Perth Harbour Phase 1 Plough Dredging

Dredging Method Statement

Introduction

The operation of Perth Harbour is presently being seriously hindered by the accumulation of natural sediment across the entrance to the harbour. This area is referred to as the 'Bar' and is shown on Figure 1 below.

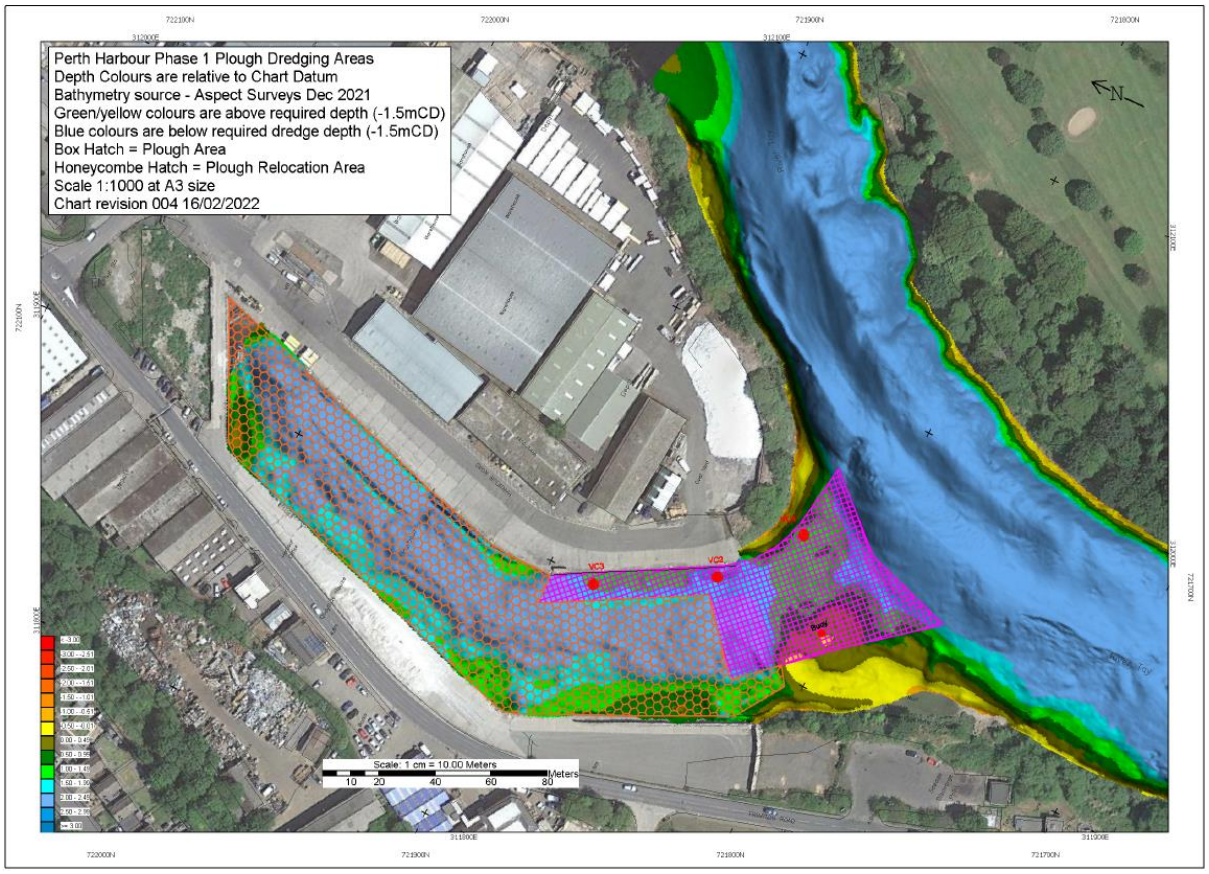

Figure 1. Bar across entrance to Perth Harbour. Blues show depths deeper than the design depth of -2.1mCD, all other colours are shallower than -2.1mCD

The harbour is presently gathering information to support a marine licence application to carry out the general dredging of accumulated sediment to restore the normal operational depth (-2.1mCD) in the whole harbour area. However, this process is taking time during which the Harbour is suffering significant operational restrictions that are impacting on the viability of the facility. In order to enable some trade to recommence, the harbour is looking to carry out a very limited dredging operation in order to increase the available depth over the bar by about 0.4m so as to establish an interim navigable depth of 1.5m below Chart Datum.

The recent bathymetric survey has identified that there are areas within the harbour that are presently deeper than the design depth of -2.1mCD (blue areas on Figure 1). The capacity of these deeper areas is greater than the volume of material that needs to be removed from the Bar in the short term. It is therefore proposed to relocate the material from a limited area of the Bar into the deeper areas of the harbour in order to enable trade to re-commence, all be it in a limited fashion (Phase 1 dredging).

It is intended to remove the remaining material that exists above the design level of -2.1mCD at a later date under a separate marine license (Phase 2 dredging).

It is recognised that there are environmentally sensitive areas in the River Tay close to the harbour entrance, and this has been taken into consideration and mitigated against by the proposed dredging methodology.

Dredging Methodology

Due to the presence of sensitive environmental receptors in relatively close proximity to the target dredge area on the bar, it is intended to adopt a dredging procedure that will minimise the risk of suspended sediments being released into the wider River Tay and hence mitigate against the risk of smothering sensitive receptors.

It is proposed to carry out the dredging by relocating material from the bar into the deeper areas of the harbour. This will be achieved using a suitable plough fitted to the back of a suitable tug (see Appendices 1 and 2 for examples of suitable tug and plough). The plough is lowered and raised by the tug as required.

This dredging method works by capturing the sediment to be dredged in an open bottom plough that is pulled over the area to be dredged. The plough is lowered down to a specific depth on winch wires and is then directed towards the area to be dredged by the tug on which the plough is mounted. As the plough encounters an area that is shallower than the set height of the plough, the cutting blade, on the front of the plough, separates the shallower material from the bed and it accumulates within the plough box. When the plough passes out of the area to be dredged and into deeper water, the material accumulated in the plough box drops out. The plough is then raised and the tug is re-positioned on the outer side of the bar to repeat the process. By repeating this process many times the available depth, over the bar, will be gradually increased and the deeper water immediately inside the harbour will be progressively filled. The process is repeated until the required depth (-1.5mCD) is achieved, at which point the dredging process will be completed.

Mitigation Methods

It is proposed to implement a number of control measures to minimise the risk of releasing suspended sediment into the wider River Tay. These measures, and the reason for them, are set out in Table 1 below.

Item	Measure	Reason
1	Only dredge on flood tide	Sensitive environmental areas are located upstream and downstream of the dredge area. By restricting ploughing operations to the flood tide only, any suspended sediment will tend to be moved in towards the harbour by the rising tidal flow. By not dredging on the ebb tide the risk of significant quantities of suspended sediment migrating outside the harbour is mitigated against. The material to be dredged has a high fine sand content so it is expected that any material put into suspension will settle back to the seabed quickly and will not migrate very far from the dredge area.
2	Only plough in towards the Harbour	By ploughing the material from the river side into the Port area it means that all material will be moved away from the river current and into the relatively benign area of the harbour. This will mitigate

Item	Measure	Reason
		against any significant quantities of suspended material entering the River Tay.
3	Lower plough in small steps	By carrying out the ploughing activity in small depth increment steps (circa 0.1m increments) it reduces the risk of the plough box filling up and material being released over the back of the box if overfilled. By limiting the depth of cut on each pass it also reduces the thrust required by the plough to pull the plough through the dredge area.
4	Plan the ploughing lines	By planning the ploughing lines based on the capacity of the plough the risk of overfilling can be prevented and the need to use excessive thrust is minimised.
5	Minimise required thrust from the tug	As the plough is mounted over the stern of the vessel it is close to the propulsion system of the tug. By minimising the depth of cut of the plough, or overfilling, the propulsion thrust necessary can be minimised. This will minimise the risk of the propeller wash disturbing the material contained in the plough or the disturbed seabed in the dredge area.
6	Have an accurate navigation system on the tug	By having an accurate navigation system on the tug the dredging operation can be carefully controlled and carried out in the most efficient manner with all dredging being targeted in the required dredge area.
7	Provision of accurate tide/height information	By having access to accurate water level height the dredging can be targeted accurately to only those areas where dredging is required. It will also enable to plough blade to be set to the required level hence minimising the risk of over cut or over dredge.

Table 1. Mitigation Methods

Ap3pendix 1 – Suitable Tug Specifications

CT VECTOR

GENERAL	
Vessel type:	Eurocarrier 2209
Built:	Neptune Marine Services BV
Year built:	2008
Classification:	RINA C* tug; special navigation MCA Workboat Category 2
Accommodation:	3 x double cabins

DIMENTIONS	
Length:	21.60 m
Beam:	9.04 m
Draft:	1.80 m
Gross tonnage:	90.60
Bollard pull:	16 t
Deck loading capacity:	80 t
Deck strength:	6 t/m2

TANK CAPACITIES	
Fuel:	57 m3
Fresh water:	31 m3

PROPULSION	
Main engines:	2 x Caterpillier C18
Total power:	2 x 600 bhp
Gearboxes:	Twin Disc MG516
Propellors:	2 x 4 blade fixed pitch in nozzles @ 1350mm

AUXILIARY	
Generators:	2 x John Deere 85 kVA
Electrical system	24v DC and 220/415V connections

DECK MACHINARY	
Deck crane:	Helia 140 3S, (26t @ 5.65m)
Deck winch:	50t SWL
Tugger winch:	10t SWL

NAVIGATION
Sailor RT5022 VHF DSC, Furuno NX-700 Navtex, Transas 4000 ECDIS, Furuno FA-150 AIS, Furuno GP-150 GPS, Furuno SC-502 Satellite compass, Furuno FCV-585 Ecosounder, Furuno RDP-119 Radar, Furuno RDP-118 Radar

Appendix 2 – Suitable Plough Specifications

8M PLOUGH

GENERAL	
Length:	8.00 m
Width:	1.50 m
Height:	1.00 m
Weight:	Apporx 5 t
Suitable grounds:	Sylth, mud, sand