



Ardersier Port Ltd.

Dredge Strategy & Best Practical Environmental Option



September 2018

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Client: Ardersier Port Ltd.

Document number: 8383
Project number: 670191
Status: Final

Author: [Redacted]
Reviewer: [Redacted]

Date of issue: 21 September 2018
Filename: 180917 2018 BPEO

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1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre were commissioned by the CWC Group to undertake an update of the dredge strategy and best practical environmental option assessment undertaken in 2013 in support of the development consents and licences at that time.

1.2 Scope of Report

This report defines the operations likely to take place in order to reinstate a suitably sized navigation channel to service the redevelopment proposals at Ardersier Port. An introduction to the site and proposed works are summarised before presenting the dredge strategy. A Best Practicable Environmental Option assessment is presented for the disposal of dredged material. This provides an overall plan to maintain the access channel to Ardersier Port while ensuring best environmental use of dredged material.

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1.4 Background to Proposed Works

The Ardersier Port is located 18km to the north east of Inverness on the southern shore of the Moray Firth and covers an area of approximately 820 hectares. A sand spit known as Whiteness Head forms the northern landward boundary of the port and a channel is located between the spit and the quayside. The majority of the land based area was historically reclaimed land, created using sand dredged from the foreshore and channel area. This was developed as a fabrication yard to construct off-shore platforms for the oil and gas industry in the 1970s. The yard was in operation between the mid 1970s and 2000. An area of sand dunes formed from excess dredge material during the initial construction phase is located along the western site boundary, and low lying coastal flats lie to the east.

The proposed redevelopment at the Ardersier Port involves construction of new quayside with associated dredging at the berth and navigation channel along with construction facilities to cater for vessels and structures associated with normal port operations.

1.5 Proposed Works

To cater for the envisaged sea traffic, the dredged access channel will be 120m wide with a dredge depth of -6.5m Chart Datum. This will allow safe access at all states of tide. In addition, a minor element of dredging will be undertaken in the inner channel to a depth of -3m CD (approximately 2-3% of the total dredge).

Dredging will take place in two distinct and separate operations, an initial capital dredge to create the design channel and subsequent maintenance dredging to maintain the channel dimensions. The total volume of material dredged during the capital dredge is estimated to be 2,300,000m³ which will comprise mainly of sand with some gravel.

It is intended to use this material where possible for beneficial uses. The main uses identified to date are the requirement for bulk fill to embankments for the proposed A96 trunk road construction material and ballast for offshore gravity base foundations.

1.6 Historic Dredging

Since the construction of the fabrication yard at Ardersier in 1972, dredging of the access channel has been a regular occurrence. Initial development of the yard area saw the formation of the channel with the dredged material being pumped ashore for land reclamation purposes. With the construction phase completed, subsequent channel dredging operations were carried out with dredged material being placed at the spoil ground on Whiteness Sands. The historic dredging licences and returns are summarised in Table 1.1.

The line of the navigation channel formed was fit for purpose taking into account of the type of vessels which would be using it – in the case of McDermott Ardersier, this was for ocean going barges laden with significant structures together with attendant ocean going tugs. The line of the channel was therefore kept as straight as possible given the restricted ability of these vessels to manoeuvre in restricted waters. The frequency of use was also generally limited to finished jacket or module float out or to import of subcontracted elements of particular projects.

The channel width was nominally 100m with the dredge depth taking account of the particular vessels using the channel but dredge depth was typically to 4m below Chart Datum – Admiralty Chart 1077 indicates a dredge depth to 4.7m below Chart Datum. The frequency of channel dredging was dependant on two factors, first the float out draught requirements of the transportation barge with the completed structure and secondly the rate at which siltation in the channel had occurred since the previous dredge.

Observations on the sedimentation of the channel were that it was very much dependant on the wind direction, with the channel general being fairly static except during easterly gales when more significant change occurred. The timing of the maintenance dredges were generally to coincide with structures leaving the yard or vessels entering, and the size of these reflected the amount of material dredged.

Table 1.1: Historic Dredging Licences and Returns

Licence Number	File Ref	Location	Valid From	Valid To	Spoil Located	Spoil Ground	Licence Total (Tonnes)*	Licence Total (cum)*	Total Disposed (Tonnes)	Total Disposal (cum)*
		Ardersier	01-May-76	20-Apr-77		Whiteness Sands	135,000	75,000	not known	not known
		Ardersier	23-Apr-81	22-Apr-82		Whiteness Sands	100,000	50,000	not known	not known
		Ardersier	25-Nov-82	24-Nov-83		Whiteness Sands	180,000	100,000	not known	not known
		Ardersier	25-Nov-83	24-Nov-84		Whiteness Sands	180,000	100,000	not known	not known
		Ardersier	18-Jan-85	17-Jan-86		Whiteness Sands	234,000	130,000	223,435	111,718
		Ardersier	21-Jan-86	20-Feb-87		Whiteness Sands	180,000	100,000	1,980	990
		Ardersier	21-Feb-87	20-Feb-88		Whiteness Sands	220,000	120,000	169,083	84,542
		Ardersier	01-Nov-88	31-Oct-89		Whiteness Sands B	180,000	100,000	131,410	65,705
		Ardersier	21-Jun-90	20-Jun-91		Whiteness Sands B	179,000	99,900	50,824	25,412
		Ardersier	10-Jul-91	09-Jul-92		Whiteness Sands B	185,000	100,000	81,320	40,960
		Ardersier	31-Jul-92	30-Jul-93		Whiteness Sands B	350,000	175,000	195,666	97,833
		Ardersier	24-Feb-95	15-Jan-96		Whiteness Sands B	586,000	360,000	473,159	236,580
		Ardersier	26-Feb-96	27-Feb-97		Whiteness Sands B	301,500	192,000	214,173	107,087
		Ardersier	27-Mar-97	26-Mar-98	004 02.26 W	Whiteness New Area ???	306,300	195,000	136,970	68,485
					57 36.16N					
					57 36.40N					
					57 36.20N					
					57 35.95N					
		Ardersier	19-Jun-98	18-Jun-99		Whiteness New Area ???	352,700	237,500	not known	not known
01508/00/0	FKB/D80	Ardersier	07-Mar-00	06-Mar-01		CR021	225,000	134,500	0	0
01508/00/1	FKB/D80	Ardersier	15-Mar-00	06-Mar-01		CR021	225,000	0	0	0
01508/00/2	FKB/D80	Ardersier	14-Jul-00	06-Mar-01		CR021	225,000	0	0	0
01676/01/0	FKB/D80	Ardersier	21-Jun-01	20-Jun-02		CR021	330,000	215,000	156,950	78,475
01676/2001/0	FKB/D80	Ardersier	21-Jun-01	20-Jun-02		CR021	330,000	0	0	0
01837/2002/0	FKB/D364	Ardersier	12-Jul-02	11-Jul-03		CR021	340,000	170,000	0	0
01837/2002/0	FKB/D364	Ardersier	12-Jul-02	11-Jul-03		CR021	340,000	0	0	0
01943/2003/0	FKB/D364	Ardersier	12-Jul-03	11-Jul-04		CR021	400,568	200,284	0	0
01943/2003/0	FKB/D364	Ardersier	12-Jul-03	11-Jul-04		CR021	400,568	0	0	0
02128/2004/0	FKB/D364	Ardersier	25-Oct-04	24-Oct-05		CR021	400,600	200,300	0	0

Red Data Supplied By Transport Scotland Ports and Harbours 19-Aug-13

Blue Data Supplied By Marine Scotland 16-Aug-13

Green Data Contained In BARMAC BPEO 01-Feb-08

Assumption

1 cum = 2 Tonnes where original figures are converted

2 DREDGE STRATEGY

2.1 Overview of Works

The current redevelopment proposal at Ardersier Port identifies the construction of new deep water quay facilities and an associated dredged access channel to cater for:

- a) The envisaged requirement of potential port users; and
- b) The size and draft of the concrete foundation structures for offshore wind farm development, together with their attendant towing vessels.

Over the period since the last dredging exercise was carried out, there has been significant sedimentation within the dredged channel. The alignment of the channel is based on the previous alignment.

2.2 Proposed Channel

The proposed dredged access channel is to be 120m wide and is intended to provide safe access at all states of the tide for users of the port. Dredge depth will be 6.5m below Chart Datum. The line of the access channel has been located to take account of the increased depth of the channel and at the same time to limit the effects of dredging activities at the western end of Whiteness Head, more or less in line with effects from previous dredging operations over the last forty years.

2.3 Dredging Operations

Dredging will take place under two distinct and separate operations – firstly, an initial capital dredge will take place to form the new access channel as previously described and secondly, maintenance dredging will take place during following years to maintain the marine access channel to its designed line and level.

2.3.1 Capital Dredging

A comprehensive hydrographic survey has been carried out (June 2018) to update survey data in the area and dredge volumes calculated. On the basis of these surveys and the required channel geometry, it is estimated that 2,300,000m³ of material requires to be dredged. This survey work will be repeated immediately prior to dredging operations commencing to confirm the final volumes of dredge material.

The most appropriate form of dredging would be to use a cutter suction, given the nature and volume of material to be excavated and potentially the timeframe for carrying out the works. Final selection of the dredging plant will be subject to normal tendering processes but it is considered that cutter suction dredging as being most likely option. The cutter suction dredger is a self propelled vessel using a rotating head to loosen the sea bed with the material being connected to a suction tube. Pumps subsequently discharge the material to the disposal points by either barge or more likely in this case by pipeline. The pipelines would either be floating or placed on the seabed or existing land, dependant on site conditions. Cutter suction dredging has been used previously at the site.

2.3.2 Maintenance Dredging

Subsequent maintenance dredging operations will be carried out, dependant on the build up of infill within the newly formed channel. The requirement to carry out maintenance dredging will be closely monitored by

ongoing survey work in order to monitor water depths in the port. In this case the type of dredging plant to be used is less predictable as a variety of dredger types could carry out the work. Past practices carried out for maintenance dredging operations have though used a variety of cutter suction, backhoe and bucket dredging. They carry out the same function of excavating dredged material and transport that material by barge or pipeline to agreed re-use or disposal areas.

2.4 Timing of Operations

There are a number of environmental considerations in the timing of the dredging works namely the bottlenose dolphin and seal breeding season between April to September and the period for wintering birds on Whiteness Head between November and February.

In order to ensure the wintering bird feeding ground at Whiteness Sands, which is part of the Inner Moray Firth Special Protection Area (SPA), is not disturbed it has been agreed that no dredging operations will take place during the months of October to March. Should dredging be required to be carried out during the month of in October (which is less sensitive for wintering birds) this will be done with the approval of Marine Scotland in consultation with Scottish Natural Heritage (SNH).

In respect of marine mammals, the draft Construction Environmental Management Document (CEMP) proposes mitigation measures (including the deployment of marine mammal observers, logging of vessel types and movements, temporary suspension of operations) which will be put in place to ensure marine mammals are not affected by dredging operations. The underwater noise modelling (Chapter 10 of the Environmental Impact Assessment Report) has shown that dredging operations are not likely to create noise levels which would pose a physical or lethal effect on marine mammals or fish.

Dredging operations for both the capital and maintenance operations are likely to be carried out on a 24/7 basis.

2.5 Navigation

The proposed works would have minimal disruption to navigation. The dredging and disposal works would be local to the immediate vicinity of Ardersier Port, so there will be minimal disruption to wider navigation within the Moray Firth. Capital dredging will create the navigable channel for vessels – maintenance operations will be timed to minimise any disruption to Ardersier Port traffic. All operations will be under the control of the Port Authority to ensure safe co-ordination.

The extremities of the dredge areas shall be marked with buoys, and notices of these shall be included by Ardersier Port in a “Notice to Mariners” at the Port offices and in the local paper.

The contract for dredging will include conditions with regard to navigation, in that navigable waterways shall not be blocked with plant, pipelines or other items of marine plant.

Dredgers, vessels and barges require to be well lit during hours of darkness in accordance with standard navigation practice. The method statement and operational procedures for the dredging operations will require to be agreed with the Harbour Master, including radio control communications, prior to works commencing.

3 BASELINE INFORMATION

3.1 Source of Materials

The source of the materials is from the re-opening of the navigation channel and quayside berth as shown in Drawing 167112/22, Extent of Capital Dredging. The dredged material will be sourced from between the existing sea bed level and the -6.5m Chart Datum depth required.

3.2 Nature and Volume of Materials

The site investigation based on borehole information identified that the material in this area would comprise of the following:

- Gravels 23%
- Sands 75%
- Silt/Clay 2%

For the entire dredge the gravel content is expected to be lower, while the sand content will be higher. This reflects the inter-tidal gravels present at the borehole locations to date.

The dredge volume is estimated to be 2,300,000m³, based on the 2018 bathymetry survey and proposed channel design.

3.3 Consents and Authorisation

The Port of Ardersier Harbour Revision Order 2014 and Harbour Revision (Transfer) Order 2017 confirm Powers to Dredge and applications for Marine Licences are being submitted to Marine Scotland in respect of the proposed dredging operations.

There are existing planning consents on the site for servicing the offshore oil and gas industry and also for a residential development, school, marina, boat yard and hotel. There is also planning in principle for port related services, for which these dredging works will form part of.

3.4 Bathymetry and Sea Bed Sampling

A comprehensive hydrographic survey was undertaken (Aspect Surveys, June 2018) as an update to previous survey data. This survey data was used, in conjunction with channel design requirements, to calculate the necessary dredge volumes.

The current position of the Mean High Water Spring and Mean Low Water Spring tides are shown on the drawing 167112/25A, Dredge Fill Areas from the 2018 survey.

Sea bed sampling has been undertaken as follows and the ground conditions summarised in Figure 3.1:

- | | |
|---------------|---|
| December 2012 | Grab samples taken to the north of the spit (Clydeside Surveys) |
| February 2013 | Three boreholes drilled through the proposed dredge material at the tip of the spit (Blake Geotechnics) |
| | Grab samples (22) and sea bed video in area around dredge area and possible disposal areas (EnviroCentre) |

March 2013 Three boreholes drilled through the existing quayside within the proposed berthing pocket. (Blake Geotechnics)

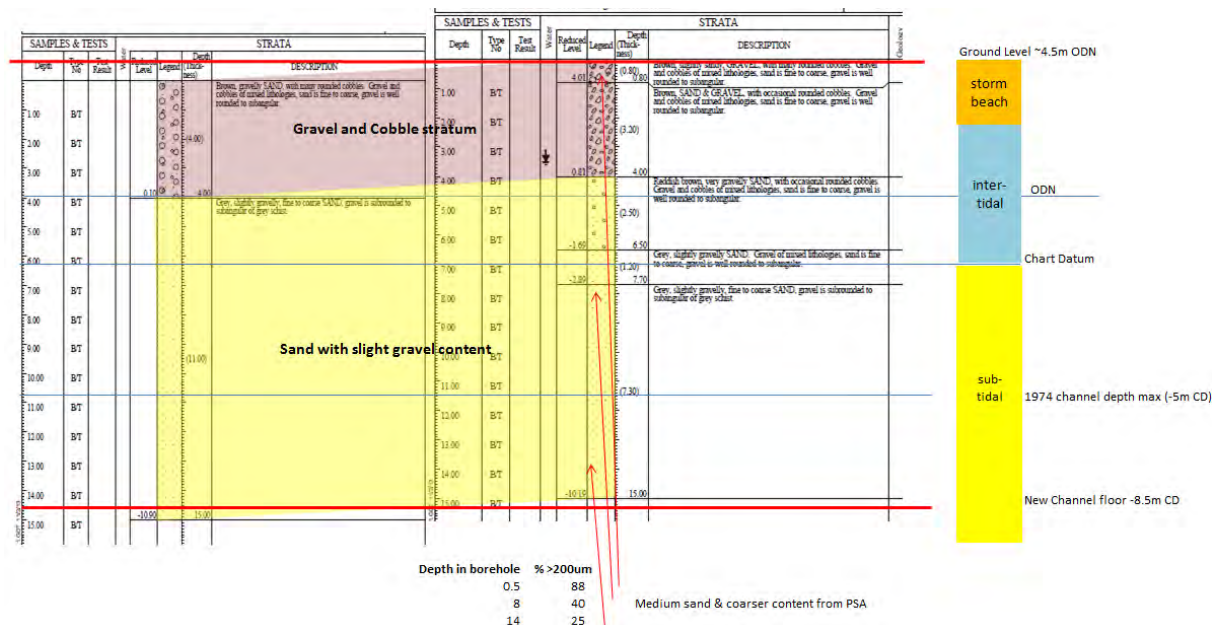


Figure 3.1: Ground conditions

4 AVAILABLE DISPOSAL OPTIONS

4.1 Introduction

The extent of the capital dredge of 2,300,000m³ is a logistical challenge but also offers an opportunity to use the material in a positive and environmental form. Historically, the main method to date of dealing with dredge material was to dispose of the material at the designated spoil ground at Whiteness Sands. In promoting this scheme, there will be an obligation to adopt best environmental options in dealing with dredge material. Whereas before, dredge material may have been regarded as a nuisance, positive uses for the dredged sand are being identified.

A range of disposal options have been identified and assessed to allow the identification of the Best Practical Environmental Option (BPEO). The 'Rochdale Envelope' approach has been used to identify the range of possible disposal options given uncertainties in the wind turbine construction processes at this stage. These options will be considered and reassessed at the time of any future maintenance dredging work. The options are listed below and detailed in the following sections.

1. On Site Land Based Use
2. Land Reclamation/Reinstatement
3. Construction Material – Bulk Transfer from Dredge
4. Construction Material – Stockpiling for Unprocessed Use
5. Construction Material – Stockpiling for Processed Use
6. Spit Restoration
7. Spit Reinforcement/Nourishment
8. Spoil Ground Disposal
9. Offshore Sea Disposal

4.2 Option 1: On Site Land Based Use

The general level of the site is 4.6m above Ordnance Datum (AOD) and there is a slightly lower area of ground to the south east of the main site platform referred to as the 'dog-leg' area. These areas could be raised to provide additional freeboard to predicted extreme water levels, which would be beneficial to the future potential residential use as already consented.

The 1 in 1,000 year return period water level predictions for the site area have been calculated using the Coastal Flood Boundary Method to be 3.51mAOD (source: SEPA), with possible sea level rise up to 2080 adding up to 0.56m onto this to 4.07mAOD.

It is calculated that raising the south east 'dog-leg' area to achieve a similar level to the main area of the site and provide a consistent freeboard to extreme water levels across the site would require 275,000m³.

4.3 Option 2: Land Reclamation/Reinstatement

The exiting site was formed by land reclamation. There are a number of constraints to any further land reclamation, with the primary constraints being the extent of suitable areas within the land ownership of Ardersier Port and the national and international designations protecting the habitat and wildlife in the immediate surrounding area.

On the basis that there is no present operational requirement for land reclamation and from discussions with SNH, it is considered that the use of dredged material to reclaim further land is not considered a viable option.

4.4 Option 3: Construction Material – Bulk Transfer from Dredge

The dredge material is predominantly sand with some gravel and could be considered as a viable construction material. Bulk transfer by barge is an option that would either be direct from the dredge area or along with using a temporary land based store for the trailer dredger material prior to it being shipped out again by sea.

The main uncertainty with this option is being able to market such a large volume of material in a short timescale and will depend upon demand for this material at the time of dredging. There is scope for temporary storage of dredged material on site without restricting the core objective to develop the port, however the double handling costs of this may affect the viability of this option.

There is not a known market for this volume of material at present and with the volumes involved, a bulk transfer by barge may be possible, but not certain.

4.5 Option 4: Construction Material - Stockpiling for Unprocessed Use

The dredge material could potentially be used as ballast material within offshore wind turbine foundations that could be constructed at the site. Material would be placed in a temporary stockpile at Ardersier Port for subsequent utilisation. It is estimated that a gravity base foundation would require 8,000 - 15,000m³ of material dependant on structure design. Based on 100 foundation units (in line with current offshore development proposals) this option could utilise 1,500,000m³. This would therefore substantially utilise the anticipated total stockpiled volume (Appendix A, letter from bam dated 14th March 2018).

Another option would be that the Scottish Government, through transport Scotland and their consultants Jacobs, are progressing a project to dual the A96 trunk road between Inverness and Nairn. An Environmental Statement was produced as part of the Design Manual for Roads and Bridges (DMRB) Stage 3 design covering the project. This identified the requirement to import approximately 2,800,000m³ of material for bulk earthworks. Discussions are ongoing between Ardersier Port and the consultants for the project (Appendix A, email from Jacobs dated 4th June 2018). Jacobs have confirmed, that based on the information available to date, that the dredge material has the potential to be suitable for re-use as a General granular Fill for highway earthworks.

It is considered that in terms of sustainable re-use of the dredge material, that this would provide a positive option for re-use of the material.

4.6 Option 5: Construction Material - Stockpiling for Processed Use

The dredge material is predominantly sand with some gravel and could be considered as a viable construction material. There are two options for securing this use for the dredge material:

1. Construction of gravity base foundations on site. There is the potential for using the sand and aggregate material from the capital dredge as construction material for the construction of gravity base foundations (Appendix A, letter from bam dated 14th March 2018).
2. Land based processing and use. This would require temporary land based storage of the material prior to it being used.

The main challenge with this option is being able to market, process and store such a large volume of material in a short timescale and will depend upon local demand for this material at the time of dredging. There is scope for temporary storage of dredged material on site without restricting the core objective to develop the port. This will require the material to be taken off site and this double handling of material may affect the viability of this option.

The anticipated volume requirements for such a use are expected to be in the order of 200,000m³.

4.7 Option 6: Spit Restoration

Historical operations have resulted in the excavation of a semi-circular area (the 'scalped area') to the inner channel on the western shore of the spit to provide access around the stern of a grounded barge during previous operations. Dredged material can be deposited to this area of the spit to restore the former alignment and plan form as a one-off exercise. This area is designated as a SPA and as a Site of Special Scientific Interest (SSSI). The estimated volume of sediment to undertake this restoration would be 200,000m³.

4.8 Option 7: Spit Reinforcement/Nourishment

Whiteness Head is a designated SSSI for, amongst other features, the coastal geomorphology. Previous and current Coastal Studies have investigated the way in which the spit exists and importantly conclude that the long term sustainability of the spit is dependent on a supply of suitable material being available to maintain its condition.

Discussions with Marine Scotland and SNH have indicated that given the potential significant volume of dredged material that could be put into the marine environment, this option would not be preferred due to the potential for impacts on the qualifying features of the Moray Firth Special Area of Conservation (SAC) and Inner Moray Firth SPA.

4.9 Option 8: Spoil Ground Disposal

During the previous operation of the site, dredged material from the access channel was routinely disposed of to a spoil ground within Whiteness Sands. Two previous BPEO assessments in 1975 and 1998, both identified that the spoil ground disposal area was the preferred location for sea disposal, although these were for lower volumes of maintenance dredge material (on average circa 80,000m³ per annum). This area has been used for disposal of maintenance dredge material between 1976-2005. This location is close to the Firing Range at Fort George which is operated by the Ministry of Defence (MoD). Consultation has taken place with the MoD to ensure protocols are put in place to allow safe working operations. This option would be no larger in scale or different in location to that which has previously been undertaken in the past.

The capital dredge volumes proposed are much larger than the historic disposal volumes and this area could not accommodate the full disposal volume. The capacity is expected to be in the range of 100,000-130,000m³ based on historic deposition rates.

4.10 Option 9: Offshore Sea Disposal

The option for offshore disposal has been examined through two previous BPEO assessments (1975 and 1998) which identified that the spoil ground disposal area was the preferred location for sea disposal. This option

could accommodate the capital dredge volume, but would require to be deposited on the Moray Firth SAC where one of the main qualifying features are the sub-tidal sandbanks.

Options for disposing of the material within the local coastal cell to the east will result in the material returning over time back towards the navigation channel and increasing subsequent maintenance dredge, while disposing of material outwith the local coastal cell will place the material closer to the identified sandbank qualifying features of the SAC with greater potential for impact. The greater distances for disposal would require that barges be used to transport and deposit the dredged material. This would increase the project timescales and cost of the dredge.

This method of disposal would not provide any environmentally beneficial reuse unless the material was placed for subsequent re-use by dredging at a later date. This is considered an unlikely scenario due to there being sufficient land storage area available at the site to provide the anticipated material requirements from a single capital dredge operation without the additional cost of a separate dredge at a later date to recover the material. Also, the likely deposition areas are within an SAC designated for sub-tidal sandbanks similar to that of the material being deposited, so SNH would require to be satisfied that there would not be any significant impact to the SAC.

With other more cost effective and environmentally beneficial disposal options available, it is not considered that disposal to an offshore site in the Moray Firth is a suitable option.

5 ASSESSMENT OF ASPECTS TAKEN INTO CONSIDERATION

5.1 Summary of Options Available

Of all the options available, only Options 3, 4 and 9, could provide sufficient capacity as stand alone options. The identification of options has concluded that Option 2 (land reclamation/reinstatement) is not considered to be a viable option due to operational and environmental constraints. Discussions with SNH have identified that Option 7 (spit reinforcement/nourishment) would not be preferred due to potential impact to designated features. Option 8 provides only a relatively small capacity in relation to the size of the capital dredge and similar to Option 9, neither would provide any beneficial use of the material and have no additional economic advantage.

As a result, Options 2, 7, 8 and 9 are discounted for practical reasons in relation to the volume of material or environmental reasons due to the sensitive national and international environmental designations in the local environment.

Options 1, 3, 4, 5 and 6 are considered the most practical, environmentally suitable, and desirable disposal options. The infrastructure required would be the same and the total dredge volume could be split between these options based on the capacities identified. These options are assessed further for strategic considerations, environment and cost.

5.2 Option 1 – On Site Land Based Use

5.2.1 Strategic Considerations

Operational Aspects

Dredged material would be used for land raising within the site, the majority of which was historically raised. At this stage, this would be limited to the 'dog-leg' area to the south east of the site which would require to be raised above the existing level. The material would be pumped ashore to a bunded area to provide temporary storage before being hauled across the site using dumpers and then deposited and levelled at the desired location.

Public and Local Acceptability

As the land raising area is within the site and close to the dredge zone, there would be no need for transport off site. Therefore there would be negligible public impact in terms of transport, visual or noise.

Legislative Implications

The material may require a waste management licence or exemption from SEPA depending upon the quality, need and end use of the material.

Consultation

SEPA have been consulted and have confirmed that there is a legitimate use for the dredge material without the need for any treatment and this will fall outwith their direct control. SEPA require appropriate mitigation measures to be detailed within the Construction Environmental Management Plan required for the site development.

5.2.2 Environment

Health and Safety Implications

There will be temporary land based storage of materials which will be a low risk activity. The material will then be hauled across the site to be placed for land raising. This will require a site transport plan to be produced to ensure that the site movements do not pose a risk to other site users during the period of operation.

Public Health Implications

Public health risks are considered low due to the clean nature of the dredged material. The material will be moved into the final location shortly after placement in the temporary storage area reducing any potential dust effects.

Pollution/Contamination Implications

The dredged material has been assessed to be clean sand, so there should be no chemical pollution risks associated with the material.

General Ecological Implications

This land based disposal option will not impact any of the ecologically designated sites in or around Ardersier Port.

Interference with Natural Systems

This land based disposal option will have negligible impact to the natural systems in or around Ardersier Port.

Amenity / Future Use

The land based use will have a positive contribution to the active use of the site ensuring that the available freeboard to extreme water levels is consistent across the site.

5.2.3 Cost Considerations

Dredge Costs

The dredge costs will be relatively consistent for each option as the method of dredging will most likely involve a cutter suction dredger due to the large volume of material along with a pipeline which will allow the arisings to be pumped ashore. Initial costings obtained from discussions with dredging companies has identified that the typical cost for the dredge will be £5/m³.

Land Based Use

The dredged material would be pumped ashore and allowed to dewater within shallow bunded areas. The material would then be transported across the site using dumper then deposited and regraded using conventional construction plant such as dozers, excavators. The transport and grading of material to the 'dog-leg' area of the site will have a typical cost of £2/m³. This will produce a unit cost for this method of £7/m³. The costs for applying this to other areas of the site will decrease slightly due to reduced haul distance.

5.3 Option 3 – Construction Material – Bulk Transfer from Dredge

5.3.1 Strategic Considerations

Operational Aspects

Material would be transferred directly to a barge from the dredger for ongoing re-use.

Public and Local Acceptability

The material would be transferred from the site during the dredging works and there would be no ongoing site activity in relation to dredging or materials arising.

Legislative Implications

The proposed end user of the material would require to ensure that they had the necessary consents in place to re-use the material.

Consultation

The end user of the material would undertake the necessary consultation with Marine Scotland or similar equivalent body if the site is outside Scotland.

5.3.2 Environment

Health and Safety Implications

The material handling operations will form part of the dredge contract and be managed as such.

Public Health Implications

Public health risks are considered low due to the clean nature of the dredged material.

Pollution/Contamination Implications

The dredged material has been assessed to be clean sand, so there should be no chemical pollution risks associated with the material.

General Ecological Implications

This disposal option will not directly impact any of the ecologically designated sites in or around Ardersier Port.

Interference with Natural Systems

This disposal option will have negligible impact to the natural systems in or around Ardersier Port.

Amenity / Future Use

The works will not have any longer term effect on any future use of the site.

5.3.3 Cost Considerations

Dredge Costs

The dredge costs will be relatively consistent for each option as the method of dredging will most likely involve a cutter suction dredger due to the large volume of material. Initial costings obtained from discussions with dredging companies has identified that the typical cost for the dredge will be £5/m³. Ongoing transport costs will be dependent upon the distance and location where the material is going to.

5.4 Option 4 – Construction Material – Stockpiling for Unprocessed Use

5.4.1 Strategic Considerations

Operational Aspects

Material would be stockpiled at the existing site for future use, either as ballast material in relation to the development of gravity base foundations, or as bulk fill for the construction of the A96 Inverness to Nairn road dualling project. Either of these would potentially be able to utilise a large proportion of the total proposed dredge volume.

Public and Local Acceptability

As the stockpiling would be within the site and adjacent to the dredge zone, there would be no need for transport off site. Therefore there would be negligible public impact in terms of transport, visual or noise.

Should the material be taken off site, the main impact on the public would be the traffic generated through transportation of the material from the stockpile to the A96 works. However, as the source of material is relatively close to the required location, the net effect would be that traffic generated would be restricted locally and controlled within the overall road construction project.

Legislative Implications

SEPA would be consulted on any required permissions in relation to temporary storage and proposed re-use of any dredged material.

Consultation

As stated above, SEPA would be consulted as part of the materials re-use strategy.

5.4.2 Environment

Health and Safety Implications

The material will be pumped ashore directly to the storage area. The land based works involved will use conventional construction plant to stockpile the deposited material. This will be undertaken in an area designated for the stockpile and can be operated as a self contained area of the larger site.

Public Health Implications

Public health risks are considered low due to the clean nature of the dredged material. Measures will be put in place to manage dust on the stockpile. Normal weather patterns will restrict any dust, however if required water suppression will be deployed as appropriate. Any further health and safety risks would be assessed and mitigated within the A96 roads contract.

Pollution/Contamination Implications

The dredged material has been assessed to be clean sand, so there should be no chemical pollution risks associated with the material.

General Ecological Implications

This land based disposal option will not directly impact any of the ecologically designated sites in or around Ardersier Port. Account will be taken of any bird roost sites in the vicinity of the stockpile and works on formation of the stockpile will not take place during the wintering bird season. The temporary stockpile will afford further protection, given it will provide a further physical barrier to public access to the roost, and a permanent section of bund will be retained to protect the roost in the longer term. The risk of dust and wind blow to Whiteness Sands will be minimised through natural weather patterns and if required, water suppression could be deployed as appropriate. Given the temporary nature of the stockpile any minimal effects will also be temporary.

Interference with Natural Systems

This land based disposal option will have negligible impact to the natural systems in or around Ardersier Port and will be a temporary feature.

Amenity / Future Use

The stockpile will be a temporary feature on the site and will not have any longer term effect on any future use of the site. . The future potential use of the dredge material as fill for road construction for the A96 dualling provides an ideal opportunity to promote two significant projects with a mutually beneficial sustainable construction option.

5.4.3 Cost Considerations

Dredge Costs

The dredge costs will be relatively consistent for each option as the method of dredging will most likely involve a cutter suction dredger due to the large volume of material along with a pipeline which will allow the arisings to be pumped ashore. Initial costings obtained from discussions with dredging companies has identified that the typical cost for the dredge with a pipeline will be £5/m³.

Land Based Use

The dredged material would be pumped ashore and allowed to dewater within shallow bunded areas and this process would be repeated to increase the height of the stockpile until the operation is completed. There will be minimal transportation of material as the stockpile will be formed where the material is pumped ashore. The stockpiling of material will have a typical cost of £1/m³. This will produce a unit cost for this method of £6/m³.

5.5 Option 5 – Construction Material – Stockpiling for Processed Use

5.5.1 Strategic Considerations

Operational Aspects

Material would be stockpiled at the existing site for future use. Material would be processed from the stockpile through basic screening processes to produce aggregates mix at required gradings. This material would then be incorporated within any end use e.g. concrete mix, graded aggregate for roads, graded aggregates for drainage. Either of these would potentially be able to utilise a large proportion of the total proposed dredge volume.

Public and Local Acceptability

The formation of the stockpile would be contained within the site and have negligible public impact. The main impact on the public would be the traffic generated through transportation of the material from the stockpile to the A96 works. The relative processed volumes are only expected to be around 10% of the total dredge and likely to be economic only at a local scale, so these are not expected to be extensive.

Legislative Implications

SEPA would be consulted on the proposed re-use of any material.

Consultation

As stated above, SEPA would be consulted as part of the materials re-use strategy.

5.5.2 Environment

Health and Safety Implications

The material will be pumped ashore directly to the storage area. The land based works involved will use conventional construction plant to stockpile and then process the deposited material. This will be undertaken in a designated area and can be operated as a self contained area of the larger site.

Public Health Implications

Public health risks are considered low due to the clean nature of the dredged material. The natural weather conditions will restrict dust, however measures will be put in place to manage dust on the stockpile through the use of water suppressors if required.

Pollution/Contamination Implications

The dredged material has been assessed to be clean sand, so there should be no chemical pollution risks associated with the material.

General Ecological Implications

This land based disposal option will not directly impact any of the ecologically designated sites in or around Ardersier Port. Account will be taken of any bird roost sites in the vicinity of the stockpile and works on formation of the stockpile will not take place during the wintering bird season. The temporary stockpile will afford further protection, given it will provide a further physical barrier to public access to the roost, and a permanent section of bund will be retained to protect the roost in the longer term. The risk of dust and wind blow to Whiteness Sands will be minimised through natural weather patterns and if required, the use of water suppression would be deployed as appropriate. Given the temporary nature of the works any minimal effects will also be temporary.

Interference with Natural Systems

This land based disposal option will have negligible impact to the natural systems in or around Ardersier Port and will be a temporary feature.

Amenity / Future Use

The stockpile will be a temporary feature on the site and will not have any longer term effect on any future use of the site.

5.5.3 Cost Considerations

Dredge Costs

The dredge costs will be relatively consistent for each option as the method of dredging will most likely involve a cutter suction dredger due to the large volume of material along with a pipeline which will allow the arisings to be pumped ashore. Initial costings obtained from discussions with dredging companies has identified that the typical cost for the dredge will be £5/m³.

Land Based Use

The dredged material would be pumped ashore and allowed to dewater within shallow bunded areas and this process would be repeated to increase the height of the stockpile until the operation is completed. There will be minimal transportation of material as the stockpile will be formed where the material is pumped ashore. The stockpiling of material will have a typical cost of £1/m³. Processing of the material may be required with a nominal typical unit cost of £1/m³. This will produce a unit cost for this method of £7/m³.

5.6 Option 6 – Spit Restoration

5.6.1 Strategic Considerations

Operational Aspects

Dredged material would be used for re-instatement of the former excavation made into the western side of the spit in the inner channel for navigation purposes. The area is located adjacent to the dredge area and therefore would have minimal requirement for transport of dredge material other than via the discharge pipeline.

Public and Local Acceptability

As the restoration is adjacent to the dredge zone, there would be no need for transport off site. Therefore there would be negligible public impact in terms of transport, visual or noise.

Legislative Implications

The activity would be licensed by Marine Scotland.

Consultation

Consultation with Marine Scotland would be required.

5.6.2 Environment

Health and Safety Implications

Activities which can be restricted to marine based will be able to deal with larger volumes of material and subsequently require less ancillary construction equipment, personnel and time. These will contribute to making marine based activities safer due to the reduce risk exposure.

Public Health Implications

Public health risks are considered low due to the clean nature of the dredged material. Marine disposal will have lower risks of potential dust arisings compared to land based options.

Pollution/Contamination Implications

The dredged material has been assessed to be clean sand, so there should be no chemical pollution risks associated with the material. The fines content (silt or clay) is very small, so the turbidity impacts will be small and very local. The dredge plume will be limited to fine sand particles which will settle out quickly in the vicinity of the disposal area.

General Ecological Implications

There are a number of national and international environmental designations in and around Ardersier Port. These are detailed in the EIAR. Undertaking this restoration from the marine environment will ensure that there is minimal disruption to the sensitive terrestrial environment on the spit.

Interference with Natural Systems

The natural physical processes around Whiteness Head are important and have environmental designations to support this. This option is focused on sheltered area which has undergone minimal change in a dynamic system since it was initially excavated and the restoration works are considered to have a negligible potential impact to Whiteness Head.

Amenity / Future Use

The spit restoration works would provide a positive benefit to restoring the natural planform of the designated features at Whiteness Head and contribute to the ongoing amenity use which this natural feature presents.

5.6.3 Cost Considerations

Dredge Costs

The dredge costs will be relatively consistent for each option as the method of dredging will most likely involve a cutter suction dredger due to the large volume of material along with a pipeline which will allow the arisings to be pumped directly to the disposal area. Initial costings obtained from discussions with dredging companies has identified that the typical cost for the dredge with a pipeline will be £5/m³. There would be minimal requirement to work this material following deposition, so the unit dredge cost has been maintained.

6 CONCLUSIONS

6.1 Summary of Findings

The options considered have identified that a combination of land based restoration (the 'dog-leg'), stockpiling for re-use, spit restoration (the 'scaloped area') and sea disposal to the spoil ground area have the greatest capacity and benefit for accepting dredge material.

6.2 Cost Findings

The dredge cost for these options are broadly similar due to the type of dredger likely to be required for these large volumes and a pipeline of similar length will allow each of these areas to be viable disposal areas. The main variation in costs are in relation to the amount of land based movement and shaping the material. The stockpiling (for beneficial use as ballast in gravity based wind turbine foundations) option has the greatest capacity, while the others each have distinct beneficial uses with small variations in cost due to the smaller capacities available.

6.3 Overall Summary of Findings

A summary of the options assessed in detail is provided in Table 6.1.

Table 6.1: BPEO summary

Disposal Option	1. On Site Land Based Use	3. Construction Material – Bulk Transfer	4. Construction Material – Stockpiling Unprocessed Use	5. Construction Material – Stockpiling Processed Use	6. Spit Restoration
Capacity (m³)	480,000	2,300,000+	2,300,000+	200,000	200,000
1. Strategic Acceptability					
Strategic Acceptability	High	High	High	High	High
Operational Acceptability	Medium	High	Medium	Medium	Medium
Capacity	Medium	High	High	Low	Low
Legislation	High	Medium	High	High	Medium
General Public & Local Acceptability	High	High	High	Medium	High
Consultations	Medium	Medium	Medium	Medium	Medium
2. Environmental Acceptability					
Health and Safety	Medium	Low	Medium	Medium	Low
Public Health	Low	Low	Medium	Medium	Low
Pollution Acceptability	High	Medium	High	High	Medium
Ecological Benefit	Low	Low	Medium	Medium	High
Interference with Natural Process	Low	Low	Low	Low	Low
Amenity/Future Use	High	High	High	High	High
3. Costs					
Cost per m ³ (£)	7.00	5.00	6.00	7.00	5.00

6.4 Identification of the BPEO

The BPEO is considered to be a combination of the acceptable disposal options available. A wider range of options may become available when the lower volumes of maintenance dredging are considered.

7 SUBMITTED DRAWINGS REFERRED TO

Drawing 167112/24	Proposed Stockpile for Dredged Material
Drawing 167112/25E	Dredge Fill Areas
Drawing 167112/28A	Indicative Masterplan

APPENDICES

A LETTERS OF INTEREST

**CWC Group
Moray House
16-18 Bank Street
Inverness
IV1 1QY**

Date: 14th March 2018
Your reference:
Doc reference: BOW-COR-SUP-FAC-GGE-00001

For the attention of [Redacted]

**Subject:
Offshore Wind Float & Submerge Gravity Foundations
Port of Ardersier**

Dear [Redacted]

Thank you for your time at our recent meeting in relation to the suitability of the Port of Ardersier for the manufacture of float and submerge gravity base foundations for offshore wind projects.

As discussed, we are currently in contact with a number of wind farm developers about sites off the UK coast for which the port may be a suitable manufacturing base. We hope to be in a position to hold more detailed discussions with you in this respect later in the year.

In the interim we have reviewed the information provided by you in relation to the marine dredge material available at the port and can confirm that in principle it appears suitable for use as aggregate for the concrete that would be used in the construction of foundations and also for use as ballast material within the foundations once they have been installed on the seabed.

Yours faithfully,
For and on behalf of **BAM Offshore Wind bv**



[Redacted]

Operations Manager

re A96 - statement on dredging materials

[Redacted]

Mon 04/06/2018 11:57

[Redacted]

Dear [Redacted]

Our geotechnical team have reviewed the information you provided on the materials within the port channel at Ardersier Port. From the available borehole and seabed grab sampling information^{1&2} (6 No. terrestrial cable percussion boreholes and 18 No. seabed sediment grab samples) together with the limited geotechnical laboratory testing available, the materials encountered have the potential to be suitable for reuse as a General Granular Fill for highway earthworks³, requiring some conditioning (stockpiling or windrowing) to dry the materials out before re-use. The materials recovered in the boreholes and grab samples appear to be consistent (mainly sands and gravels with made ground up to 0.6m located in three of the terrestrial boreholes). The grab samples only cover the surface deposits (0.1m) immediately below seabed level, when it is understood that dredging of up to 2m below the sea bed may be required.

Geochemical analysis was taken on all samples; the majority of which passed Marine Scotland action levels for suitability for disposal at sea. Re-use of dredged materials on land is uncommon with no clear guidance and is anticipated to require discussions with SEPA. From the geochemical results available, it appears that there should be no risk to Human Health and the Environment, but further site specific assessment would be required to assess the risks to the Water Environment. Any necessary consents from statutory bodies in relation to the re-use dredged materials on land as a General Granular Fill for highway earthworks³ will not be the responsibility of the promoting authority.

More detailed ground investigation and testing of the materials would be required to confirm the acceptability of the material for re-use as a general earthworks fill. This is necessary to determine the nature and variability of the materials, particularly within the existing channel, to determine their geotechnical properties and to determine the nature and concentration of any potential contaminants that may be present at depth below seabed level.

For the avoidance of doubt, the above comments are being provided by Jacobs for your information and assistance only, we are not an approving authority in terms of the potential re-use of these materials, and would recommend you seek further professional advice on all matters we have highlighted above.

I trust this is of assistance however should you wish to discuss this further please do not hesitate to get back in touch.

Yours sincerely,

[Redacted]

[Redacted] BSc (Hons) MSc CGeol CEng | Jacobs | Technical Director Highways | [Redacted]
[Redacted] | www.jacobs.com

References

1. Factual report for EnviroCentre for site at Whiteness Yard and Spit, Blake Geoservices Ltd, April 2013, Report 12159-01
2. Port of Ardersier, Whiteness Sediment Sampling, April 2013, Envirocentre, Report 5436

3. In accordance with the Specification for Highway Works (SHW) from the Manual of Contract Documents for Highway Works, Series 600 Earthworks.

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