Shell Island Maintenance Dredge

Long term management plan for dredge and disposal operations at Shell Island: Llandanwg beach

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Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
1	2nd January 2006	Initial document prepared by Halcrow incorporating comments from CCW.	Nigel Pontee	NA	NA	NP
2	8th December 2010	Coversheet and contents amendment sheet added	Nigel Pontee	NA	NA	Nigel Pontee
3	16th December 2019	New Jacobs format and general review	Nigel Pontee	Isabel Lee-Eliott	Beatriz Serato	Kevin Jones

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1. Site background

Shell Island (also known as Mochras - Figure 1-1) is a peninsula of land in the north of Cardigan Bay, privately owned and used for public recreational purposes in the form of boating and camping. Part of the area is designated as a Site of Special Scientific Interest (SSSI) and two Special Areas of Conservation (SACs) (Figure 1-2).

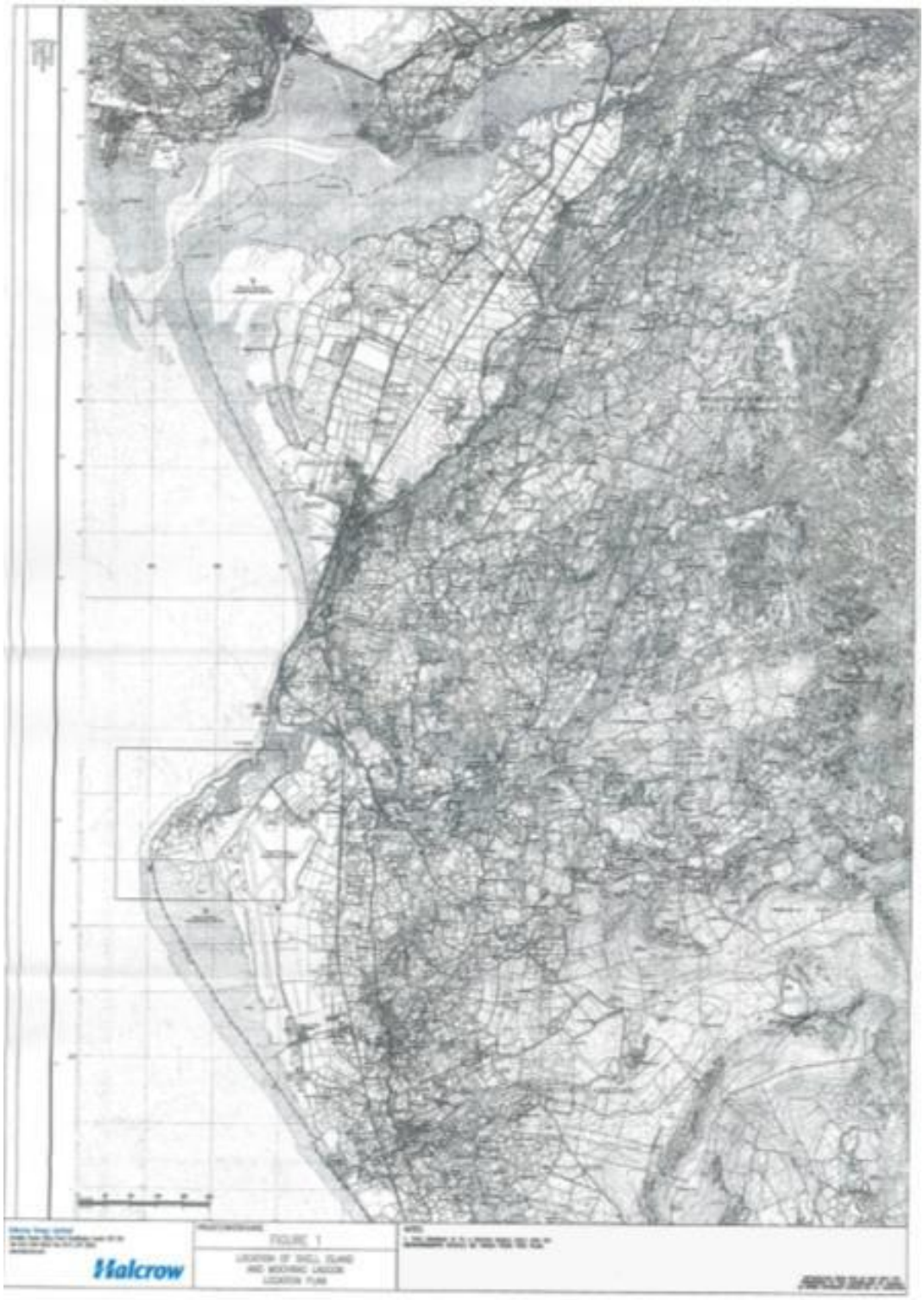

Figure 1-1: Location of Shell Island and Mochras Lagoon

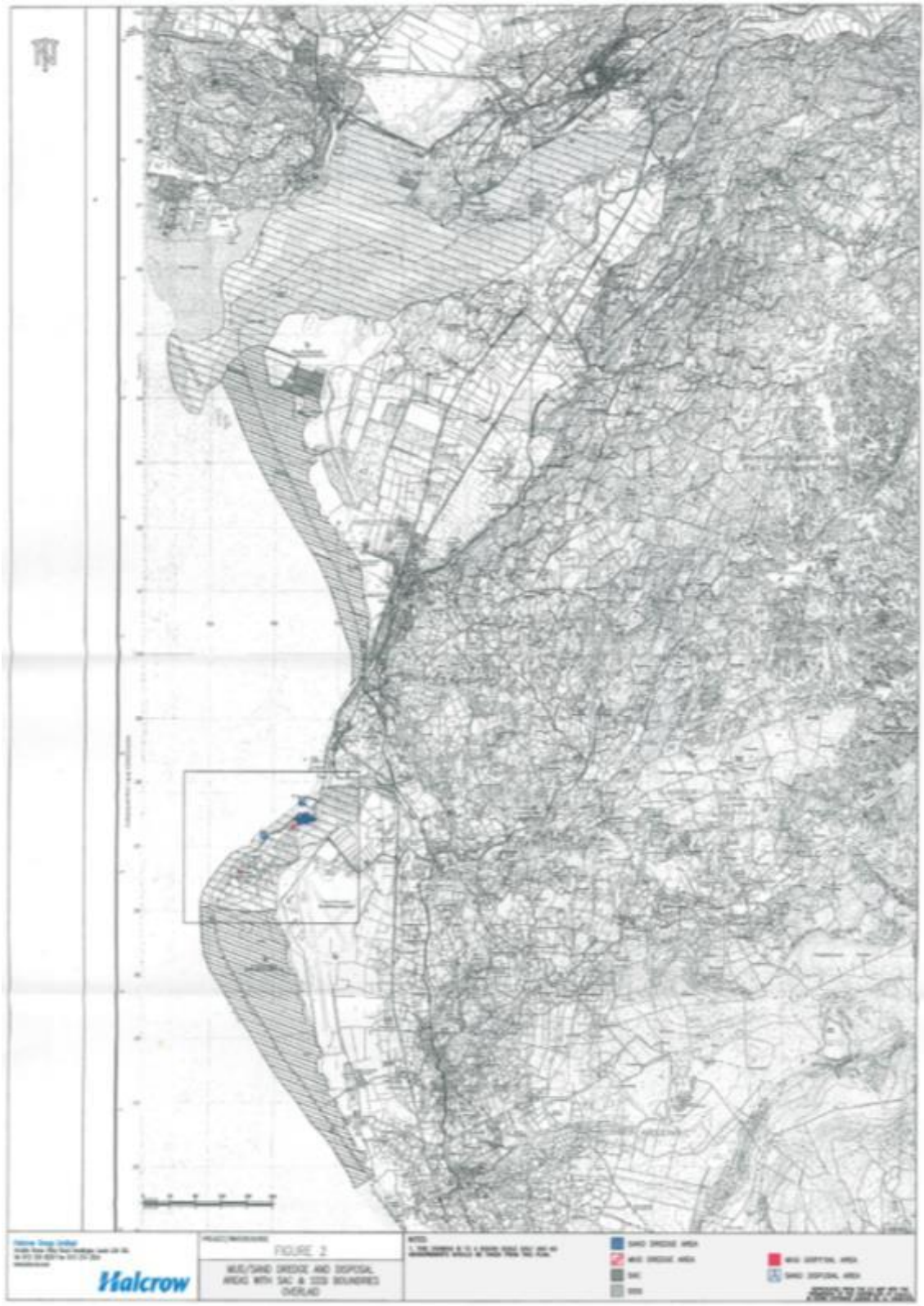

Figure 1-2: Morfa Harlech a Morfa Dyffryn cSAC and SSSI, and Pen Lynn a'r Sarnau SAC

2. Dredging requirements

Shell Island has a requirement to carry out maintenance dredging in two areas:

i) Main entrance channel composed of sandy sediments; and,

ii) Enclosed tidal basin composed of muddy sediments.

A dredging operation was previously consented in 2000/2001, based on consultation with CCW, MAFF/DETR, Gwynedd County Council, Snowdonia National Park Authority, and the Environment Agency. Currently, a dredging operation is being planned for early 2006, following essentially the same methodology as 2001. Full details of the methodology have been publicly registered under the Food and Environmental Protection Act 1985: Section 34 and the Town and Country Planning Act 1990.

There is a requirement to repeat the dredging every 3 – 5 years. This management plan describes the materials removed and the locations of disposal, with respect to minimising environmental impacts to the designated sites within and around the dredging operation areas. Dredge and disposal sites are expected to remain as they are in the attached methodology, as they represent the most sustainable options for disposal.

The disposal of sandy material in particular has been subject to an Appropriate Assessment, which was requested by CCW. The conclusions of this assessment have helped to inform the details of a long-term management plan. This includes consideration of Llandanwg Beach as a disposal site for sandy materials, which is the focus of this document.

The frequency of dredging and volumes of materials to be dredged are shown in the table below. The proportion of the total volume that is composed of mud and sand may vary according to need, but the total volumes of material dredged will remain under the FEPA/CPA Band A consent limit of 9999 tonnes in each repeat dredging operation.

Material	Location of Dredging	Volume of material removed*	Depth to which material will be removed	Frequency of removal	Location of Disposal
Sandy sediments	Main entrance channel	5238 tonnes	0.29 m	3-5 years	Bar Newydd and/or Dinghy Beach
Muddy/silty sediments	Tidal basin	4662 tonnes	1 m	3-5 years	Improved grassland on Shell Island camping area.
TOTAL		**9900 tonnes**			

*Tonnages proposed to be removed in 2005/2006. Future requirements are likely to vary around these values by approximately +/- 2500 tonnes, with the total value for sands and muds staying below 9999 tonnes (FEPA/CPA Band A consent limit).

This management plan will be reviewed every 10 years, which would correspond to every 2-3 dredging cycles, to ensure that dredging and environmental requirements continue to be compatible. Review meetings would include presentation of evidence from site condition monitoring and any other relevant survey work, as detailed below and in the Appropriate Assessment, to the client, CCW and other relevant parties. This information would be used to adjust the management plan as necessary. Each dredging operation will still require FEPA/CPA and other consents to be applied for, but these processes will now be streamlined due to the production of this

management plan, which outlines a long-term consideration of the environmental constraints of dredging and disposal works at Shell Island.

As agreed at the meeting between Halcrow, CCW, Gwynedd County Council and the client on the 12th December 2005, the client will consider the various survey options and cost implications for designing a dredge depth. A designed dredge depth will be applied as far as is practical and as agreed between the client and relevant parties. This can be further discussed at the review meetings.

3. Sand disposal options

Two options for sand disposal on Shell Island are suggested and are available for public viewing as detailed in Section 2. It is considered that these two options will be potentially beneficial to Llandanwg dunes as disposed sand can be transported towards the dunes by natural coastal transport systems. CCW have suggested that a third option has the potential to be more beneficial for the eroding dunes at Llandanwg: supplying materials directly to Llandanwg Beach. These dunes are currently maintained by the Llandanwg Dunes Protection Group.

Should the future dredge operations coincide with the requirement for direct dune nourishment at Llandanwg, it may be possible to combine operations of Shell Island and the Llandanwg Dunes Protection Group. Any additional costs associated with this operation, including both plant operations and any further environmental assessment or consents work needed for the Llandanwg disposal site would need to be covered by the Llandanwg Dunes Protection Group. It is understood that previous nourishment exercises were grant funded and this approach might provide the necessary funds in the future. The findings from monitoring site condition before, during and after works, and any other relevant monitoring work, can be presented at the periodic review meetings to allow sufficient time to enable funding proposals to be drawn up in advance of scheduled dredge works.

3.1 Dredge and Disposal Methods

Dredge operations would take place during the winter months when most of the boats are removed from the water. The operation would require the mooring chains which cover the areas to be taken up to avoid damage.

3.1.1 Sandy material

The main entrance channel dredge (sandy material - Figure 3-1) would be carried out with a tracked excavator and three, 25 tonne capacity, tipper trucks. It is estimated that each truck would take approximately half an hour to fill and empty.

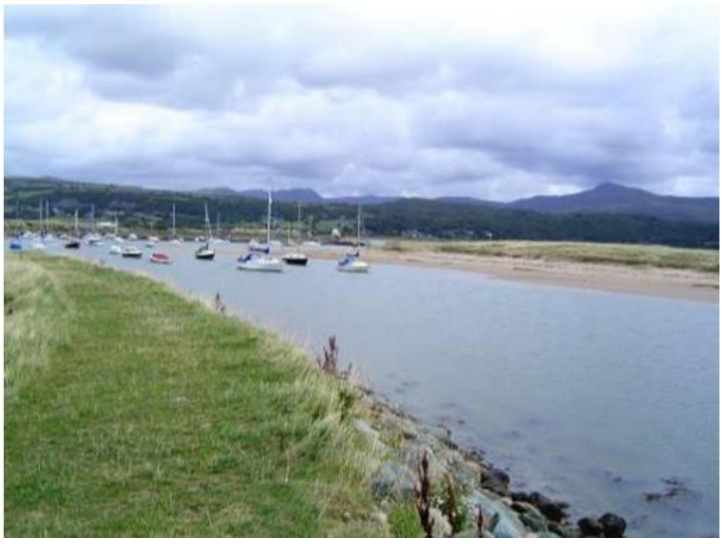

Figure 3-1: Main entrance channel composed of sand.

Each tipper truck will carry 25 tonnes of dredged sandy material 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, and existing slipways will be used to transport sandy material from the dredge area, to avoid unnecessary damage to intertidal habitats. With a working window of 2.5 hours per tide, this will result in 7 or 8 truck loads of sand being deposited 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 approximately 0.2 m. The total amount of sandy material to be deposited in this way is 5238 tonnes. At 400 tonnes per day this will involve 14 days of works.

If transported directly to Llandanwg Beach by truck, there are a number of potential routes for sand transport:

i) It is understood that previous dune nourishment works have taken sand from Shell Island via a temporary causeway being built across the estuary behind the dunes at Llandanwg.

ii) An alternative route would be for trucks to cross the mouth of the estuary at low water on spring tides, from the tip of Bar Newydd (Figure 3-2) to the foreshore of Llandanwg Beach.

iii) Either route would require additional work to assess the potential impacts to SAC features within the estuary and between the tip of Bar Newydd and the Llandanwg Beach foreshore.

Sand transport to Llandanwg Beach could also be achieved by transporting material on existing roads through the villages of Llanbedr and Llandanwg.

Compared with the preferred disposal option on Bar Newydd the disposal at Llandanwg Beach requires a longer duration for the works, additional plant and further environmental assessment work. If this disposal option were to be pursued in the future then any additional costs associated with the operation, including both plant operations and any further environmental assessment or consents work, would need to be covered by the Llandanwg Dunes Protection Group.

3.1.2 Consultation

Consultation was previously undertaken with CCW, Gwynedd Council, Environment Agency and representatives from Shell Island, in 2000, in order to understand the consent requirements for the works and agree a suitable methodology for extraction and disposal of material. Further consultation was carried out at this time as part of the various application procedures for the 2006 operation, and has included the requirement from CCW for this management plan and the Appropriate Assessment.

As part of the present application procedure, initial consultation has been undertaken with CCW, Gwynedd Council, Environment Agency, Snowdonia National Park and DEFRA's Marine Consents & Environment Unit in order to

- re-confirm the licences and consents necessary for the proposed works; and,
- secure preliminary agreement for the proposed methodology.

This consultation has taken the form of telephone calls and letters. The Appropriate Assessment requested by CCW focused on the potential for impacts on two SAC features: Large Shallow Inlet and Bays (LSIB) and Sabellaria reefs. In addition, CCW requested confirmation of the presence of two invertebrate groups: piddock communities, thought to be in clay just south of Bar Newydd, and the gammarid shrimp Pectenogammarus planicrurus, thought to be in shingle at the entrance to the inner harbour. An assessment of the SSSI intertidal mudflats was also covered in the Appropriate Assessment. The results of this assessment have informed the details of this management plan, for example routes between dredging and disposal sites, and choices of disposal sites, have been adjusted to minimise impacts on these SAC and SSSI features.

3.1.3 Potential Impacts and Mitigation

3.1.3.1 Entrance Channel Dredge (Sandy Material)

The removal of approximately 5238 tonnes of sand will deepen the entrance channel by 0.29 m on average. Whilst there will be some loss of subtidal sand habitats here it covers an area of less than 1% of the estuary and these habitats should be recolonised within 3-4 months, given the dynamic nature of the coastal processes in and around the channel.

a) Options A and B

Deposition of dredged material on Bar Newydd (Figure 3-2) or Dinghy Beach (Figure 3-3) (options A and B, respectively) will re-introduce material to the northerly littoral drift system, which has led to the formation of Morfa Dyffryn and Morfa Harlech. The dunes at Llandanwg Beach immediately north of Shell Island (and in the SACs) are subject to erosion, so that re-introduction of dredged material from deposition at Bar Newydd or Dinghy Beach could have an overall beneficial impact on the system.

Figure 3-2: Bar Newydd – preferred disposal site for sandy sediments

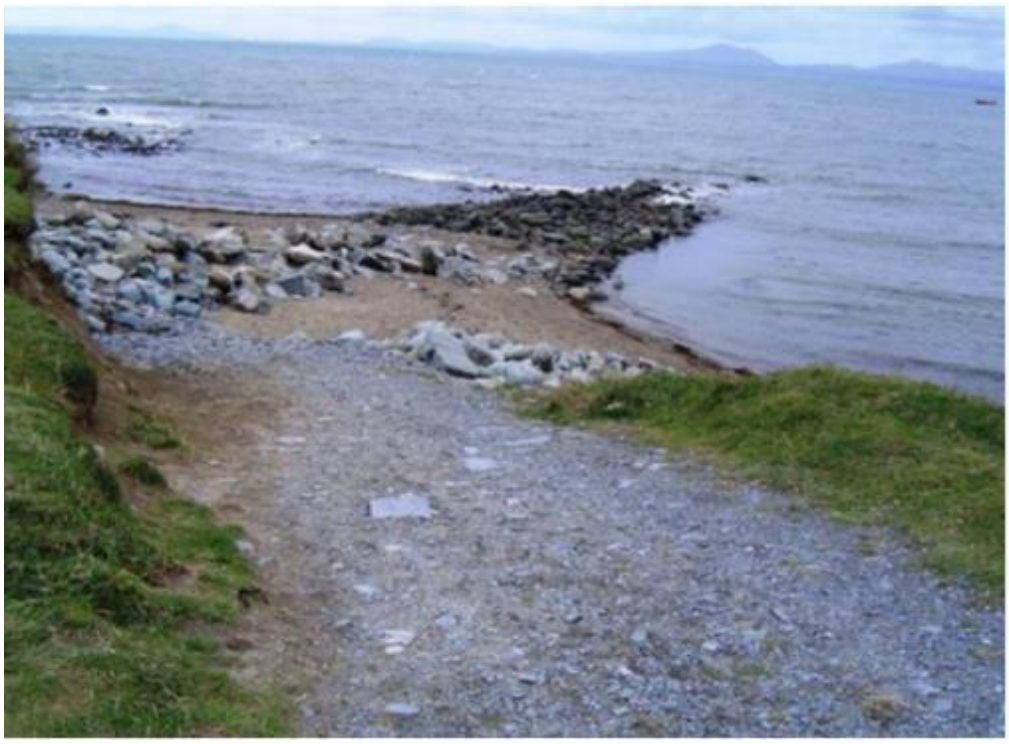

Figure 3-3: Dinghy Beach – possible disposal site during bad weather

The routes between dredge and disposal sites will avoid any *Sabellaria* reefs, which were monitored before the 2006 works began as part of the Appropriate Assessment of the site and found to be in good condition. Routes between dredge and disposal sites (Figure 3-6) will avoid directly driving over *Sabellaria*, because existing slipways will be used. Precise disposal routes will be agreed with CCW before works commence and will be clearly marked out for contractors to follow. Photographs of the transport routes before, during and after works will be used to document vehicular movements and hence ensure that there is no significant damage to the SAC/SSSI/other habitat features of concern.

Additionally, sandy material will be disposed of at Bar Newydd and/or Dinghy Beach in such a way as to avoid directly smothering *Sabellaria*, which require sand in suspension and are fed by large offshore inputs brought in by substantial natural wave action along the coast (ABP Research 2001, see also the current Appropriate Assessment). Potential smothering of subtidal habitats by deposited sand will be temporary, as the deposited sand will be carried away by incoming tides within a few hours of deposition; the volumes of sand to be deposited will also be half that of the previously consented dredging and disposal works in 2000/2001. Again, photographic evidence will be used to show that sediments are deposited in accordance with agreed procedures, and repeat photographs of a marker post at the sand disposal site will be used to monitor whether the deposited sandy sediments disperse in accordance with the predictions outlined in the Appropriate Assessment.

The Appropriate Assessment concluded that addition of sand to the Bar Newydd would result in sand re-entering the natural circulation of the area within a few hours as the tide rises, and that the volumes of sand involved (200 tonnes per tide or 400 tonnes per day), would not be significant compared to the background volumes of sand being moved around by the area's natural coastal processes. Further, this added sand will temporarily cover 600m2 or 0.6 ha of the SAC, which is 0.0004% of the SAC's total area of 146,023.48 ha. Thus, the impact of sand deposition at Bar Newydd, Dinghy Beach on the LSIB feature is considered to be negligible. Smothering of *Sabellaria* would be avoided as the reefs lie south of Bar Newydd or more than 400 m to the north of the Afon Artro estuary. *Sabellaria* reefs to the north, may also benefit from sand deposition on Bar Newydd, as there is a natural littoral drift that will carry the material northwards as it is swept away. The reefs will be monitored again after the works to ensure that their condition has not deteriorated as a result of the works. Future monitoring methods will be finalised with CCW and applied to future dredging works as part of the long-term management of the site.

Sabellaria reefs were subject to a walkover survey during the piddock and shrimp surveys. These reefs and other biological features have been photographed during the surveys, and will be photographed after the works to ensure that no significant changes to biological features have occurred at the disposal site.

The Appropriate Assessment also focused on other potential impacts to the fauna of the Pen Llyn a'r Sarnau SAC and the SSSI features: smothering of piddocks in clay just south of Bar Newydd, and habitat loss for the gammarid shrimp *Pectenogammarus planicrurus* in the main entrance channel and harbour. Surveys for piddocks and shrimp revealed:

i) that shrimps are not present in the dredging area and the substrates are not suitable, which casts some doubt of the validity of the previous record of *P. planicrurus* for Shell Island, and

ii) Piddocks are not now present and the habitats south of Bar Newydd are not suitable for them, although there is evidence of an historical piddock community on the upper foreshore; this is now covered regularly by incoming sand from offshore.

Impacts to habitats and species will be further minimised partially by timing of works and partially by location of the works. The channel entrance area has accreted since the last dredge, and although habitat for benthic invertebrates (amphipods, polychaetes) on which fish and birds feed will be removed, this will be recolonised within 3-4 months. Physical disturbance to saltmarsh and *Sabellaria* reefs due to travel between dredge and disposal sites will be minimised as it will occur over existing roadways. The current works have been timed to avoid disturbance to migratory fish and to breeding birds, i.e., works are planned for January/February 2006: birds breed March-June/July and fish migrate April-May. The *Sabellaria alveolata* reefs lie either to the south of Bar Newydd, from which material will be carried north, or more than 400 m away to the north. Additionally, *Sabellaria* has a relatively high tolerance to sedimentation and even requires some sand in suspension to build the characteristic honeycomb reefs (MarLIN, 2005).

b) Option X - Llandanwg Beach

The same impacts and mitigation procedures described for sand disposal options A and B apply here. Although direct deposition of sand on Llandanwg beach would be beneficial for the dunes, it would not be as directly beneficial for *Sabellaria* reefs, as the sand would not be in suspension. Given the dynamic nature of the coast, however, there is potential for some of the deposited sand to be re-suspended and thus to be of benefit to *Sabellaria* reefs at Llandanwg Beach and further north. Further assessment of potential impacts of this option would be conducted in conjunction with Llandanwg Dunes Protection Group and with advice and input from CCW. This further assessment would be particularly important regardless of whether sand was transported to Llandanwg via the estuary or by road because:

i) direct transport would involve driving vehicles over LSIB areas that would not be impacted in options A and B,

ii) transporting sand by road could increase the risk of accidental spillages of sediment onto the saltmarsh SAC feature that surrounds the tidal causeway linking Shell island with the main roads, and

iii) the additional plant involved in transporting sand by road at a sufficient rate could potentially lead to a greater impact on intertidal organisms when vehicles are driven from dredge areas up to the slip roads

For all three sand disposal options, noise will be limited to the excavator and tipper trucks. Although there will be some temporary disturbance of low water feeding grounds for birds, there are adjacent areas of sand flats still available to feeding birds.

3.1.3.2 Basin Dredge

The removal of approximately 4662 tonnes of silt will deepen the basin by 1 m. The tidal basin (Figure 3-4) will be isolated from the tide during dredging by placing sand across the basin entrance to prevent water from entering the basin during work. This barrier will be removed once the dredging is completed, thereby creating only a temporary effect on circulation within Mochras Lagoon. Furthermore, the basin itself represents much less than 1% of the area of Mochras lagoon, so that any effects of the temporary tidal barrier and dredging on circulation and water quality will be negligible relative to natural water level variations in what is a highly dynamic system (ABP Research 2001).

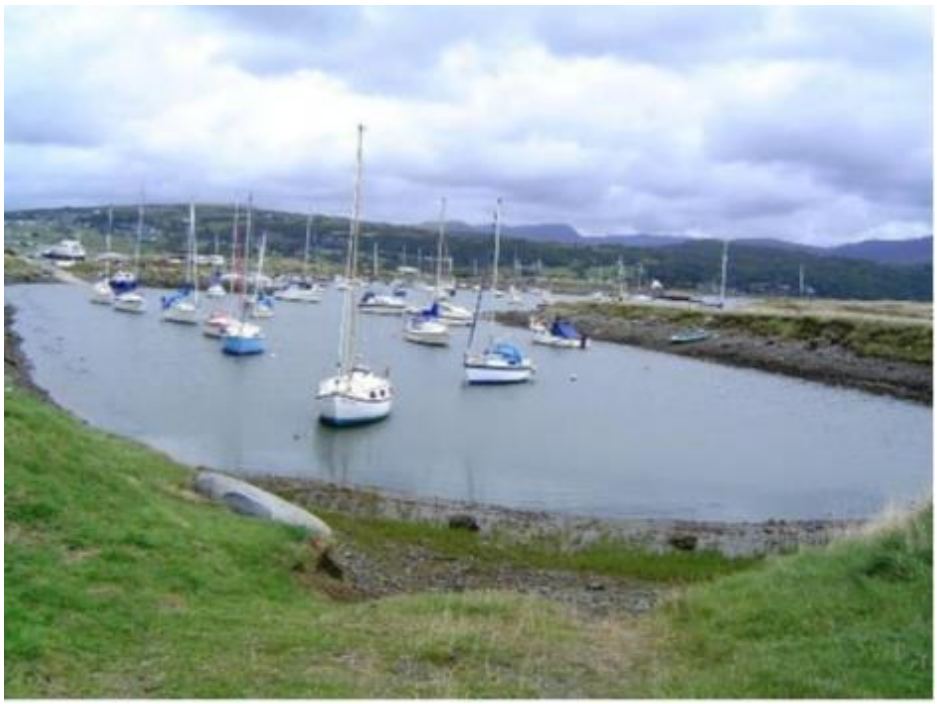

Figure 3-4: Enclosed tidal basin composed of muddy sediment

As for the sandy materials, timing of works is such that disturbance to breeding birds and migratory fish will be avoided.

There will be a small direct loss to benthic habitats due to the dredging, and physical disturbance to sensitive habitats will be avoided as disposal routes are over existing roadways. The silt disposal site (Figure 3-5; Figure 3-7) is on an improved field/scrubland outwith the SAC/SSSI boundaries, and material will be ploughed into the field during the summer period, with reseeding if necessary. The Appropriate Assessment concluded that losses of intertidal mudflats will not be an issue, as mud will be dredged from the subtidal zone.

Figure 3-5: Preferred disposal site for muddy sediment

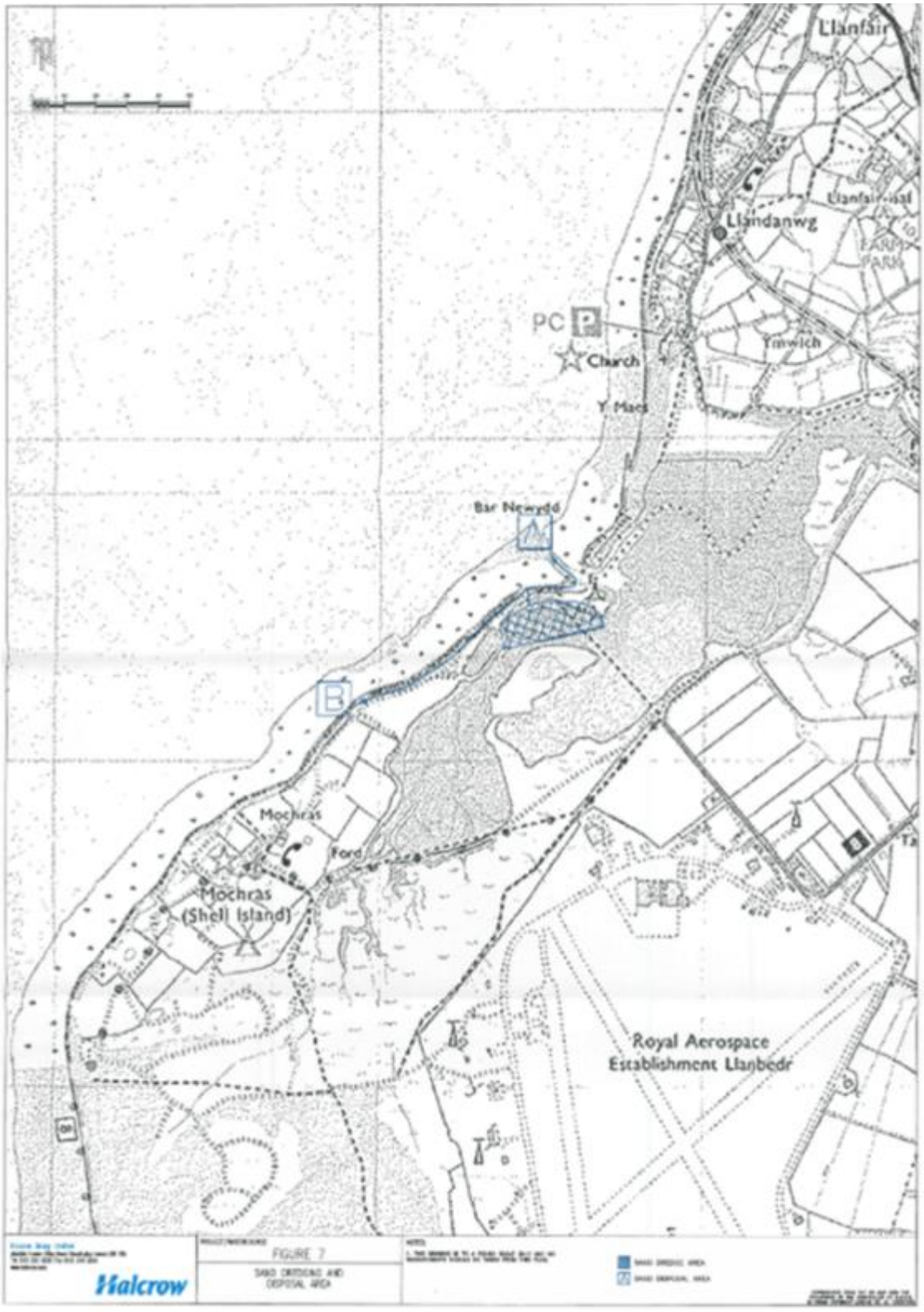

Figure 3-6: Sand dredging and disposal area

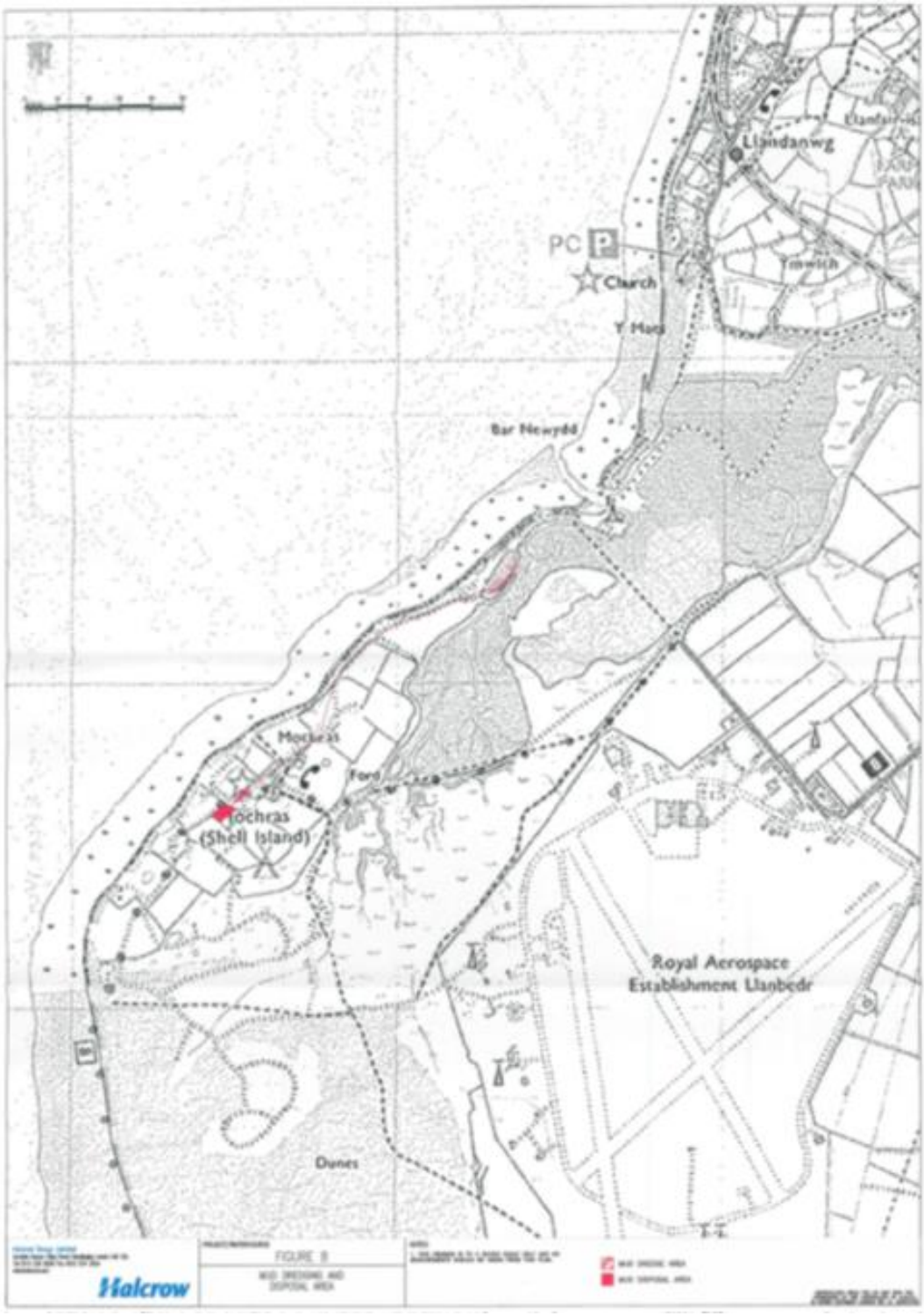

Figure 3-7: Mud dredging and disposal area

4. References

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

MARLin: Marine Life Information Network for Britain and Ireland, 2005. Information on Sabellaria and piddock communities. www.marlin.ac.uk