combined with freshwater inputs leading to strong natural variations in suspended sediment levels. There would be rapid recolonisation of dredged area by fauna within 3-4 months. Sand will be disposed so that it re-enters the northerly littoral drift system and further avoids smothering southern reefs, potentially travelling in suspension to feed northern reefs. *Sabellaria* requires sand in suspension to build its reefs	Negligible (potentially minor beneficial but not proven)

Ecological Features	Potential impact	Mitigation	Residual impacts
		and has a relatively high tolerance to sedimentation.	
Mammals (marine) including otter	Disturbance or injury/mortality	No mitigation required. Activities not within/adjacent to haul out sites for grey seal, e.g., as identified by Westcott and Stringell, 2004); activities carried out in the dry so will not disturb marine mammals. Activities relating to the works are temporary (10 days) and localised in nature with slow moving vehicles on the intertidal zone, therefore any foraging otters will be able to avoid working zone.	None

5. Monitoring and Reporting

It is recommended that photographs of the transport routes before, during and after works are taken, to be used to document the vehicular route and hence ensure that there is no deviation from the works plan. Photographic evidence such as this can also be used to show that sediments are deposited in accordance with agreed procedures. Repeat photographs of a marker post at the sand disposal site is also recommended to be used to monitor whether the deposited sandy sediments disperse in accordance with the predictions outline within this report. Biological features have previously been photographed, as detailed within a previous Appropriate Assessment Screening report (Halcrow, 2005), and, where feasible, will be photographed following the works. These photographs can be included as information within the long-term management plan and will help to inform any future changes to routes or methods of disposal that may be required in the future.

6. References

CCW (2001). SITE OF SPECIAL SCIENTIFIC INTEREST CITATION GWYNEDD/MEIRIONNYDD MORFA DYFFRYN. Available at: https://cdn.cyfoethnaturiol.cymru/643602/SSSI_0456_Citation_EN001f701.pdf [Accessed May 2026].

Jacobs (2026). Shell Island Maintenance Dredging and Disposal Works - Habitats Regulations Assessment: Screening and Appropriate Assessment.

Halcrow (2005). Shell Island Maintenance Dredging and Disposal Works, Llanbedr. Appropriate Assessment. Halcrow report 13pp.

Halcrow (2006). Long term management plan for dredge and disposal operations at Shell Island: Llandanwg beach. Halcrow Report. 12 pp

Hebog Environmental (2005). Shell Island *Pectenogammarus* and Piddock Survey November 2005. Hebog Environmental Report for Halcrow Ltd.

https://records.nbnatlas.org (2026). NBN Altas. Available at: https://records.nbnatlas.org/#tab_simpleSearch [Accessed May 2026]