



Shell Island Maintenance Dredge

Shell Island Maintenance Dredging and Disposal Works - Appropriate Assessment

SI_report_03 | Rev 1

18 December 2019

Shell Island

Shell Island



Shell Island Maintenance Dredge

Project No: B2371200
Document Title: Shell Island Maintenance Dredging and Disposal Works - Appropriate Assessment
Document No.: SI_report_03
Revision: Rev 1
Document Status:
Date: 18 December 2019
Client Name: Shell Island
Client No: Shell Island
Project Manager: Kevin Jones
Author: Nancy James
File Name: SI_report_03_Appropriate Assessment_dec19

Jacobs UK Ltd
Burderop Park
Swindon SN4 0QD
United Kingdom
T +44 (0)1793 812 479

www.jacobs.com

© Copyright 2019 Jacobs U.K. Limited. The concepts and information contained in this document are the property of Jacobs. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright.

Limitation: This document has been prepared on behalf of, and for the exclusive use of Jacobs' client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this document by any third party.

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
0	17 September 2019	For internal review and checking	Nancy James	Beatriz Serato	NA	NA
1	17 December 2019	Updates amended and for submission	Nancy James	Beatriz Serato	Isabel Lee-Elliott	Kevin Jones

Contents

1.	Introduction.....	1
1.1	Background	1
1.1.1	<i>Introduction.....</i>	1
1.1.2	<i>Dredging History and Requirements</i>	1
2.	Dredging and Disposal Methods and Impact Pathways.....	3
2.1	Information on SPA and SACs.....	3
2.1.1	Pen Llyn a'r Sarnau SAC	3
2.1.2	Morfa Harlech a Morfa Dyffryn SAC	4
2.1.3	Gogledd Bae Ceredigion SPA.....	4
2.2	Potential Impact pathways of Dredging Operations on SPA Features	5
2.2.1	Gogledd Bae Ceredigion SPA feature	5
2.3	Potential Impact pathways of Dredging Operations on SAC Features	5
2.3.1	<i>LSIB feature Conservation Objectives and Potential Impacts.....</i>	5
2.3.2	<i>Reef Feature Conservation Objectives and Potential Impacts</i>	6
2.3.3	Atlantic saltmeadows	6
3.	Magnitude of Impacts to SPA and SAC Features	7
3.1	LSIB feature	7
3.2	<i>Sabellaria</i> reefs.....	7
3.3	<i>Atlantic saltmeadows.....</i>	8
4.	Summary of LSEs, Mitigation and Potential Benefits	9
4.1	LSIB feature	9
4.2	<i>Sabellaria</i> reefs.....	9
4.3	Atlantic saltmeadows	9
5.	Incombination Effects.....	10
6.	Monitoring and Reporting	11
7.	References	12

1. Introduction

1.1 Background

1.1.1 Introduction

A network of protected areas for certain habitats and species of conservation importance has been established by European Union (EU) member states under the Habitats and Birds Directives (Council Directive 92/43/EEC and Directive 2009/147/EC); these areas are known as European sites. The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations) require that an appropriate assessment of the implications must be made by the decision-making authority (or Competent Authority) if a project is likely to have a significant effect on a European site alone or in combination with other projects. The four-stage process of determining impacts to European sites under the Habitats Regulations is known as Habitats Regulations Assessment (HRA).

This document constitutes the HRA Stage 1 (Screening) of the European sites with the potential to be affected by proposed maintenance dredging operation works at Shell Island (Mochras), Llanbedr, Gwynedd. Dredging and disposal for maintenance purposes at this site has been previously undertaken, most recently in 2014. Because the dredging works are every three years or so, new consents are obtained prior to each dredging and disposal operation, to ensure any new and environmentally sensitive issues are captured and to ensure as up to date information as possible is used as part of the consenting process.

The methods for dredging and disposal of dredged materials are summarised in this screening document and are given in detail in the Long Term Management Plan (Halcrow, 2006). These options were previously agreed with Natural Resources Wales (NRW) through the consenting process in 2013, after a screening and scoping request, scoping opinion, acceptance of supporting documents (including relating to Appropriate Assessment) and the obtaining of a Marine Licence.

The screening opinion obtained in 2013 stated that the works were not likely to cause significant environmental impacts. The dredging and disposal activities to be undertaken in 2020 will be very similar to the licenced works undertaken in 2013.

An Environmental Review has been developed (Jacobs, 2019) which has informed this Screening document. This Screening study considered potential effect pathways between the works and the qualifying interest features of three European sites identified within the dredge and disposal sites' zone of influence. These designated sites are:

- Morfa Harlech a Morfa Dyffryn SAC,
- Pen Llyn a'r Sarnau (PLAS) SAC; and
- Gogledd Bae Ceredigion SPA,

The purpose of this Screening study was to identify whether the dredging and disposal works would result in likely significant effects, alone or in combination, on the qualifying interest features of the aforementioned European sites.

1.1.2 Dredging History and Requirements

Shell Island provides marina facilities for around 100 boats and is a significant source of input into the local tourist economy. Maintenance dredging is required at regular intervals to return the water levels to their original depths and allow craft to navigate safely. Dredging of sandy sediments will occur in the subtidal areas of the entrance channel. It is important to note that dredging of muddy materials within the tidal basin have occurred in the past but will not occur in 2020. Disposal of dredged materials will follow the previously consented methodology of 201 and materials will be carried along existing slipways and predetermined routes over the foreshore and deposited on Bar Newydd.

The materials to be dredged required analysis for contaminants and particle size (PSA), which was undertaken in December 2019 for the purposes of the marine licence application. The chemical results showed that the contamination was of no concern, according to Cefas sediment action level limits¹, and PSA results showed that the sediments were predominantly sand.

The dredging lies within the PLAS SAC, but previous correspondence with the NRW (previously Countryside Council for Wales - CCW) has stated that there are no SAC intertidal features under the footprint of the dredge. As a result, the potential for Likely Significant Effects (LSE) is related to the disposal of sandy materials from the dredging operation, therefore the zone of influence is Bar Newydd and the coastal waters within the tidal excursion.

¹ <https://www.pla.co.uk/Environment/Cefas-Guideline-Action-Levels-for-the-Disposal-of-Dredged-Material>

2. Dredging and Disposal Methods and Impact Pathways

Works are planned for February-March 2020. 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 m³, and spreads this over an area of 75 m² (3 m x 25 m), eight truck loads would cover an area of 600 m² (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 under the footprint of the dredge area):

- physical damage to species or habitats from vehicular access; and
- smothering from dredge material deposition (directly or carried in suspension).

2.1 Information on SPA and SACs

2.1.1 Pen Llyn a'r Sarnau SAC

Annex I habitats that are a primary reason for site designation:

- **Sandbanks which are slightly covered by sea water all the time**

This is a dynamic habitat and includes the sandbanks of Devil's Ridge, Bastram Shoal, the Tripods, and areas within and to the south of Tremadog Bay.

- **Estuaries**

These include examples of bar-built estuaries in north-west Wales, with a sediment gradient from sand in the outer estuary to mud in the sheltered estuary. These along with fringing saltmarsh provide important habitats.

- **Coastal lagoons * Priority feature**

This habitat relates to Morfa Gwylt lagoon across the mouth of the Afon Dysynni in mid Wales.

- **Large shallow inlets and bays**

Tremadog Bay is situated south of the Llyn Peninsula and contains of a mosaic of different sediment and habitat types, and associated plant and animal communities.

- **Reefs**

This SAC contains a variety of reef habitats, including bedrock, boulders, cobbles, sandy rock, supporting diverse plant and animal communities. Reefs can be dominated by mussels e.g. *Modiolus modiolus*, ascidians, or the tube worm (*Sabellaria spinulosa*), for example.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- **Mudflats and sandflats not covered by seawater at low tide**
- **Salicornia and other annuals colonizing mud and sand**
- **Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)**
- **Submerged or partially submerged sea caves**

Annex II species present as a qualifying feature, but not a primary reason for site selection:

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

2.1.2 Morfa Harlech a Morfa Dyffryn SAC

Annex I habitats that are a primary reason for selection of this site:

- **Embryonic shifting dunes**

Embryonic shifting dunes occur along narrow zones mainly in the Morfa Harlech part of the complex.

- **Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")**

The shifting dune habitat at this site are extensive where they occur, being particularly well-developed at Morfa Dyffryn.

- **Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)**

Both Morfa Harlech and Morfa Dyffryn have comparatively large areas of this habitat present.

- **Humid dune slacks**

Examples of three different humid dune slack communities have been recorded within the complex.

Annex II species that are a primary reason for selection of this site

- **Petalwort (*Petalophyllum ralfsii*)**

2.1.3 Gogledd Bae Ceredigion SPA

The qualifying feature of the SPA is the nationally important nonbreeding population of red-throated diver (*Gavia stellata*).

2.2 Potential Impact pathways of Dredging Operations on SPA Features

2.2.1 Gogledd Bae Ceredigion SPA feature

The Gogledd Bae Ceredigion SPA is adjacent to the dredge disposal site and will not be encroached upon by the proposed dredging operations. However, as the qualifying feature of the SPA is the red-throated diver, and as this species is highly mobile, they may encroach upon the dredge disposal area to forage for invertebrates that are being disposed of along with the dredged arisings. As all works will occur in the dry at low water, there are no impact pathways from the dredging operations on this feature.

2.3 Potential Impact pathways of Dredging Operations on SAC Features

Considering the SAC features presented in Section 2.1, those that could be in the zone of influence of the proposed dredge disposal site are:

- the Large Shallow Inlets and Bays (LSIB) feature, extending into the mouth of the Afon Artro;
- the Atlantic saltmeadows within the Afon Artro and
- Reefs (*Sabellaria*) to the north and south of the site.

2.3.1 LSIB feature Conservation Objectives and Potential Impacts

Conservation objectives (NRW, 2018) for LSIB include:

- The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing.
- The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Particularly the geology, sedimentology, geomorphology, hydrography and meteorology, water and sediment chemistry and biological interactions. Contaminant levels in the water column and sediments derived from human activity to be at or below existing statutory guideline concentrations (amongst others).
- The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. This includes: species richness, population structure and dynamics, physiological health, reproductive capacity recruitment and mobility range.

It was noted in the previous Appropriate Assessment screening (Halcrow, 2005) that the LSIB feature, which may have contained the nationally important community MLR.Myt.Pid piddocks in clay could have been affected directly by disposal of sandy sediments from the dredging works. A survey of the LSIB and potential piddock habitat just south of the Mochras Lagoon estuary mouth was therefore conducted at the time (2006) to verify the presence or absence of live piddocks, of which there found to be none.

It is currently proposed to dispose sandy material in such a way as to return sandy sediments to the natural northerly littoral drift system. The disposal site is at Bar Newydd at the estuary mouth. The dunes north of the marina site at Llandanwg beach are subject to erosion and it is thought that they would benefit from a supply of sand to the littoral drift system (ABP Research, 2001). Another option, of disposal of sand directly onto Llandanwg Beach below the dunes, has been suggested by NRW and was explored in previous consents for maintenance dredging at Shell Island (ABP Research, 2001) and the current long-term management plan.

As the works are proposed to occur at low tide, there could be a pathway for material to smother intertidal habitats, including the LSIB feature.

2.3.2 Reef Feature Conservation Objectives and Potential Impacts

Conservation objectives for *Sabellaria* reefs include:

- That the overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing. The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Particularly the geology, sedimentology, geomorphology, hydrography and meteorology, water and sediment chemistry and biological interactions.
- That the presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. This includes: species richness, population structure and dynamics, physiological health, reproductive capacity recruitment and mobility range.

The fate of extra sediment in the system following disposal of materials is also explored here, by calculating the amounts of material that will be deposited during each tide and using existing knowledge of flow routes along the coast to predict the fate of deposited materials at high tide. This will provide information on the impact of sand deposition on *Sabellaria* relative to background movement of materials on site. It will also allow for some prediction of potential beneficial effects of reintroduction of sandy materials to the drift system on *Sabellaria* reefs and dunes north of the site, at Llandanwg Beach.

Impacts that may hinder the conservation objectives for the reef feature described above would include be smothering from deposition of dredge sediments. The *Sabellaria* was therefore photographed during a walkover of the site prior to the previous works, to allow for assessment of potential impacts of sand deposition to these reefs. The deposition site is positioned at the end of a sand bar in the intertidal zone, not in any *Sabellaria* reef zones

As with the LSIB feature, information on *Sabellaria* was used to determine whether there was a pathway for the access route to significantly affect reef habitats by physical damage from vehicular movements. This vehicular access route determined at the design stage was the most direct out to the sand bar forming Bar Newydd and does not cross any *Sabellaria* reef habitat.

2.3.3 Atlantic saltmeadows

Conservation objectives (NRW, 2018) for Atlantic saltmeadows include:

- The overall distribution and extent of the habitat within the site is stable or increasing.
- The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Particularly the geology, sedimentology, geomorphology, hydrography and meteorology, water and sediment chemistry and biological interactions.
- The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. This includes: species richness, population structure and dynamics, physiological health, reproductive capacity recruitment and mobility range.

No pathways for effect have been identified for Atlantic saltmeadows from deposition activities as the routes of transport between dredge and disposal sites are over existing roads and slipways. The only pathway possible would be if sandy material transported in suspension could initially be deposited on Atlantic saltmeadow habitats, smothering plants and altering the sediment composition.

3. Magnitude of Impacts to SPA and SAC Features

3.1 LSIB feature

The main effect on the LSIB feature will be the deposition of 200 tonnes of sand per tide on the exposed shore at low tide. This material will not remain deposited for more than a few hours, before being carried into suspension by the rising tide. The entire coast is subject to deposition of volumes of sand that have (1) been sufficient to establish and maintain extensive *Sabellaria* reefs (discussed further in 4.2) and (2) been sufficient to regularly cover historical piddock communities. Furthermore, the coast is exposed to west/southwest wave action that varies strongly in intensity with the seasons, thereby resulting in wide natural variations in the amounts of sandy material that are suspended and deposited on the LSIB feature at any given time or tide.

The temporary addition of 200 tonnes of sand per tide is therefore unlikely to make any impact on the LSIB feature relative to the natural variation in deposition of sandy materials along the entire coast. Further, this sand will temporarily cover 600 m² or 0.06ha of the SAC, which is 0.00004% of the SAC's total area of 146,023.48 ha. Thus, the impact of sand deposition at Bar Newydd on the LSIB feature is considered to be **negligible**.

3.2 *Sabellaria* reefs

Sabellaria reefs occur immediately south of the estuary and within the estuary channel adjacent to Bar Newydd, and to the north of the estuary at Llandanwg Beach. The northern reefs are approximately 400 m away from Bar Newydd, which is the site for disposal of sandy materials from dredging. The reefs are supplied by sand from wave action that is predominantly from the west and southwest, and by the northerly littoral drift system that carries sand in suspension towards Llandanwg Beach and its dunes. *Sabellaria* require an adequate supply of sand in suspension to build their honeycomb reefs (Jackson, 2008; ABP Research, 2001). Thus, the wave action and drift system are essential for transporting sand in suspension to maintain the reef features. The existence of extensive living and historical reefs on Llandanwg Beach and adjacent to Bar Newydd suggests that sandy sediment transported by wave and littoral drift action has been an essential characteristic of the coast for a considerable period of time.

The coast at Bar Newydd and north of the estuary at Llandanwg Beach is exposed to winter wave heights that exceed 1 m for almost 50% of the time. Locally generated waves have 5-10 second periods, with swell waves having periods of 10-12 seconds. The intensity of wave action and the exposed nature of the coast means that materials deposited at Bar Newydd will quickly be carried into suspension when the tide comes in. Given that the working window between tides is 2.5 hours, the sandy materials deposited at the disposal sites will not remain on the LSIB feature for more than a few hours before being carried away. In summer, wave heights of over 1 m occur less than 25% of the time. This seasonality of wave action and the input of freshwater from the Afon Artro estuary makes for a highly dynamic system and therefore large variations in the suspended sediment levels that naturally occur in the system (ABP Research, 2001; refers to data from Cyngor Gwynedd *et al.*, 1998). Thus, there is a large amount of natural variation in sediment supply to *Sabellaria* reefs, and the exposure of the coast to intense and very variable wave action also contributes to the large amounts of sand that cover the historical piddock community, as described in the previous Appropriate Assessment (Halcrow, 2005).

As the direction of wave action along the coast is from the west and southwest, materials deposited at low tide will be carried northwards. If materials are placed on Bar Newydd, they can potentially be carried towards Llandanwg Beach with its *Sabellaria* and sand dunes. This can add to the supply of materials in the natural littoral drift system, thereby potentially helping to maintain the northern *Sabellaria* reefs and augmenting the natural supply of materials to the dunes at Llandanwg.

Given the amounts of sand that will be deposited on Bar Newydd beach (see Section 3.1), and the time for which they will remain deposited before being suspended by incoming tides, it is unlikely that *Sabellaria* reefs adjacent to the disposal sites will be affected by sand deposition. The predetermined access route (out to the sandbar and northeast along to the deposition area) does not cross the reef feature; therefore, there will be no damage to reef features. As the sand will not be deposited on the *Sabellaria* reefs directly, and that it will then be carried

northwards by west/southwest wave action and littoral drift, it is predicted that potential smothering impacts of sand deposition on *Sabellaria* reefs will be **negligible**. Whilst some sandy material may re-enter the estuary mouth from Bar Newydd as the tide rises, this re-entry is also likely to be negligible compared to the materials that may naturally enter the estuary from offshore sources (ABP Research, 2001).

3.3 *Atlantic saltmeadows*

Given the amounts of sand that will be deposited on Bar Newydd beach (see Section 3.1), and the time for which they will remain deposited before being suspended by incoming tides, it is unlikely that Atlantic saltmeadows within the estuary will be affected by sand deposition. This is the same as the direction of wave action along the coast (from the west and southwest), therefore material deposited at Bar Newydd at low tide will be carried northwards and any impacts on Atlantic saltmeadows would be **negligible**.

4. Summary of LSEs, Mitigation and Potential Benefits

4.1 LSIB feature

With the design of the dredging works and timings of the operations, no mitigation is required for the LSIB feature as there are no LSEs identified. The disposal method means that the sandy materials will be deposited at low tide in such a way that they will be quickly resuspended by natural wave action and littoral drift. This will have the benefit of adding to the supply of suspended materials that maintain the sand dunes further north. Existing slipways will be used to transport materials therefore there will be no LSEs from vehicular damage.

4.2 *Sabellaria* reefs

With the predetermined transport route, there will be no LSEs on the *Sabellaria* reefs adjacent to Bar Newydd. Furthermore, the deposition area at the outermost limit of the sand bar of Bar Newydd will mean that there would be no LSEs as no materials will be directly placed on top of the reefs, as this would smother the organisms. As materials will be deposited in such a way that they will be quickly resuspended by natural coastal processes, this can add to the supply of suspended sand that *Sabellaria* require to build their honeycomb reefs, thereby potentially helping to maintain the extent of this SAC feature and its associated communities.

4.3 Atlantic saltmeadows

With the design of the dredging works and timings of the operations, no mitigation is required for the Atlantic saltmeadow feature as there are no LSEs identified; transportation of suspended material is likely to be northwards rather than towards the saltmeadows within the estuary.

5. Incombination Effects

There are no current planned works in the Artro estuary or adjacent coastline that would occur at the same time as the proposed dredging and deposition works. As the works are short term and temporary, and there are no LSEs identified, there is no potential for incombination effects with other works.

6. 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 the previous Appropriate Assessment Screening report (Halcrow, 2005), and, where feasible, will be photographed following the works to ensure that no significant changes have occurred to these biological features. 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.

7. References

ABP Research, 2001. Mochras Lagoon, Shell Island – Maintenance Dredging and Disposal. Report produced by ABP Research & Consultancy Ltd (now trading as APBmer, Waterside House, Town Quay, Southampton, UK, Report No. R750. 25pp.

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

Jackson, A. 2008. *Sabellaria alveolata* Honeycomb worm. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 17-12-2019]. Available from: <https://www.marlin.ac.uk/species/detail/1129>

Jacobs, 2019. Shell Island Maintenance Dredging and Disposal Works – Environmental Review. Jacobs UK Ltd report. 14 pp.

NRW, 2018. Pen Llŷn a'r Sarnau / Llyn Peninsula and the Sarnau Special Area of Conservation Advice provided by Natural Resources Wales in fulfilment of Regulation 37 of the Conservation of Habitats and Species Regulations 2017. 144 pp.

