



# **Best Practicable Environmental Option**

**Proposed Dredging Works**

**Lossiemouth Harbour 2020**



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## 1. INTRODUCTION

### 1.1 Background

Elgin and Lossiemouth Harbour Company (a non-profit organisation) constructed Lossiemouth Harbour in 1836 - a thriving cargo and fishing port for over a century. After the decline of the fishing industry in the 1990's, the Company transformed the harbour into a marina to sustain its viability and continue to provide a safe port for fishing vessels. The harbour has always been at the heart of the small community of Lossiemouth (population approximately 7000).

A continuous current passes northward past the entrance to the harbour. This is set up by the Lossie River which drains into the sea, point three of a mile to the south of the harbour entrance. Normally this current runs at less than a half a knot however during flood conditions it can be stronger. During such conditions, which occur several times each year, a vast amount of silt is washed down the River Lossie, a small proportion of which enters the harbour.

As a necessity and requirement for the safety of commercial, fishing and deep drafted leisure vessels annual dredging is required to the harbour entrance, linking basin channels and in between the finger pontoons. The co-ordinates for the proposed areas to be dredged are detailed on the application and lie within the harbour undertaking.

There had been an increase in sediment settling underneath the pontoons and within areas of the channel and berths due to traditional dredging methods not being able to access these areas successfully over the years.

Since 2018, Elgin and Lossiemouth Harbour Company has been operating with its own dredging system to good effect, particularly so on the previously limited accessible areas.

Successful dredging of the harbour is at the very core of the future viability of the Lossiemouth Marina.



## 1.2 Description of Site and Dredging Requirements

### 1.2.1 Site

Lossiemouth Harbour comprises of two basins each linked by a narrow channel to each other and to a common East facing harbour entrance.

The entrance is subjected to heavy South Easterly seas several times a year which cause heavy surges into the harbour. To reduce the power of this heavy motion, a spending beach faces the entrance – not a beach as such, rather a historic slipway which is no longer in use.

The seas wash onto a long gradual area reducing the currents into the basins. Over many years most of the sand has been removed from this area by natural ebb and flow and strong motion and has been transferred into the channel linking both basins.

The current berth capacity at the harbour is 115 berths, comprising of permanent, visitor, commercial and fishing vessel berths.

There is a launch-way at the west basin where vessels are lifted out from and into the water. This launch-way is purely used to allow access to the undercover workshops and dry standing areas for leisure vessels and up to fifteen tonne fishing vessels. No commercial work is undertaken on this launch facility.

### 1.2.2 Dredging Requirements

Previous traditional dredging methods had proved to be unsuccessful at removing silt build-up and sandbanks at Lossiemouth Harbour, resulting in vessels experiencing major tidal obstruction at the entrance to the west basin channel, the visitor pontoons and inbetween the finger pontoons within both the east and west basins. This has resulted in negative feedback and loss of business.

A method that was capable of accessing the previously unobtainable areas was required to maximise safe access for customer, visitor and commercial vessels alike.

A pump dredging system on a manoeuvrable floating platform was purchased and has been operating in a phased process, redepositing small volumes of spoil at the authorized designated areas within the harbour undertaking and to the outside of the harbor wall where it will be naturally dispersed by the previously mentioned current.



### 1.2.3 Material to be Redeposited

The water/silt ratio within the harbour area is estimated at 70-30% maximum and therefore the sediment element will disperse readily by the natural movement of the sea.

Samples from three locations (East basin, West basin and West channel – see attached report) were taken within the harbour as per instructions by James Hutton Limited who performed the analysis.

The method involved collecting and placing the sediment into supplied containers in accordance with instructions supplied by the analysts.

Full results of analysis are attached to this report.

### 1.2.4 Relocation site:

The spoil, which comes through by suspension will be disposed of within the harbour undertaking also via the suspension method by natural dispersion by the coastal and river tides. The sites will be:

1. Harbour entrance
2. Spending beach adjacent to west basin channel
3. West end of basin
4. North wall

1. Harbour entrance: Previously the disposal site during plough dredging operations (Licence for Act of Plough Dredging issued by Marine Scotland). Disposal site suitability for East Basin and Visitor berths due to close proximity. This area berths approximately fifty vessels, including commercial and occasional fishing vessels.

3.





2. Spending beach (disused slipway): Originally a sand beach designed to diffuse power of storm force surges entering the harbour. Over the decades this sand has washed down and settled within the channel leading to the West basin. This has resulted in silt build-up, obstructing access to vital areas of the harbour. Disposal site suitability is for the West basin channel due to its close proximity, separated by a stone harbour structure approximately fifteen metres wide. The operation will deepen the West channel and in addition recreate the sandy spending beach, enabling it to serve its original purpose of diffusing storm surge and minimizing the amount of force from the waves entering the inner areas of the harbour. The area lies completely within the harbour undertaking therefore no sand will be deposited outwith its boundaries.

The Scottish Environment Protection Agency (SEPA) have been contacted regarding depositing sand above Mean High Water Springs at the spending beach. The Agency confirmed that although a Marine Scotland Licence will be required, they will not have any further requirements as the operation falls within their guidelines.

- 3,4. West end of basin and North wall: The West channel leads into the West basin. This is a well sheltered inner harbour area with minimal tidal current which encourages the build-up of sediment. This basin berths over fifty vessels. Disposal site suitability selected to reduce the distance between the extraction and deposit sites from the West basin, one located at the North East and the other to the North West end of this basin.

In addition to the current set up by the River Lossie there is a North westerly setting tidal current of between point five and point seven knots on the flood tide and a north easterly setting current of similar velocity on the ebb tide. (*Admiralty tidal chart*)

The combination of the constant outflow from the River Lossie and the two north flowing sets of the tide ensure that the silt redeposited to sea is swept northward clear of the harbour and adjacent coast. This ensures that silt is swept well clear of both the river and the beach which lie to the east of the River Lossie and runs for approximately ten miles to Buckie.



### 1.3 Scope of Report

The purpose of this report is to review the dredging method purchased and operated within the harbour since 2018, which is believed to be the best option strategically and financially for Lossiemouth Marina.

## 2. AVAILABLE OPTIONS

### 2.1 Disposal to Sea and Spending Beach

Suction Pump Method :

Lossiemouth Marina purchased its own inhouse dredging system in 2017 (£70,000) and has been in operation during the duration of the current Marine Dredging Licence. The system has proved successful and application is made regarding this option only.

This pump works on the same principle of regular electrical submersible pumps.

A spinning impeller draws up water and the action of this draws in the surrounding sediment. This is then pumped through an outlet hose to another location.

With the hydraulic submersible pump, the danger from high voltage electricity in water is removed.

A small diesel engine powers the hydraulic pump which uses biodegradeable hydraulic oil.

The efficiency of a pump depends on the total dynamic head, this is the combination of the length of the discharge hose plus the height above water that it attains. As the length of the discharge hose increases the flow rate from the pump decreases. Similarly, as the height of the discharge point increases the flow rate decreases.

The Heidra 100 Hushpac pump draws a mixture sediment and water from its immediate surrounding area. The amount of sediment lifted by the water will vary but as a rule of thumb between ten and thirty percent solids to water by ratio can be expected.



Cost Effectiveness: The pump dredge system is an 'in-house' operation removing spoil as and when required at convenient but not specific times. There are no mobilisation nor demobilisation costs, unlike traditional dredging methods.

The pump and auxiliary unit can move up to 1.2 cubic metres of solids per hour depending on mud/sand composition.

Running costs are estimated at £23 per hour, equating to £19 per cubic metre.

The spoil is dispersed in relatively small volumes over a period of time.

The suction pump method for disposal at sea is a feasible option and its practicality is discussed further at Section 3.

## **2.2 'Do Nothing' Approach**

Elgin and Lossiemouth Harbour Company relies heavily on its income received from its permanent berth holders, commercial and visitor dues each year. The entire income goes towards the maintenance and upkeep of the harbour.

Previously, dredging operations have been performed approximately every two years for the last 20 years at Lossiemouth Harbour. Despite this, the harbour continues to silt up to the point where it is becoming unmanageable. Access to the west basin, the visitor pontoon and also between finger berths is now severely restricted.

Should we accept this and take the 'do nothing' approach, access will no longer be safe nor possible for vessels to enter the vital areas of the harbour.

The harbour will no longer be viable resulting in major loss of income and the harbour will inevitably fall into disrepair. In turn, this will result in a major downfall in tourism and local business income/employment in the local area.





### 3. OPTION FOR CONSIDERATION

#### 3.1 Disposal to Sea and Spending Beach

##### 3.1.1 Environmental Considerations:

The area is not the following:

An area of special scientific interest.

A National Scenic area.

A National Nature Reserve.

A RAMSAR Site.

A Special Protected Area

A National Park.

A Local Nature reserve - lies to the east of the special area of conservation (site code 8327)

*(Scottish National Heritage Site link)*

There is a continuous outflow from the River Lossie which flows to the sea past the entrance to the harbour, no matter what state of the tide.

At no point does water from the harbour flow back up the River Lossie.

Lossiemouth Marina is situated on the corner of the Moray Firth Specific Area of Conservation, an area covering 373,798 acres.

The bulk of the sediment from the River Lossie flows into the Firth and therefore the MFSAC area. Sediment also flows into the harbour and is the cause of silting up during spate conditions. Although the amount in comparison to the sediment flowing into the Firth is small, it is a significant amount for the harbour.

According to the Lossiemouth District Salmon Fishery Board there are a number of factors affecting the River Lossie and therefore fish stocks. The greatest factor affecting salmon stocks at the moment is sea survival. Survival rates for salmon smolts to returning adults are currently 5% or less. The Board states a large number of factors affecting condition of rivers and fisheries include the following: Distilleries, wind farms, flood alleviation schemes, barriers to migration, agricultural practices, quarrying, forestry, invasive non-nature species, illegal fishing, predators and disease.



An understanding of the background processes is key to understanding sediment movements within the littoral zone (*JBA Lossiemouth Breakwater Assessment Report for Moray Council January 2015*). The Report states the annual fluvial sediment yield for the River Lossie is approximately 4.44 t/km<sup>2</sup>. This sediment flows directly into the sea past the harbour mouth. The currents which disperse this are dominated by tidal action and the nature of the sea bed. Close to shore wave action tends to drive current parallel to the shoreline. At Lossiemouth, the dominant angle of wave approach is from the North to North East. The East West alignment of the coast results in a net Westerly current.

Although a comparatively small percentage of the aforementioned sediment enters and remains in the harbour, it builds up steadily. The constant current passing Northward past the harbour entrance set up by the outflow of the River Lossie and the net Westerly current flow in the coastal area will ensure that no sediment discharged from any of the proposed discharge points have any effect on fish populations or environment as no sediment will flow back against the current. The sediment which we propose to discharge is the small proportion of the same sediment that originally flowed from the River and as such will have no additional impact on marine life to seaward of the discharge.

#### 3.1.1.1 Public health and safety implications

Only small volumes of sediment will be removed at any one time over the duration of three years – due to the nature of the system.

Noise pollution will be minimal, unlike traditional methods. The 'hushpac' only emits 65 dba at seven metres and is promoted as being in the 'Super Silent Range'.

#### 3.1.1.2 Interference with existing activities:

This method has had little or no interference with existing activities.



## 4. CONCLUSION

The suction pump dredge is considered to be by far the one effective method for Lossiemouth Harbour.

The noise output has been minimum due to the Hushpac system, creating minimal disturbance possible to marine life and the general public. It was also found to be more cost effective as fuel consumption is lower, no mobilization nor demobilization costs plus this method eliminates any necessity for road transportation for redepositing purposes.

The hydraulic oil supplied under pressure to run the pump is biodegradable, specifically designed for use in environmentally sensitive areas.

Small, targeted areas are dredged at any one time, removing smaller amounts and therefore less disturbance to the seabed and marine life, compared to the vast tonnage being removed at any one time by traditional dredging methods. The equipment can also access the vital confined areas which were previously unobtainable by the previously hired dredging vessels.

The redepositing of the sediment is controlled via the pipeline and deposited in relatively close proximity to its original source. Furthermore, as the spending beach is utilised as one of the deposit sites, not all the sediment is deposited back to the sea.

The discharge from the pump unit is monitored visually to establish the quantity of solids carried in suspension.

Sediment returns are documented and reported to Marine Scotland on an annual basis.

The equipment is small in comparison to traditional dredging vessels and it will be easily managed by harbour staff



## **5. BEST PRACTICABLE AND ENVIRONMENTAL OPTION**

After careful research and consideration in 2016 and 2017, then the subsequent purchase and operation of the pump suction dredge method from 2018-2020, the conclusion remains unchanged in that this is the best practicable environmental option and most cost effective method for the dredging operations at Lossiemouth Marina.

It is strongly believed that this method will continue to be the most effective in ensuring the longterm viability of the harbour.