



DEVELOPMENT OF DUNBAR HARBOUR

1 BACKGROUND

1.1 INTRODUCTION

There has been a harbour in Dunbar at its present location since at least the 17th Century and it has played a key role in the history of the town and the surrounding area over the years. In recent times, however, the harbour has become less important to the economy of Dunbar and East Lothian in general.

The harbour suffers from several physical limitations. The most important of these are;

- the difficulty of approach during northerly to north easterly storms;
- lack of depth at low tide within the harbour; and
- penetration of storm swells through the entrance.

There have been several incidents at the harbour approaches which have resulted in the loss of or significant damage to, vessels attempting to enter. Significantly the RNLI moved their Trent all weather lifeboat to Torness Power Station harbour in 1995 due to these physical constraints.

Dunbar Harbour Trust (DHT) is responsible for the operation, maintenance and development of Dunbar Harbour. The Trust is currently considering the long term development of the harbour facilities to improve the safety and utility of the harbour and promote increased use by resident and passing vessels. The reasons why the DHT is motivated to develop the harbour are discussed in the following section.

1.2 THE CASE FOR DEVELOPING DUNBAR HARBOUR

1.2.1 Port of Refuge

Although disadvantaged by the physical constraints described above, Dunbar Harbour occupies a geographically important position in the outer Firth, an area where there are no harbours which are both sheltered in all weather conditions and accessible at all states of the tide to vessels with a draft of 2m. Dunbar therefore has a potential role as a port of refuge for small vessels making passage into or operating in the Firth of Forth.



1.2.2 Recreational and Economic Development

Whilst, nationally, certain sectors of the fishing industry have reduced in size the inshore fisheries sector in East Lothian is by no means extinct and has grown slightly in Dunbar. There is potential for maintaining and even increasing the fishing fleet that is currently operating out of Dunbar. Other sectors, specifically recreational boating, are growing as indicated by the proposed development of marina facilities at Port Edgar, the placement of pontoons at Anstruther and Eyemouth and the increase in diving and pleasure boat trips from local harbours.

1.2.3 Return of All-Weather Lifeboat to Dunbar

In addition to the above, DHT are committed to helping the RNLI re-establish an all weather lifeboat station and mooring within Dunbar Harbour.

The crew facilities at Torness are temporary and comprise two Portacabins, the main lifeboat station being located at Dunbar. In order to launch the RNLI's Trent class ALB from Torness, the crew have to assemble at Dunbar and travel by road to Torness. For all casualties, except those in the immediate vicinity of Torness, this increases the response time in comparison with launching from Dunbar. To reach the lifeboat the crew have to pass through a locked security gate. Access to the site may be denied in the event of a security or safety incident at Torness Power Station. There are safety risks for the crew due to the road journey and the method of boarding the lifeboat which does not lie alongside but is secured on a swinging mooring.

In order to recover a large vessel taken under tow in winds from the north easterly quarter to a safe port the lifeboat crew have been forced to steam to Leith. The lack of a suitable safe port in the Outer Firth of Forth increases the length of the tow and the risk to the lifeboat crew and casualty alike.

During a recent severe storm from the north the mooring at Torness failed and the lifeboat was damaged beyond economic repair. It is understood that the shore-works to construct an alongside berth at Torness have been considered by the RNLI and their feasibility is currently under consideration. However returning the lifeboat to an improved Dunbar Harbour would have a number of advantages over its present location at Torness as follows:

- Lifeboat operations would be unaffected by safety or security incidents at Torness.
- Response times would be decreased particularly for incidents to the west of Dunbar.
- Response times would be unaffected by road conditions.
- There would be a reduced risk to crew by avoiding road journey especially in bad weather.



- Boarding of the lifeboat would be safer and quicker.
- Improved facilities could be provided for crew.
- A safer and more secure mooring for lifeboat would be provided alongside.
- Decreased running and maintenance costs would be achieved by ease of access, provision of shore power and avoiding the routine travel to Torness
- Improved facility for docking casualties in poor weather would be provided.
- The presence of the lifeboat in the harbour would improve the visibility for RNLI to the general public.

We believe that bringing the ALB back to Dunbar would be advantageous for the efficiency of Lifeboat operations in the Firth of Forth and would send out a strong message of confidence in the Harbour which has suffered bad publicity from the incidents which have occurred at the entrance.

1.2.4 Need for ongoing Maintenance

A recent structural survey of the harbour infrastructure, by Becket Rankin Engineers¹, indicated that whilst there were no serious structural problems within the harbour, both the Victoria and Cromwell Harbour walls require remedial work to be undertaken at an estimated cost of £60,000. Recent storm damage is also being evaluated and may increase this amount. When considering the need for this maintenance it should be considered that, in addition to protecting the harbour basin, the harbour walls also serve to protect the castle and adjacent properties in Victoria and Cromwell Harbours. The required remedial works could be absorbed into the development of the harbour but currently there are no funds available to progress this work, the need for which will undoubtedly grow more acute with time.

1.2.5 Protection of the Long Term Future of the Harbour

Taking all the above into account the '*do nothing*' option is very unattractive. DHT have considered the future of the harbour without development and it is clear that the outlook is uncertain if not poor. Currently the harbour operates at a comparatively low cost but provides little in the way of services although some minor improvements to infrastructure have been carried out with grant assistance.

There is genuine concern within DHT that without a significant upgrade of the harbour the costs of piecemeal maintenance and escalating running costs are very likely to exceed available income in the near future. As a consequence the harbour might well become an economic burden on the local community.

¹ Harbour Survey and Recommendations for Further Work Becket Rankin 2007



However providing a practicable engineering solution can be identified and implemented, DHT are confident that the harbour will have a secure future and be restored to its former significant role in the culture and economy of Dunbar and East Lothian. It is therefore the vision of DHT that Dunbar Harbour is developed to provide a self sufficient, safe and accessible harbour, without tidal or weather restrictions, for vessels in the target size group of 2 m draft; this in turn will generate the potential for continued development.

This document sets out the background to the harbour's present activities, its surrounding economic and environmental context, describes the present operational conditions in the harbour and outlines the plans for improvements which will realise the vision outlined above.



2 DESCRIPTION OF HARBOUR AND ACTIVITIES

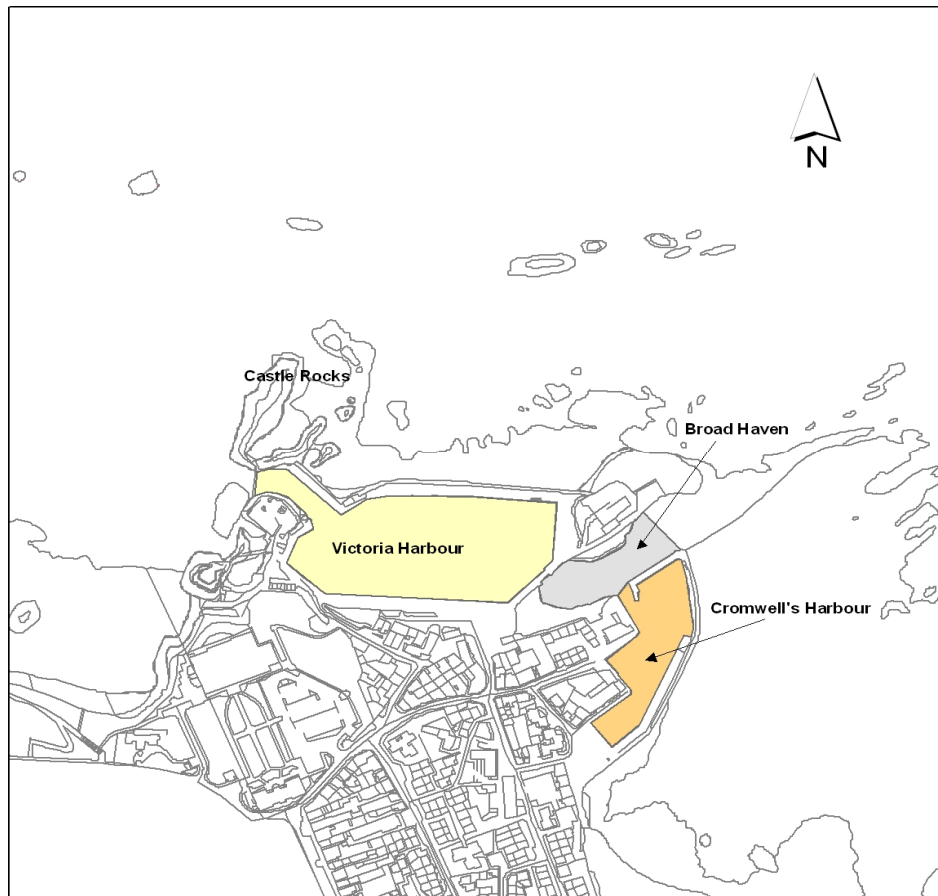


Figure 2.1 Dunbar Harbour

2.1 SUMMARY OF HARBOUR BASINS

Dunbar harbour covers approximately 3 ha and is located at the western end of Dunbar Town. The harbour comprises three basins; Cromwell Harbour was constructed in the 17th Century, Victoria Harbour, built during the 19th Century, and Broadhaven, a natural basin between the two as illustrated in *Figure 2.1*. The entrance channel to the harbour is located at the western end of Victoria Harbour between the Castle Rocks to the north and the cliff directly under the castle to the south. The original access into Broadhaven has been blocked by rock armour.

Victoria Harbour and the Cromwell Harbour are constructed mainly of sandstone blocks although there have been some repairs to both using a variety of material including



bricks and mass concrete. A recent inspection report concluded that both walls are generally structurally sound and stable but are in some need of repair and on-going maintenance^{2, 3}.

All three basins dry out at low tide. There is a rock bar at the mouth of the Victoria Harbour at approximately Chart Datum (CD) which prevents vessels of 2 m or above from entering the harbour for 2 hours either side of low water.

At the entrance to the Broadhaven from Victoria Harbour there is a rock sill. The Broadhaven is bounded by the masonry walls of the Victoria and Cromwell harbours except the north western side (Lammer Island) which comprises a cut bedrock cliff. The old entrance to the Broadhaven is blocked by randomly placed sandstone blocks and debris deposited there in the 1970s. The Broadhaven dries completely on spring low tides.

The entrance to Cromwell Harbour is between two masonry harbour walls. Two parallel vertical grooves suggest that a sluice gate was used in the past. Cromwell Harbour dries completely except on neap tides.

The sediments of Victoria Harbour are mainly sand. In the Broadhaven the sediments are poorly sorted sands and gravels with some cobbles and exposed bedrock. In Cromwell Harbour the sediments are sandy around the edges next to the harbour walls but become fine unconsolidated mud towards the middle of the basin.

It is understood that there is bedrock near the surface in all of the harbour basins. Observations of the harbour by local fishermen suggest that the Victoria Harbour is subject to sediment transport by storm waves passing into the harbour basin. Based on limited survey work carried out for the RNLI⁴ at the western end of the Victoria Harbour there is approximately 1m of sand overlying bedrock which is at 1m BCD. The emergence of bedrock in the Broadhaven suggests that the sedimentary layer here is thinner. There is no currently available information on sedimentation in Cromwell Harbour

During periods of strong northerly and north westerly winds, Victoria harbour is affected by significant surge. During such conditions most vessels seek shelter in Cromwell Harbour. At high tide, storm waves will break over the sea wall at Victoria Harbour and the armour stone at the Broadhaven.

² Harbour Survey and Recommendations for Further Work Becket Rankin 2007

³ However following a severe storm in March 2008 significant damage to the sea wall of Victoria Harbour has been reported and is currently being investigated.

⁴ Report on Additional Site Investigations and Wall Stability DRL for RNLI 1996



2.1.1 Harbour Facilities

The current facilities in the harbour comprise 24 moorings in the Victoria Harbour, 6 in the Broadhaven and 17 in Cromwell's harbour. In total the three basins of the harbour have approximately 900 m of quay side and two slipways, the one in the Broadhaven having recently been renovated. DHT have also built a maintenance bay, again in the Broadhaven. There are no pontoons or walkways in the harbour and access to all vessels not moored along one of the quays is by tender. DHT provides diesel fuel for harbour users and there are also electricity and water points available.

2.2 CURRENT ACTIVITY

2.2.1 Fishing Vessels

There are currently 17 fishing vessels (2007)⁵ based in Dunbar comprising trawlers catching prawns, and creel boats catching crab and lobster. This is an increase from 14 in 2004.

2.2.2 Commercial Vessels

Some of the creel boats also operate as angling charter vessels however there are two commercial vessels operating in the recreational sector e.g. diving and scenic/thrill rides.

2.2.3 Recreational vessels

The number of resident cruising yachts and motorboats reflects the small increase in moorings which has been put in since 2004. Visiting yachts have decreased in number since the yacht Nobeless grounded in the harbour entrance in 2006 and became a total loss. However, launching of day motor boats and diving boats have increased in the same period⁶.

⁵ DHT Estimated figures

⁶ Pers. comm. Dunbar Harbourmaster

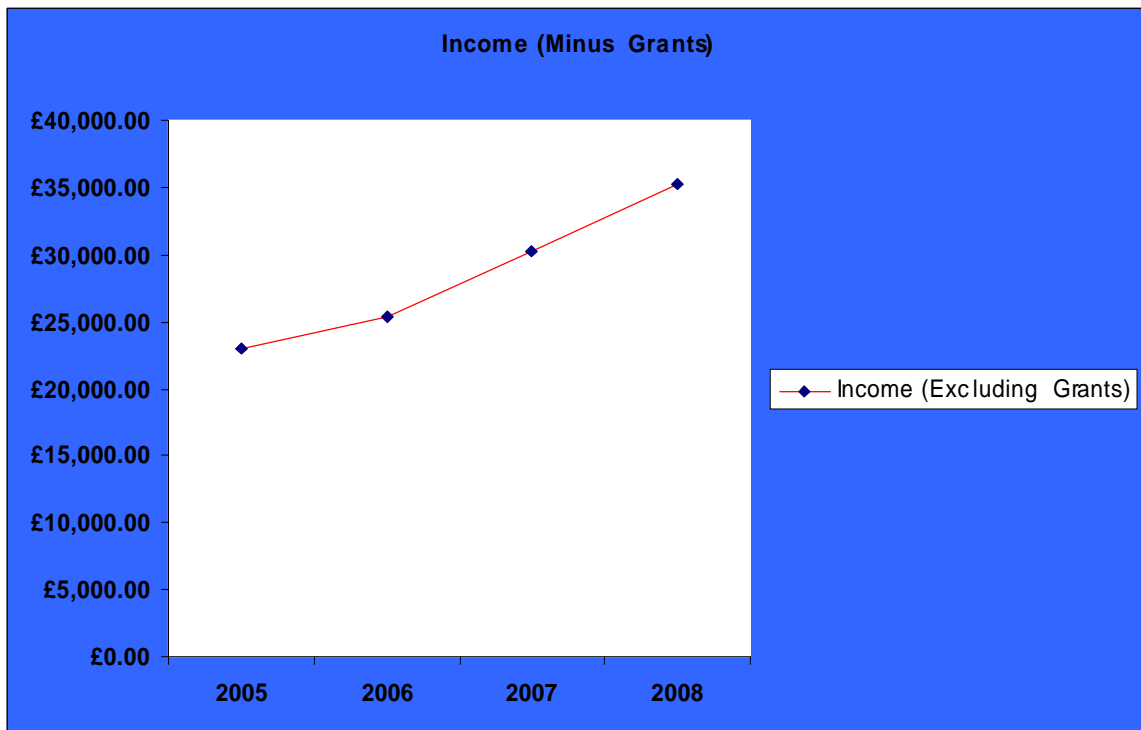


Figure 2.2 Dunbar Harbour Income Excluding Grants 2004 to 2008

2.3 REVENUE

Income figures are represented in *Figure 2.2*. The data are adjusted for grant awards. Income from moorings, fuel and use of the slipway returns has risen every year from approximately £23,000 in 2004 to £35,000 a rise of 150%. The increase in income is mainly due to the rise in launchings, increased value of fisheries landings and the increase in the number of moorings. Launchings could increase further as could landings but unless charges are raised the potential for increasing income is comparatively low. Running costs are increasing every year and profitability is comparatively low estimated at £2,000 for 2008.

This simple assessment of the Trust's financial position indicates two important points. The potential for further increase in income is limited without significant changes to the structure of the harbour or a rise in charges. The comparatively low profit generated and potential for increasing running costs leaves the Trust vulnerable to cash flow fluctuations. DHT would be unlikely to be able to finance unplanned capital investment for emergency repairs or unforeseen expenditure without external support.



2.4 ENVIRONMENTAL AND SOCIAL CONTEXT

2.4.1 Social and Economic Amenity

Dunbar harbour underpins the town's sense of place and identity and until recently had been a very important feature in the local culture. Although this contribution is declining, due to the influx of people into new housing on the outskirts of Dunbar, the harbour remains an important focal point for the town and it is unquestionably a feature of which more could be made. Economically there are an estimated 40⁷ jobs which are directly connected to the harbour comprising fishermen, day trip/dive charter vessels, the harbour master and his assistant, a shellfish merchant and two, full time lifeboat crewmen. In addition there are some local businesses which rely mainly on the fishing industry.

Dunbar attracts tourists from all over the world due to its connection with John Muir the noted conservationist. It is a popular dive location and water sports in general are increasing in East Lothian with surfing and kite surfing growing markedly in popularity on the nearby beaches.

2.4.2 Historical Interest

The most important historical feature in the harbour is the castle and the recently discovered vaults. The castle dates from the Twelfth Century and is a scheduled ancient monument. Both Cromwell Harbour & the fort on Lamer Island, built to defend the town from American privateers during the American War of Independence, are Grade B listed.

McArthur's Store, in Cromwell harbour, is believed to be the oldest fishermen's store in continual use in Scotland and is currently being refurbished.

Despite the historical interest of the harbour, it is anticipated that future developments could be undertaken without significant effects on the designated features.

2.4.3 Nature Conservation

Dunbar is adjacent to the Firth of Forth Special Protection Area (SPA) and the ecology of the seas adjacent to the harbour is afforded a high level of protection from activities which could harm the features for which the SPA has been designated. Within the harbour area there is a well established kittiwake colony, on the castle and surrounding cliffs, which is monitored by the Scottish Seabird Centre at North Berwick via a remotely controlled camera. Any development in the harbour would have to be undertaken without significant effects on the SPA.

⁷ Estimated by DHT



3 DEVELOPMENT PLANS/OBJECTIVES

3.1 OBJECTIVES

The main objective of the planned improvement works is to deliver a harbour of refuge in the outer Firth of Forth and to facilitate the relocation of the lifeboat to Dunbar. Secondary objectives are to provide a suitable location for visiting vessels to visit Dunbar and by so doing re-establish the harbour as an important feature in the cultural landscape of the town.

Unless the surge, responsible for the sediment transport, is prevented by means of a breakwater, maintenance dredging to remove the sediment to the bedrock would have to be repeated on a regular basis. In order to improve access to allow passage at all states of the tide, an area of bedrock exposed in the harbour entrance would also have to be removed.

In order to allow vessels of 2 m draft to stay afloat at any state of the tide, the depth of the harbour would have to be 2.5 m at chart datum including a 0.5 m safety margin. Based on this approximately 1.5 m depth of bedrock would have to be removed in addition to all the sand (assuming flat water could be achieved in the harbour). Even if the 2.5 m depth was only required over a small area of the harbour, all the sand would have to be removed to prevent it being redistributed from areas of the harbour left undredged.

Conditions at the harbour entrance also need to be improved to prevent the effect of breaking seas from the north across the harbour approach. Based on these considerations proposals for any improvement scheme in Dunbar Harbour must meet the following technical requirements:

- To provide a safe entrance under reasonably foreseeable conditions of tide, wind direction and strength.
- To provide sufficient depth in the approaches and at least part of the harbour basin to allow vessels of 2 m draft to enter and remain afloat during all states of the tide.
- To reduce swell within the harbour to less than 40 cm under all reasonably foreseeable conditions.
- To reduce transport of sand into the harbour and so prevent deposition and accumulation of soft sediment.



3.2 KEY FEATURES OF SCHEME

The key features of a solution which meets the objectives listed above are likely to include the following.

- A breakwater extending from the Castle Rock to the west.
- Removal of all soft sediments from the Victoria Harbour basin (estimated at 20,000 m³).
- Removal of hard substrata to give at least 2.5 m BCD over western most half of the harbour and approach Channel (estimated at 25,000 m³).
- Protection of the Victoria Harbour breakwater by placement of armour to force wave breaking north of the wall.

These key features should be delivered in such a way as to allow subsequent development of the harbour.

3.3 ADDITIONAL WORKS

Additional features of the scheme could include the following.

- Maintenance and repair of quay walls
- Placement of pontoons, utilities and quay furniture necessary to accommodate visiting vessels.

3.4 PROPOSED SCHEDULE AND BREAKDOWN OF PROJECTED COSTS

3.4.1 Introduction

The proposed schedule and project plan is illustrated in *Figure 4.1* and costs for each major phase are listed in *Table 4.1*. Both the schedule and costs are estimated based on reports by HR Wallingford⁸ and Envirocentre Ltd⁹. The estimates are less certain for the later stages of the project and depend on the size and complexity of the design options which meet the project objectives.

⁸ HR Wallingford Dunbar Harbour Wave Disturbance Studies 2002

⁹ Envirocentre see Annex 1



There are three main stages, Stage 1 Background Studies, Stage 2 Detailed Design, Stage 3, Procurement and Construction. The proposed project plan assumes that the stages will run sequentially and that each stage will be funded separately by a specific campaign. Assuming that Stage 1 starts in July 2008 then the commissioning date would be January 2010 although this would mean construction takes place over the winter period which could be impractical. Costs of pre construction works are estimated at £450,000. Construction costs are projected to be between £5,000,000 and £10,000,000.

These stages to be developed are described in more detail below.

3.4.2 Stage 1: Background Studies

The Background Studies will include bathymetric and geological surveys which will determine the depth of the seabed and the nature, thickness and movement patterns of sediment.

The bathymetric data will be used in desk-top wave modelling to determine the optimum design and location of a breakwater structure. The information of sediment transport and substrata type will inform the design of the dredging programme in the harbour and approaches. This information will also assist the design of the harbour improvements to limit sedimentation within the harbour to a tolerable level.

The output from Stage 1 would be up to three costed outline design options. At this stage the viability of the project will be assessed.

3.4.3 Stage 2: Detailed Design through to Planning Application

Further, more detailed studies might be required at this stage; and may include physical modelling of the options and additional geo-technical investigations. A comprehensive EIA will be required due to the level of designation in the harbour area and the need for an Appropriate Assessment under the Habitat Regulations. These studies would support the detailed design and submission for relevant authorisations. They will include a Food and Environmental Protection Act (1985) licence, Coast Protection Act licence (1949) and Planning Permission.

3.4.4 Stage 3: Procurement and Construction

Following the award of the required permits the detailed design would be used to develop a tender document for the construction contract. The tendering process, bid evaluation and construction management would be commissioned to a specialist engineering consultancy.

Construction is expected to take three months and will involve the following main activities:



- Construction of the breakwater; this will provide shelter for the following works
- Dredging of the soft and hard sediments.
- Wave protection for north wall of Victoria Harbour to prevent overtopping.
- Maintenance of existing quay walls.
- Fitting of quay furniture and pontoons.



Table 4.1 Breakdown of Estimated Costs for Re-development of Dunbar Harbour (K£s)

Stage 1 Background Studies		
<i>Bathymetric Survey</i>	Survey of seabed bathymetry and substrata in harbour and approaches. Will involve single beam echo sound survey, sub-bottom profiling and side scan sonar	10
<i>Wave Modelling</i>	Modelling of wave conditions and sediment transport to support the identification of design options which satisfy the design criteria	20
<i>Options Assessment</i>	Comparison of design options estimation of construction and maintenance costs and economic viability study	25
Stage 1 Sub Total		55
Stage 2: Detailed Design Through to Planning Application		
<i>Geo-technical Work</i>	Detailed geo-technical survey to determine geological characteristics of development area will involve bore hole	50
<i>Detailed Modelling</i>	Detailed modelling of chosen option to confirm conditions in harbour and approaches	50
<i>EIA</i>	Assessment of potential environmental effects and identification of mitigation measures	100
<i>Final Design</i>	Finalisation of design taking into account the output from geo-technical investigations, EIA and modelling.	100
<i>Planning Application</i>	Preparation and submission of planning application	15
Stage 2 Sub Total		315
Stage 3 Procurement and Construction		
<i>Production of Construction Contract</i>	Preparation of detailed tender	40
<i>Procurement of Construction Contract</i>	Preparation of bids and assessment of tenders	15
Stage 3 Sub Total exc Construction		55
Pre-construction Works Subtotal		425
<i>Construction</i>	Construction of breakwater , dredging of sediment of soft sediments and hard sediments, making good of existing harbour infrastructure, installation of pontoons and quayside furniture	5,000 – 10,000

Figure 4.1 Estimated Schedule

