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MAINTENANCE DREDGING AT WICK HARBOUR

BEST PRACTICABLE ENVIRONMENTAL OPTION (BPEO) ASSESSMENT

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Document Control

Project Information

Client	Wick Harbour Authority
Project Title	Maintenance Dredging
Project Location	Wick Harbour, Wick
Project Ref	163065

Document Information

Description	Listing
Document Id	4R163065-01
Document Originator	J D Clarke
Date Prepared	13/07/2017
Authorised By	J Simpson

Document History

Version	Issue Date	Changes
01	14/07/2017	Issue

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1. INTRODUCTION

The approaches to Wick Harbour have traditionally been subject to the build-up of sand resulting in a restricted water depth. This has required periodic maintenance dredging to restore acceptable water depths for shipping.

Wick Harbour Authority propose to undertake further maintenance dredging to the harbour area. The proposed programme of works involves the dredging of approximately 25,000 m^3 of sand from the two areas and depositing the dredged materials at a designated deep water dumping ground.

The proposed works are detailed on drawings 3D163065-01(A), 3D163065-02(A), 3D163065-03(A), 3D163065-04(A), 3D163065-05(A) and 3D163065-10 (A) (refer to Appendix 1).

Arch Henderson LLP have been instructed by Wick Harbour Authority to prepare the application for a sea disposal licence under the Marine (Scotland) Act 2010. Part of the application process requires the preparation of a Best Practical Environmental Option (BPEO) assessment. The purpose of the BPEO assessment is to identify and assess each of the available disposal options. The BPEO procedure establishes the option that provides the most benefit or least damage to the environment as a whole, at acceptable cost, in the long and short term.

Representative sampling confirming particle grading and composition analysis of the materials to be dredged are presented in Appendices 2 and 3.

This report presents the findings of the BPEO assessment, and provides justification for the proposal to dispose the dredged materials at sea.

2. IDENTIFICATION OF PRACTICAL OPTIONS

2.1. Introduction

This section of the report identifies all potential options for the disposal of the dredged materials. Where a disposal option is considered to be impractical at the outset, the reason is given and the option is discounted from further assessment.
The assessment of each practical option is carried out in Section 3 of this report.

2.2. Option 1 – Sea Disposal

The analysis of the sediment samples taken indicates that the maximum concentrations of pollutants recorded are below the AL1 levels stipulated by Marine Scotland. The area proposed has previously been utilised for maintenance dredge material disposal and is shown on drawing 3D163065-01 (refer to Appendix 1).
The nature of the dredged sand and the proximity of suitable deep water disposal sites, make sea disposal a practical option.

2.3. Option 2 – Landfill Disposal

The sediment samples taken confirmed that the material is predominantly granular, course to fine sand. Non cohesive material containing no significant pollutants would be considered as acceptable low grade infill.
The nature of the dredged sand and the scope for identifying potential landfill sites, makes landfill disposal a practical option.

2.4. Option 3 – Stockpiling for Future Use

The nature of the dredged sand and the scope for identifying potential sites for storage, make stockpiling for later use a practical option.

The utilisation of stockpiles would however involve triple or possibly quadruple handling of the material, with associated considerably increased machinery fuel consumption. Potential areas for the stockpiling of the material have not been identified at this stage.

2.5. Option 4 – Spreading on Agricultural Land

Samples analysis of the materials arising from maintenance dredging to Wick Bay undertaken in the past has established that the material is not suitable for conditioning agricultural land.

This option has therefore been discounted.

2.6. Option 5 – Reclamation/Beach Nourishment

No projects have been identified as on-going or scheduled to be undertaken within the Caithness area which involve reclamation or beach nourishment.

This option has therefore been discounted.

2.7. Option 6 – Land Incineration

No projects have been undertaken in the Caithness area which involve land incineration.

This option has therefore been discounted.

3. ASSESSMENT OF PRACTICAL OPTIONS

3.1. Introduction

All practical options identified in Section 2 of this report, are assessed in this section with respect to the following criteria:

- Strategic
- Environmental
- Cost

The relative advantages and disadvantages of each option are considered with respect to the three assessment criteria. The considerations for each option are presented in the form of a schedule. These schedules are used to enable a qualitative comparison to be made between the practical options, which subsequently provides the basis of selection of the BPEO.

3.2. Option 1 – Sea Disposal

This option would involve dumping the dredged material at designated deep water dumping grounds. The proposed dumping grounds are located at a distance of up to approximately 4km from the dredging site.

The designated disposal area has been stipulated by Marine Scotland and utilised for previous maintenance dredging operations. The migration path for the build-up of sea bed sediment is not known. Although it would appear from the deposit pattern that much of the sediment build-up is river based it is felt that extreme storm conditions could disturb some of the material at the designated disposal area.

Dumping of dredged material at sea could possibly increase the frequency of maintenance dredging operations.

The relative advantages and disadvantages of this option are summarised in Table 1.

3.2.1 TABLE 1 - Option 1 Sea Disposal

Option 1 - Sea Disposal		
	Advantages	Disadvantages
Strategic	Avoids double handling of the dredged material. Avoids significant land based activities. Avoids transportation of dredged materials to landfill sites.	Increased travelling distance for the Dredger.
Environ' mental	Minimal environmental impact on the land. Minimal disruption to the town. No depletion of available landfill sites.	The impact of the increased fuel consumption due to the greater travelling distance to the designated sea disposal area is considered to be relatively marginal. The envisaged transition area will involve travelling from the outer areas and the increased fuel consumption will be more than offset by the fuel consumption of the machinery for the transfer of the dredged material. Disturbance of the sea bed at dumping grounds.
Cost	No land based excavation and transportation activities. No landfill charges.	Reduction in dredger efficiency, due to dredger spending more time travelling to and from the dumping grounds.

3.3. Option 2 – Landfill Disposal

This option would involve the disposal of the dredged material at a designated landfill site(s). This would require the dredger to deposit the dredged material at a temporary disposal area adjacent to the harbour. This material would then be removed by land based excavation equipment and loaded onto road vehicles for transportation to designated landfill site(s).

High saline content in dredged material.
The saline content of the sediment samples was not measured. It is assumed that the salinity content of the sea-water would be in the order of 35mg/kg as per typically recorded levels. It is estimated that the saline content of the sediment material would be in the order of 5mg/kg.

The relative advantages and disadvantages of this option are summarised in Table 2.

3.3.1 TABLE 2 - Option 2 Landfill Disposal

Option 2 - Landfill Disposal		
	Advantages	Disadvantages
Strategic	Reduced travelling distance for the Dredger.	Double handling and double excavation of the dredged material. Increased risk of dredger grounding in shallow waters. The laden draft of the dredger has been confirmed as 4m. The bed level to the area potentially available for transient discharging of material for stockpiling is to the South end of the South Pier is -1.8m C.D. Discharging would have to be carried out on a tidal basis with close control to avoid grounding the dredger. Substantial land based excavation activities necessary within the confines of the harbour. Trafficking of heavy goods vehicles through the town and the harbour roads (approximately 2500 return journeys).
Environ' mental	Avoidance of sea dumping grounds would result in reduced damage to the sea bed. Reduced fuel consumption of dredger, due to lesser travelling distance.	Increased fuel consumption and associated pollution, due to heavy goods vehicles travelling to the landfill site. Increased disruption in the town and on local roads, due to heavy goods vehicle movements. Depletion of available landfill resources, and consequential increase in demand for additional landfill capacity.
Cost	Increase in dredger efficiency, due to dredger spending less time travelling to and from the dumping grounds. Permanent removal of dredged material would possibly reduce the frequency of maintenance dredging operations.	Additional costs due to land based excavation and transportation activities. Additional costs due to landfill charges.

3.4. Option 3 – Stockpiling for Future Use

This option would be similar to option 2 except the dredged sand would not be dumped at a designated landfill site(s). Instead it would be stockpiled at a suitable holding area, processed as necessary and sold for commercial benefit.

It is considered that the dredged sand has the following potential uses:

- General engineering fill material
- Admixture for road de-icing salt
- Fine aggregate for concrete or mortar production

It is however considered that the commercial viability for using the sand for concrete or mortar production, would be very limited. This is because the sand would need to be rigorously washed, in order to achieve compliance with stringent British Standard requirements for chloride content. Published data suggests that the salinity of sea-water comprises 55% chloride. On the basis of the estimated saline content of the sediment material the chloride content of the sand would be in the order of 3mg/kg.

The relative advantages and disadvantages of this option are summarised in Table 3.

3.4.1 TABLE 3 - Option 3 Stockpiling for Future Use

Option 3 – Stockpiling for Future Use		
	Advantages	Disadvantages
Strategic	Reduced travelling distance for the Dredger. Provides a potentially useful materials resource. Local quarries could possibly be adapted to serve as stockpiling areas.	Double handling and double excavation of the dredged material. Increased risk of dredger grounding in shallow waters. The stockpiling of material would involve tidal discharging of the dredged material and the increased fuel consumption for the loading machinery, as outlined for Option 2. The stockpiling of the dredged material would also require the establishing and safeguarding of a stockpile area. Substantial land based excavation activities necessary within the confines of the harbour. Trafficking of heavy goods vehicles through the town and the harbour roads (approximately 2500 return journeys).
Environ' mental	Avoidance of sea dumping grounds would result in reduced damage to the sea bed. Reduced fuel consumption of dredger, due to lesser travelling distance.	Increased fuel consumption and associated pollution, due to heavy goods vehicles travelling to the stockpiling site. Increased disruption in the town and on local roads, due to heavy goods vehicle movements. High saline content in stockpiled material.
Cost	Increase in dredger efficiency, due to dredger spending less time travelling to and from the dumping grounds. Permanent removal of dredged material would possibly reduce the frequency of maintenance dredging operations. Potential commercial value of recovered material.	Additional costs due to land based excavation and transportation activities. Recovered material may require washing for certain applications. Potential commercial value of recovered material outweighed by additional costs of recovery and treatment.

3.5. Option 4 – Selection of Best Practicable Environmental Option (BPEO)

A qualitative, comparative review of Options 1, 2 and 3 has been carried out. It is apparent from the schedules presented in sections 3.2 to 3.4 of his report, that Option 1 – Sea Disposal is the most beneficial in strategic, cost and environmental terms.

The main reasons for Option 1 being selected as the preferred option are as follows:

- No double/triple handling of dredged materials
- No land based activities
- No land haulage requirements
- Minimal disruption to the town
- No requirement for landfill or land storage sites

Option 1 is also considered to be superior with respect to safety implications, since all work will be confined to the dredging vessel, thus avoiding significant interaction with the town and the general public.

The main disadvantages of Option 1 in comparison with the other options, are the damage caused to the sea bed at the dumping grounds, and the increased dredger movements. However, such disbenefits are considered on balance to be significantly outweighed by the strategic, cost and environmental disadvantages which are inherent in the land based activities under Options 2 and 3.

Of the other two options, Option 3 – Stockpiling for future use, offers significantly greater potential benefits than Option 2 - Landfill Disposal. This is because Option 3 avoids landfill costs and the depletion of landfill capacity. Option 3 also offers a degree of commercial return for the recovered material. However, the commercial viability of Option 3 is at this stage unproven, and it is apparent that the potential commercial value of the recovered sand would not justify the additional cost of recovery.

4. CONCLUSIONS

Wick Harbour Authority propose to undertake a programme of maintenance dredging to the harbour approaches. The work will involve the removal of approximately 25,000m^3 of sand from the sea bed.

A number of practical options have been considered for the disposal of the dredged material. These are:

- Option 1 - Sea Disposal
- Option 2 - Landfill Disposal
- Option 3 - Stockpiling for Future Use

These options have been subject to a Best Practical Environmental Option (BPEO) assessment, to identify which option offers the most benefit or least damage to the environment, at acceptable cost.

It is concluded that Option 1, sea disposal of the dredged sand, offers the greatest strategic, cost and environmental benefits. This option is therefore selected as the BPEO.

APPENDIX 1

Drawings

3D163065-01 (A)	Location of Proposed Dumping Area
3D163065-02 (A)	Existing Seabed Surface Profile
3D163065-03 (A)	Site Plan and Sample Location
3D163065-04 (A)	Area 'A' River Basin Approaches
3D163065-05 (A)	Area 'B' Main Harbour Entrance
3D163065-10 (A)	Location of Proposed Dumping Area & Noss Head MPA