John o Groats Harbour
Highland Council
Harbours

Dredging of Harbour basin and
entrance to the sea

MARINE SCOTLAND ACT 2010
APPLICATION FOR DREDGING AND DEPOSIT OF SOLID WASTE IN THE TERRITORIAL SEA AND UK CONTROLLED WATERS ADJACENT TO SCOTLAND

BEST PRACTICABLE ENVIRONMENTAL OPTION ASSESSMENT

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1. INTRODUCTION

John o Groats (JoG) harbour contains soft sediments to an average depth of about 1.5 m. It is these sediments that are targeted for dredging, the underlying harder material representing the original harbour floor.

The recent, extensive chemical analysis of representative harbour sediment samples has shown overall that the harbour is relatively uncontaminated. Suggestions of localised traces of historic harbour contaminants such as TBT in an earlier single core analysis can now be discounted, as any such traces will be biologically unavailable (tightly bound by the highly humified organic matter and fine particle size fraction of the older sediments). The newer sediments derived from recent river transport and wind-blown erosion are coarser textured and free from any contamination.

1.1 Background

This report has been prepared by Highland Council Harbours. The report considers options for disposal of material dredged from the inner harbour and entrance to JoG. The following points have been addressed:

- review of previous practices
- recommendations for improving the current practice to achieve a sustainable method for dredging operations

JoG Harbour is located on the North coast of Scotland, at OSGB Grid Reference ND379773479

Due to the orientation of the harbour and the effects of the fast-tidal stream of the Pentland Firth. Dredging is required periodically to maintain the depth of water for access to the berths in the inner harbour, which are used by 3 small fishing vessels and one-foot passenger ferry.

This has not been dredged since before 2000.

This harbour has silted up to a level that seasonal Ferry to Orkney is now grounding on all but the high tides and will be unable to operate without dredging the basin and entrance. The ferry currently has to berth projecting out of the harbour and blocking the entrance. Fishing vessels are only able to enter and depart at 1 hour either side of MHWN. This leaves them vunerable to sudden bad weather to be able to take shelter in their home Harbour. The income from these (3 Small fishing boats and the pedestrian ferry) does not cover the costs of operating this harbour to the local council for the local community. In addition this harbour is a national icon and a mecca to cyclists and tourists coming to Scotland. Allowing it to silt up and become a mudflat is also dangerous to the public.

1.2 Program of Work

The program of work involves the removal of approx. 1,000 m^3 of sand and mud that has accumulated on the bed of the inner harbour and entrance, as a result of tidal flow and natural deposition. This work will be a maintenance dredge and is proposed to take place in March 2023.

The material will be removed by “A W Sinclair contractors”. and deposited on the beach at the approved site.

1.3 Scope of this Report

In this report we will review each available disposal option for the dredged material. In this fashion those options which are not practical can be rejected and the reasons (be it on the grounds of strategy, environment, or cost) for so doing explained. Once this review has been completed a conclusion as to the Best Practical Environmental Option (BPEO) can be drawn.

1.4 Report Structure

The remainder of the report will be structured as follows:

Section 2: description of available disposal options

Section 3: discussion of those options shown to be practicable

Section 4: summary of findings

Section 5: conclusion including BPEO

2. Available Options

2.1 Introduction

This section will discuss all available disposal options for the dredge materials. If the method is considered impractical the reasons will be explained for its exclusion from the remainder of the report. Those options considered as practical will be carried through the report for further analysis.

2.2 Land Disposal

In order to prepare the dredge material for disposal to landfill it would first have to undergo a number of stages. The material in the dumper trucks will have to be stored to allow de-watering to take place. This material would then have to be reloaded to allow transport to a landfill site.

Repeated handling of this wet material is time consuming and expensive. JoG is only a small harbour and there is insufficient space to allow for this material to be stored. The visual impact and smell of such storage cannot be overlooked for the residents and tourists of JoG.

Even after this process has been completed the material would still have high water content and as such vehicles designed specifically for transporting such materials (closed transportation) will be required. The probability of creating a public nuisance is considered highly likely due to the repeated movement of these large vehicles, and the nature of the cargo, through a small coastal town such as JoG, Keiss, and or Halkirk as well as other surrounding settlements.

Though difficult this option will be further investigated in **Section 3**.

2.3 Land Incineration and Disposal

The dredged material is non-combustible and therefore incineration is not possible. This option is therefore discounted from further analysis.

2.4 Spreading on Agricultural Land

Due to the saline nature of the dredge material it is not suitable for spreading on agricultural land, and farmers and landowners are unwilling to take delivery of the material for deposit. Even if they were, the same problems of transport highlighted in 2.2 remain. For this reason, this option is therefore discounted from further analysis.

2.5 Reclamation

The dredge material is unsuitable for use as reclamation fill as a result of its lack of bearing capacity and its susceptibility to wash out. For this reason, this option is therefore discounted from further analysis.

2.6 Disposal to Sea

JoG is a small harbour with a narrow entrance (9 meters) to the inner basin. As such it is unsuitable for a large-scale dredger and would instead require the dredged material to be placed into a smaller, shallow draught vessel for disposal at an approved site at sea. In addition, the river access to the sea is restricted by its depth and the tidal times for operations. It would take 2 months to complete this operation. Ploughing the material out to sea is not possible with the narrow entrance for the smallest of boat mounted excavator. The pier - raised walls limit any excavator rotation. In addition, the weight of such excavators could not be supported by the pier structure.

This is a possible disposal method and will therefore be carried forward to **section 3** for further analysis.

2.7 Beach Nourishment

In any dumping of harbour sediment from harbour to beach, the tide will rapidly disperse the finer, more organic, older sediment over a 2 Km2 area, while some of the newer, coarser sediment will be available and ideally suitable for rocky beach nourishment. In all analytical tests made, these coarser textured (grading into sands and fine gravels) sediments are contaminant-free.

There is a suitable area immediately to the east of the harbour wall (within 40m.). The use of this site would allow the spread of the material at low water along the waterline.

This is a possible dispersal method and will therefore be carried forward to **section 3** for further analysis.

2.8 Other Beneficial Uses

Investigation has not provided any alternative uses other than beach nourishment.

3. Options under consideration

The options carried forward from **Section 2 (2.6 and 2.7)** above will be further considered with a view to strategic, environmental and cost implications.

3.1 Strategic considerations

3.1.1 Disposal to landfill

The initial strategy has been discussed in brief above i.e. handling, dewatering, and transport of dredge material to a suitable landfill site. This process involves multiple handling as well as storage on the quayside and is slow and expensively prohibitive to the Highland council with little funds to use on such a project.

3.1.1.1 Availability of suitable sites/facilities

Once the dredged material has been dewatered it must be reloaded in specialist closed transportation and taken to a suitable facility. No such facility exists nearby to the village of JoG. This would take approximately 100 truck trips through the town.

3.1.1.2 General public acceptability

Multiple journeys of these large (30 ton) trucks through many local settlements is unlikely to be looked on favorably by the public in general. There is a risk of many complaints about noise, nuisance and congestion as well as the increased safety risk to other road users and pedestrians.

3.1.1.3 Local acceptability (e.g. local residents)

The storage of the dredge material to dewater will be problematic as space is at a premium in a small harbour such as JoG. Residents will almost certainly not approve of this option. Use of landfill for such quantities of inert material will increase the rate at which these utilities are filled, potentially requiring more to be opened. This will undoubtedly be an unpopular option locally.

3.1.1.4 Legislative implications

The dredge material will be considered as a controlled waste material for the purposes of transport and would be liable to Landfill Tax Regulations at the point of its eventual disposal. Thus, the strategy is possible but problematic, however environmental and cost implications make this option impractical.

3.1.1.5 Summary of the outcome of consultation

Highland Council Waste Management have stated it doesn't have a site nearby that is licensed to accept waste of this type, which would have to be tested for hazardous substances. However, it was also stated that this method of disposal is always extremely expensive in comparison to the alternatives.

3.1.2 Disposal to Sea

Section 2.6 above discusses the strategy involved with dredging JoG Harbour.

3.1.2.1 Availability of suitable sites/facilities

No Suitable sea disposal area exists within 50 miles of the Harbour.

3.1.2.2 General public acceptability

This disposal site has been used previously as a disposal site hence it is unlikely that the public will find this solution unacceptable.

3.1.2.3 Local acceptability (e.g. local residents)

The use of this site would not, it is believed, result in any further local concerns.

3.1.2.4 Summary of the outcome of consultation with third parties

The local harbour users agree that there would be a much longer operational time for a sea disposal due to tidal access to the harbour basin. There would also be an environmental in pollution from the machinery. The efficiency of excavators and dredgers running out to the sea disposal site.

3.1.3 Beach Nourishment

As discussed above, a suitable disposal area for fine material exists within 40m of the dredge site. Use of an excavator dredging unit on the harbour pier to take each bucket of spoil in one lift from the basin to the spoil area. This will be the fastest and cleanest method.

The eroded sand beach areas to the west are not accessible. To the west it would cross garden land owned by the "Natural Retreats" Company who operate the holiday accommodation facing and 30metre from the sea. To the East the road is owned by the John O groats development trust. As recent as September 2022 it has been pedestrianized. Childrens swings and rides as well as stone picnic tables and information displays have been built. This blocks the access to the sand beach. The committee have agreed to allow transport over their new paved structure to the east sandy beach.

This is now the only option open to us to fulfil the local marine community needs in using the harbour. .

3.1.3.1 Availability of suitable sites/facilities

This procedure and others similar have been carried out at other harbours in the region and as such plant, site and facilities are all readily available.

3.1.3..2 Local acceptability (e.g. local residents)

As stated above, this method has been used previously in Brora (License 05297/14/0 dated 2/10/14) dredge from channel to beach although using excavators. Local residents are supportive of this method of dredge operation. The operation provides cleaning teams both during the operational shift and at the close of shift. Local sensibilities with regard to timing of operation and minimising noise are addressed by the method of beach disposal.

3.2 Environmental Considerations

3.2.1 Disposal at Sea

3.2.1.1 Safety implications

Disposal at sea would have negligible implications for safety providing that normal navigational and maritime procedures are observed.

3.2.1.2 Public health implications

There are no known threats to public health associated with disposal at the site.

Furthermore it is far lower than the operation of suction dredgers and barges attempting to dredge the harbour over a much longer period of time. In addition, far lower than running road vehicles through the town to landfill.

3.2.1.3 Pollution/contamination implications

It is believed that the system of sea disposal has not been demonstrated to have had any significant adverse effect on the receiving environment and no evidence has been found of any substance likely to be harmful to the marine life.

3.2.1.4 General ecological implications

There would be little or no known risk of ecological impact arising from disposal to sea.

3.2.1.5 Interference with other legitimate activities, e.g. fishing operations

No complaints have been received from marine interests relating to previous dredges from JoG Harbour and there is no evidence that the sea disposal has produced turbidity, discoloration, foaming, odour or floating substances either at the disposal sites or on the adjoining shore. No objections have been received on amenity grounds, and the Council is unaware of the disposal operation causing any interference with other legitimate uses of the sea.

3.2.1.6 Amenity/aesthetic implications

No amenity or aesthetic implications have been identified for this option.

3.2.2 Disposal to landfill

3.2.2.1 Safety implications

The increased handling of the dredge material increases the risk to plant operatives and in the region of 100 return journeys would pose an increased risk to other road users. This risk would be greatest at the points of loading and unloading and also maneuvering the large vehicles through JoG itself. This may require the introduction of traffic control to maintain an acceptable level of safety.

3.2.2.2 Public health implications

A small increase in health risk due to exhaust and dust emissions would result from increased traffic.

3.2.2.3 Pollution/contamination implications

There is the risk due to the high salinity of the dredge material that this could affect local water courses. This possibility would require further investigation in order to avoid any SEPA licence condition breaches.

3.2.2.4 General ecological implications

No other risks have been identified at this time.

3.2.2.5 Interference with other legitimate activities, e.g. fishing operations

As already discussed, the initial de-watering and storage will inconvenience harbour users and the numerous return journeys will create inconvenience to road users and residents along the length of the proposed route.

3.2.2.6 Amenity/aesthetic implications

No amenity or aesthetic implications have been identified for this option.

3.2.3 Beach Nourishment

In any dumping of harbour sediment from harbour to a rocky beach, the tide will rapidly disperse the finer, more organic, older sediment over a 2 Km2 area, while some of the newer, coarser sediment will be available and ideally suitable for beach nourishment. In all analytical tests made, these coarser textured (grading into sands and fine gravels) sediments are contaminant-free.

The harbour dredging's will be dumped to the low water mark (covered each high tide by between 2 and 4m water), and because JoG beach is a relatively high energy environment, the dispersible, fine sediment (finer silt and clay sized fractions) will be rapidly and readily diluted by the sea and in the tidal flows to ensure that the material has no adverse impact on the local ecology.

Furthermore, the organic part of these sediments is highly humified and hence has a negligible biological oxygen demand and so should not significantly reduce the oxygen concentration of the water column or beach sediments. The sulphatic nature of this fraction will be rapidly transformed to further ensure no adverse ecological impact and only transient odour effects, as the sulphide is oxidized to sulphate (half life of sulphide approximately 20 minutes) in the highly aerated water column.

3.2.3.1 Safety implications

The approved disposal area is within 40m of the harbour and the excavators are avoiding the requirement of further handling the dredge material and the risks inherent in such.

3.2.3.2 Public health implications

The method avoids transit through the village of JoG and other surrounding towns, villages and settlements.

Only the finer, older sediment is associated with anaerobic conditions (and hence a sulphidic odour from the reduction of sulphate) and this part of the harbour dredging's

will be rapidly dispersed and swept away by the fast tidal stream off JoG. therefore, has the added advantage that any risk of odour will be minimized on disposal, ensuring little or no impact in terms of public perception.

3.2.3.3 Pollution/contamination implications

The operation provides cleaning teams both during the operational shift and at the close of shift to ensure that all dredge material is kept clear from the area once work is completed. The disposal area is the subject of a photographic protocol and it is anticipated that the dredged material will be spread evenly within a small number of tides.

3.2.3.4 General ecological implications

Acknowledging the short term risk of deposition of fine material in the disposal area, this process will be complete within a short space of time. There is a small risk of an increase in bioactivity at the disposal site by the introduction of the decayed marine vegetation and the aerobic agitation of the disposed material.

3.2.3.5 Interference with other legitimate activities, e.g. fishing operations

One fishing operation is conducted from the harbour and this would not interfere with its operation. It will not be possible for vessels to operate in the harbour from the start to finish of the whole operation. If required an alternative berth in other Highland Council Harbours. There is overwhelming support from the Harbour Users for this work to take place as soon as possible. *There are some boats out of the water for the winter. If this is prolonged into the spring and summer the harbour users will not be able to make use of the whole of the summer season and they will be under pressure to move their boats around the harbour throught the dredging process. The users vessels are restricted to entry and exit of the harbour to a 1 to 2 hour window either side of high water. Many of the boats are almost aground on the harbour bed for up to 20 hours. The effects on hull coating wear is increased from the daily friction of sinking into and out of the harbour bed. Many boats owner have left the harbour for others nearby. The user group meetings bring up the matter of dredging and relay that complaint back to ourselves.*

3.2.1.6 Amenity/aesthetic implications

The darkening effect on the adjacent shoreline where material is deposited will be monitored and photographed to confirm return to normal aerobic state and colour. This normally occurs within a number of weeks.

3.2.3 Cost Considerations

3.2.3.1 Disposal to landfill

At the current disposal charge of £66.78/tonne, the cost for 2,000 cubic metres to go

to landfill totals £133,560. Landfill Tax @ £2.50/ton adds another £5,000 and there will be a further cost for the specialized transportation that will be required.

3.2.4.1 Disposal to Sea

The work would take 8 weeks and is outside of the budget allowed (£30,000).

3.2.5.1 Beach Nourishment

Costs for this method have been quoted at less than £25,000. There is a cost saving because the harbour does not have to be cleared of boats in the low season. The excavator will be able work around the infrastructure in a flexible manner.

4 Summary of Findings

Six options were initially considered for the removal of dredged materials from JoG Harbour, three being ruled out in the initial stages (land incineration and disposal, spreading on agricultural land and reclamation.)

The remaining three were further reviewed and the findings are summarised below.

4.1 Disposal to Land

This option was problematic throughout and strategically it was fraught with issues. The costs are by far the highest of the three remaining options and are prohibitive to the Council.

In environmental terms the increase in road traffic would have been significant and the duration of such a project would have been greatly extended.

These factors when taken all together result in this being the least practicable of the three options.

4.2 Disposal to Sea

This option would be a slow process, limited by the tides. The available operating window is small to get the dredger and/or barges into the basin loaded and out again to the spoil ground area. The whole operation taking months and running into the summer season, with resulting delays to the public and users of the harbour.

4.3 Beach Nourishment

Fast and effective method with little impact on the environment and local population. This would be completed up to 2 weeks.

5 Identification of BPEO

It is concluded having view to the strategic, environmental and cost considerations above that the BPEO for disposing of the dredged material from JoG Harbour is beach nourishment to the east of the harbour. This is an area subject to significant erosion. This is the preferred method as it will successfully dredge and spread the

material over a small area in a fast, cost effective and environmentally efficient way.

All other investigated options are for various reasons unsuitable (be that based on cost or practicality) whereas the selected option is, we believe, acceptable on all counts. The cost is manageable given the Council's duties and budget constraints, and the initial short term impact on the immediate environment is acceptable.