Falmouth Cruise Terminal and Harbour Works Environmental Scoping Study

Falmouth Docks & Engineering Co. Limited and
Falmouth Harbour Commissioners

February 2006

Final Report

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1 INTRODUCTION

1.1 FALMOUTH CRUISE TERMINAL AND HARBOUR WORKS

Falmouth Harbour Commissioners (FHC) and Falmouth Docks & Engineering Co. Ltd (FDEC) are proposing to undertake a joint scheme to improve the cruise terminal facilities and navigation at Falmouth. The scheme involves:

- Construction works to improve the existing cruise terminal facilities at the Docks operated by FDEC. This will include improvements to sections of the Northern Wharf and Queens Wharf, and construction of a new terminal building;
- Capital dredging to deepen the new berth and deepen and straighten the navigation channel between Carrick Roads and the harbour / Docks (jointly operated by FHC and FDEC) (Figure 1.1);
- Disposal of the dredged material and beneficial use of some of the dredging arisings. It is proposed that some of the dredged material will be used as a beneficial use and habitat creation scheme to increase the area of maerl within the bay and to find a beneficial use for the dredged arisings. A proportion of the material will also be used as fill material within existing jetty structures or new reclamation. The remaining material is proposed to be disposed of at sea at the licensed offshore disposal ground within Fal Bay.

Improvements to the cruise terminal are needed in order to allow a greater range of cruise vessels to access the Docks. This additional business will help secure the long-term business of the port. However, it would also have major benefits for the local economy by increasing the number of cruise passengers visiting the local area.

Capital dredging of the navigation channel is needed to deepen the channel to -7.5m below Chart Datum (CD), and straighten the channel to improve navigation of large vessels to the Northern Wharf and Queens Wharf, which serve the cruise terminal and to dredge the Northern/Queens Wharves to 9.5m below CD.

The dredging is considered to be capital dredging rather than maintenance dredging because of the proposal to straighten the channel and the long period since the previous dredge to create the current declared depth (this was in 1965).

1.2 NEED FOR SCHEME

1.2.1 Current Docks Activity

Falmouth Docks, which is situated within the Inner Harbour Falmouth, undertakes shiprepair and conversion as well as providing extensive quayside facilities for commercial cargo vessels as well as cruise ships. It has three dry Docks capable of accommodating vessels up to 100,000 dead weight tonnage. Cruise vessels form an increasingly important part of the Docks business. The existing cruise terminal provides basic facilities for two types of cruise operations: day calls and turnarounds. The total number of cruise calls to Falmouth in 2005 was 40 and 65 cruise calls are expected in 2006 In 2005, 22 day calls brought approximately 11,000 passengers to the town and West Cornwall. Day calls were made throughout the year but tended to be concentrated from April to September. Of the passengers coming ashore in 2005, approximately 50% visited Falmouth by walking or shuttle bus, while the other 50% visited other parts of West Cornwall by coach.

The size of vessels that can be berthed at the Docks is restricted by the depths of the channel and berths and the length of quay available. At present, only vessels up to 230m in length can use the Docks due to the restrictions of length along the County wharf and Queen's wharves. The available depth of water varies with the tidal cycle. In practise the maximum draught of vessels which can visit the Docks is 8m, this being restricted by the depth of water on the County Wharf. The times at which larger vessels can get into and out of the Docks is restricted by the depth of water within the navigation channel.

1.2.2 Requirement for the Scheme

FDEC and FHC wish to improve the cruise terminal facilities at Falmouth in order to be able to attract a greater range of cruise vessels to Falmouth. By being able to attract a greater range of vessels, this will help secure the long-term business of FDEC and the employment which is directly and indirectly related to the Docks including those employed by FHC.

In order to be able to attract a greater range of cruise vessels, the cruise terminal facilities require improvement. In particular, a dedicated building is required which can handle passengers and house administrative staff. The wharves also require improvement in order to increase the length of quayside available.

In order for larger cruise vessels to be able to access the Docks, the navigation channel requires deepening. By deepening the channel and berths, cruise vessels will be able to access the Docks at a greater range of times and so the Docks will be more attractive to vessel operators as a cruise terminal. Cruise vessels typically like to enter port early in the day and leave in the early evening. By deepening the channel, larger vessels will be able to enter the Docks at this time on a greater number of days.

The channel requires straightening in order to improve the safety of navigation. The existing navigation channel is designed to provide vessels with safe access to FDEC's dry Docks, but not the wharves. At present, accessing the wharves requires vessels to be lined up for the dry Docks approach and then manoeuvred northwards around the wharves and vessels moored against them. The realigning of the vessels' tracks to northwards requires course alterations and a period of settling onto the new track. This adds unwelcome complexity to the manoeuvre and reduces the margins of safety for larger vessels. The safe handling of large vessels with minimum margins for diverging from the intended track requires a track as straight as possible so that the vessel can be lined up on the intended track and maintained and effectively monitored in safe water throughout the passage.

Increasing the number and size of vessels visiting the Docks will have additional major benefits for the local economy by increasing the total amount of income that cruise passengers, crew and others associated with cruise ships spend in the local area while in port.

1.3 ENVIRONMENTAL SCOPING STUDY

Although a formal screening opinion and/or direction have not been sought, FHC and FDEC assume that the proposals will be the subject of Environmental Impact

Assessment (EIA) and it will be necessary to prepare an Environmental Statement (ES) to accompany applications for relevant consents and permissions. EIA is driven by the legislation described in ***Section 1.4***.

As a precursor to the preparation of the ES, FHC and FDEC will request a scoping opinion / direction from the relevant competent authority/ies to formally determine the context and extent of the matters to be covered in the environmental information to be submitted in the ES. To facilitate the scoping opinion / direction, an environmental scoping study has been undertaken to identify the issues on which the ES should focus and the scope of work required to investigate these issues. This report details the findings of the environmental scoping study.

1.4 LEGISLATIVE CONTEXT

The following paragraphs describe the legislation applying to the proposed cruise terminal and harbour works at Falmouth. These paragraphs do not constitute legal advice and are provided to describe the legislative context of EIA and other environmental protection mechanisms applying to the proposals.

1.4.1 Permissive Powers

Both FDEC and FHC have various permissive powers granted to them under Acts of Parliament. These powers entitle them to effectively self-regulate the activities included under the respective Acts.

Falmouth Docks Act

The Falmouth Docks Act 1959 (FDA) consolidates FDEC's statutory powers dating from the initial Act granted in 1859. The powers are granted to the Falmouth Docks & Engineering Company, which is owned by the A&P Group.

Section 7 of the FDA grants FDEC with powers relating to improvements to the wharves and construction of any buildings. It states, in part: 'The Company…may from time to time make and maintain for the purposes of the authorised works all necessary…wharves…and they may also for the general purposes of their undertaking (including the accommodation of vessels and of traffic and persons frequenting the tidal harbour and works of the Company) make erect…upon any lands of the Company…all necessary or convenient…works buildings.'

Section 26 of the FDA grants FDEC with powers relating to dredging. It states, in part: 'for the purposes of the undertaking upon any lands…or situate within the tidal harbour excavate dredge scour and deepen to such extent as they may deem necessary.'

Falmouth Harbour Act

The Falmouth Harbour Act 1870 (FHA) established the statutory powers of FHC. The harbour limits were originally from Zone Point to Rosemullion Head but these were increased by the added limits by the Falmouth Harbour Revision Order 1991. The added limits comprise a box of approximately 3 miles x 3 miles placed adjacent to the original harbour limit line. The FHA excludes the area defined within Falmouth Docks

Acts of 1859, 1864 and 1959, but the role of FHC in matters of navigation is acknowledged.

The FHA grants FHC with powers relating to 'the dredging of the Harbour and otherwise improving the same, and laying down buoys and moorings and providing other appliances and conveniences for the use of vessels frequenting the Harbour'.

1.4.2 Environmental Impact Assessment

The requirement for EIA is established by European Directive 85/33/EEC as amended by 97/11/EC on the assessment of the effects of certain public and private projects on the environment (the EIA Directive). The EIA Directive is implemented through national law, some of which is applicable to the proposed scheme at Falmouth.

Coast Protection Act

Section 34 of the Coast Protection Act 1949 (CPA) concerns activities that may be detrimental to the safety of navigation. Under Section 34 of the CPA the Secretary of State for Transport's consent is required for the following activities taking place below mean low water springs in territorial waters:

- Construction, alteration or improvement of any works on, under or above any part of the seabed;
- Deposition of any object or materials; and,
- Removal of any object or materials.

With the introduction of new law in the years since 1949 (notably Section 36 of the Merchant Shipping Act 1988), Section 34 has been extended to take account of the potential environmental effects associated with the activities listed above and can trigger the need for EIA. Under the CPA, EIA can be required via the Harbour Works (Environmental Impact Assessment) Regulations 1999 which transpose into national law the requirements of the EIA Directive.

Improvements to the proposed cruise terminal and capital dredging will include all of the construction, deposition and removal activities listed under Section 34 of the CPA. It is considered that EIA will be required for this project because it is likely that it qualifies under Annex 1, Part 8b of the EIA Directive (97/11) concerning 'Trading ports, piers for loading and unloading connected to land and outside ports (excluding ferry piers) which can take vessels of over 1350 tonnes.' Assuming that the project falls under this category, then EIA is mandatory.

Town & Country Planning Act

FDEC are undertaking the construction works under their powers granted in the Falmouth Docks Act 1959 and therefore permission under the Town and Country Planning Act is not being sought.

1.4.3 Appropriate Assessment

The proposed scheme would take place within the Fal and Helford Special Area of Conservation (SAC) and areas important for nature conservation interest. Further details of the SAC are provided in ***Section 5***. In light of this, English Nature have

advised that the proposed scheme is likely to have a 'significant effect' on the SAC and, therefore, have advised that appropriate assessment is required in accordance with Regulation 48(1) of the Conservation (Natural Habitats &c.) Regulations 1994. The information required to inform an appropriate assessment will be contained within the Environmental Statement. As part of this assessment, the effect of the scheme in-combination with other plans or projects will be considered (see ***Section 17*** for further details).

1.4.4 Other Environmental Requirements

It is recognised that a number of consents will be required under Part II of the Food and Environment Protection Act 1985 (FEPA). FEPA applies to the deposit of articles or materials in the sea and tidal waters and is in place to protect the marine ecosystem and human health and to minimise interference and nuisance to other users of the marine environment. Consents will be required to undertake marine works (e.g. wharf improvements – see ***Section 2.1***) and disposal of dredged material (e.g. deposit at sea and beneficial use of dredged material – see ***Section 2.1***).

It should be noted that an initial FEPA application for disposal of dredged arisings was made to the MCEU in 2004. As part of this FEPA application a series of sediment samples were taken and analysed to determine the proportion of sediments which might be acceptable for disposal at sea. The FEPA application has yet to be determined as it is waiting on the results of an EIA.

1.5 ENVIRONMENTAL SCOPING METHODOLOGY

The scoping study comprised a series of tasks to identify the potential environmental issues associated with the dredging and coast protection works and to determine the scope of work required for the preparation of the ES. The study consisted of the following tasks:

- Collation of existing environmental information by searching relevant databases and literature;
- Identification of potentially significant environmental effects;
- Consultation with interested parties; and,
- Preparation of the environmental scoping study report.

1.5.1 Consultation

As part of the scoping study, informal consultation was carried out with statutory and other consultees for the following purposes:

- Explanation of the proposed scheme;
- To determine the particular concerns of consultees about the scheme;
- To obtain existing information and data about the site; and,
- To reach a consensus on the scope of the work required during the EIA to investigate the potentially significant impacts.

Consultation at this early stage allows potentially significant impacts to be identified and appropriately addressed in the EIA. A list of the organisations contacted during scoping is presented below and relevant correspondence is presented in **Appendix 1**. Meetings

were held with English Nature and the Environment Agency, whilst the remaining consultees were contacted by letter.

- Carrick District Council;
- Cornwall County Council;
- Cornwall Sea Fisheries Committee;
- Countryside Agency; and
- English Heritage;

1.6 REPORT STRUCTURE

This introductory section (***Section 1***) briefly describes the proposal scheme and sets out the background to the environmental scoping study including the methodology adopted and the legislative context for EIA.

Following the introduction, ***Section 2*** provides a description of the proposed scheme including its construction phase, operational phase and alternative options.

Sections 3 to 16 detail the potential issues associated with the proposed scheme with regard to a range of environmental parameters (i.e. marine ecology, water quality, fisheries, archaeology, etc.). For each of the environmental parameters examined, the following aspects are described:

i) **Overview of existing environment** – a description and evaluation of the environmental parameters and the data and/or information that is available for assessment purposes.

ii) **Identification of key issues** – identification of the likely environmental impact(s) of the construction and operational phases of the proposed scheme, including any opportunities for enhancement and beneficial impacts as well as potentially adverse impacts.

iii) **Recommendations for further work and approach to EIA** – the way forward is addressed by describing the environmental work that is required to progress the proposals and general approach for the preparation of the ES.

In considering the likely environmental impacts of the proposed development, this report concentrates on the potentially significant impacts that need (or are considered likely to need) further investigation. It should be noted that although the potential environmental effects of disposal of dredged arisings at sea have been included within this report, they are expected to form only a relatively small part of the EIA. This is because the Falmouth Bay disposal ground is a licensed site and it is expected that quantities to be disposed of will be within the range of quantities which has been previously disposed of at the site.

The environmental parameters included within this report are:

- Hydrodynamic and sedimentary regime;
- Sediment and water quality;
- Marine and coastal ecology;
- Marine and coastal ornithology;

- Terrestrial ecology;
- Commercial fisheries;
- Commercial navigation;
- Archaeology and heritage;
- Recreation and leisure;
- Noise and vibration;
- Air quality;
- Geology, landscape and visual setting;
- Traffic and transportation; and
- Socio-economics.

Section 17 sets out the scope for the preparation of the ES.

References are provided in ***Section 18*** with two appendices providing additional information

2 DESCRIPTION OF THE PROPOSED SCHEME

2.1 CONSTRUCTION PHASE

The construction phase refers to the cruise terminal improvement works and the capital dredging of the berth and navigation channel. The construction phase is defined as the period from the commencement to completion of the proposals.

2.1.1 Cruise Terminal

Wharf Improvements

The following three areas along the Northern and Queens wharves require improvement to provide a continuous berthing facility along the combined length of the wharves:

- An open quay area at the eastern end of the Queens Wharf;
- Two concrete quays to the east of the above and either side of the old wooden jetty referred to below
- An old wooden jetty at the western end of the Northern Wharf.

At present there is no design available for the wharf improvements. However, it is considered most likely (at least in terms of technical and economic requirements) that the improvements would take the same form of the recently re-constructed Queens Wharf. Following fire damage, the Queens Wharf was re-constructed in 2003 as a concrete deck supported by piles. The construction method for this structure included the following activities:

- Installation of tubular steel piles. The piles were initially driven through alluvial sea bed material using a hydraulic vibrator, and then driven through bedrock using a hydraulic hammer. Piling equipment was operated from a floating barge. The piles were not coated with an anti-foulant.
- Deck construction. Pre-cast concrete beams and deck planks were installed and an *in situ* concrete surface was placed over the deck planks; and
- Installation of pre-fabricated fenders, services, a walkway and furniture.

It is possible that some of the new quays may be designed to contain some of the dredged arisings as fill material.

New Terminal Building

A new terminal building is being proposed to improve cruise terminal facilities. The building will be situated towards the eastern end of the improved wharf (i.e. between the existing Northern and Queens wharves). The design of the new terminal building has not been prepared however it will have a footprint of approximately 400m^2 and have two floors, with the ground floor dedicated to the handling of cruise passengers and the first floor dedicated to offices.

A new terminal building and dredged berth are needed because of increased demand for cruise vessel visits to Falmouth. At present, the number and size of visiting vessels is limited by the availability, condition and the water depth alongside the berths at the County and Queens Wharves. The building is required to handle and manage passengers.

2.1.2 Capital Dredging

Dredging Areas

It is proposed that the capital dredge will be undertaken as one contract, but for description purposes the dredge can be divided into the following four areas corresponding to the areas identified in Figure 1.1:

- Area 1: The western navigation channel between the approach to the FOS jetty and the harbour / docks.
- Area 2: The berth alongside the Northern Wharf and Queens Wharf, which will provide improved berthing for cruise vessels.
- Area 3: The direct approach to and berths alongside the FOS jetty; and
- Area 4: The eastern navigation channel between Carrick Roads and the approach to the FOS jetty.

Capital dredging of the navigation channel is needed to deepen the channel, which is declared at -7.5m below Chart Datum (CD), and straighten the channel to improve navigation of large vessels to the Northern Wharf and Queens Wharf, which serve the cruise terminal. The existing navigation channel is designed to provide vessels with safe access to FDEC's dry Docks, but not the wharves. At present, accessing the wharves requires vessels to be lined up for the dry Docks approach and then manoeuvred northwards around the wharves and vessels moored against them. The realigning of the vessels' tracks to northwards requires course alterations and a period of settling onto the new track. This adds an unwelcome complexity to the manoeuvre and reduces the margins of safety for larger vessels. The safe handling of large vessels with minimum margins for diverging from the intended track requires a track as straight as possible so that the vessel can be lined up on the intended track and maintained and effectively monitored in safe water throughout the passage.

Capital dredging of the berth alongside the Northern Wharf/Queens Wharf and FOS jetty is needed to provide deep-water berthing pockets for vessels.

The dredging is considered to be capital dredging rather than maintenance dredging because of the proposal to straighten the channel and the long period since the previous dredge to create the current declared depth (this was in 1965).

Dredging Depths and Volumes

The current declared depths of the navigation channel varies between -4.5mCD and -7.5mCD. The capital dredge will improve the declared depth to –7.5mCD along the entire length of the navigation channel. The berths alongside the Northern and Queens wharves and the FOS jetty have depths of -6mCD and -8mCD respectively. The capital dredge will improve the declared depths at the berths to -9.5mCD. In order to achieve the declared depths, capital dredging will remove approximately 246,360m^3 of material (Table 2.1).

Table 2.1 Summary of Dredging Depths and Volumes

Area	Proposed Dredge Depth (m)	Depth of Material to be Dredged (m)	Volume (m^3)
Western navigation channel	7.5	0.0 – 1.8	45,520
Northern and Queens wharves	9.5	1.2 – 3.7	38,100
FOS jetty	9.5	0.3 - 4.5	13,820
Eastern navigation channel	7.5	0.0 - 2.5	148,920
Total			**246,360**

Dredged Material

Subject to further characterisation, it is expected that capital dredging will give rise to material of various physical and chemical characteristics. The nature of the dredged material arising from each of the proposed dredge areas is summarised in Table 2.2. A vibrocore survey has been carried out a copy of which is presented in **Appendix 2**.

Table 2.2 Summary of Dredged Material

Area	Physical Characteristics	Chemical Characteristics
1: Western navigation channel	Silt / clay overlying weathered schist / schist	TBT, metals
2: Northern and Queens wharves	Silt / clay overlying weathered schist / schist	TBT, metals
3: FOS jetty	Silt / clay overlying weathered schist / schist	TBT, metals, hydrocarbons
4: Eastern navigation channel	Sand with maerl (calcified seaweed)	TBT, metals

Dredging Method

It is assumed that the capital dredge will be undertaken using a mixture of suction and mechanical dredgers. For the basis of this study, it is assumed that a trailing suction hopper dredger (TSHD) or a cutter suction dredger (CSD) will be used to dredge the navigation channel and the approach to the FOS jetty. It is assumed that mechanical plant, such as a backhoe dredger, will be used to dredge the berths alongside the Northern and Queens wharves and the FOS jetty.

Timing and Duration

At present no particular time has been allocated for initiating the capital dredge. It is recognised that the timing will be dependent on various factors including relevant consents and permits, disposal opportunities and environmental restrictions. However, it is intended that the dredge be completed by the end of 2008.

2.1.3 Disposal of Dredged Material

Various options for disposal of the dredged material have been investigated by FDEC and FHC. Specifically, an initial FEPA application for disposal of the material was made to the MCEU on 1st September 2005 to determine the proportion of material which is likely to be acceptable to dispose of at sea.

As part of the FEPA application procedure a series of sediment samples were taken from within the proposed dredge area which were then analysed by CEFAS for a suite of chemical determinands. CEFAS have advised that within Areas 1,2 and 3 the surface sediments are contaminated by metals, PAH's and PCBs at a level that would preclude the material from disposal to sea. CEFAS advised that all of the sediments in Area 4 would be suitable for disposal and within areas 1-3 only the material at depths 1m-1.8m, 1.5-3m for area 2 and only at depths of 2m-4m for area 3 would be suitable for disposal at sea. On the basis of the advice from CEFAS, it has been calculated that approximately 74,000m^3 of material is not suitable for disposal at sea due to it's level of contamination. This leaves a total of approximately 172,177m^3 which is chemically suitable for disposal at sea. It is proposed to use as much of this material as possible as a beneficial use scheme by placement elsewhere within the estuary. The following disposal routes are therefore proposed:

- Approximately 74,000m^3 of material to be used as fill material within existing jetty structures and for a small element of reclamation. This is the material which is too contaminated to be disposed of at sea;
- Up to 144,500m^3 of material to be used beneficially for habitat creation to increase the extent of maerl habitat;
- Approximately 27,000m^3 of material to be disposed of at sea.

It should be noted that these are only rough figures at this stage based on a limited amount of geotechnical information and are provided to give a only broad indication of the quantities involved.

Deposit at Sea

It is proposed to dispose of some of the material at a licensed offshore disposal site. The nearest offshore disposal site is the Falmouth Bay site which is situated some 7km to the south-east of the entrance to the Fal Estuary. The water depth at the site is approximately 55m. Consent for the deposit at sea will be under Part II of the Food and Environment Protection Act (FEPA) 1985. At this stage, it is anticipated that around 27,000m^3 of material will require disposal at sea

Beneficial Use of Dredged Material

Subject to the material's physical and chemical characteristics and other legislative requirements (e.g. the Conservation (Habitats &c) Regulations 1994), it hoped to use some of the material beneficially. Informal discussions with English Nature indicate that there is the potential for the maerl component of the dredged material to be used beneficially for habitat restoration / improvement in the Fal and Helford Special Area of Conservation (SAC). This opportunity depends on the dredged maerl being sufficiently clean in terms of silt content and chemical contaminants. The dredged maerl would

have to be characterised and matched to areas of existing maerl habitat elsewhere in the Fal estuary. However, such beneficial use may in itself have an impact on the SAC and therefore English Nature have suggested that it should only be taken forward as a compensation measure for effects of the capital dredge. English Nature also indicates that there is little other opportunity for beneficial use for the other components of the dredged material (silt, sand, etc) because the nature of the estuarine system.

It is anticipated that up to 144,00m3 of material will be available for beneficial use. However, it is possible that there is insufficient capacity to make use of all of this material beneficial and therefore some of it may need to be disposed of through other means such as commercial use of disposal at sea.

Commercial Use

Maerl has up until recently been extracted from the Fal Estuary and sold as a commercial product with an approximate market value of up to £20 per tonne. If suitable maerl were available (including excess maerl following beneficial use), then it could potentially be used commercially rather than be deposited at sea, subject to agreement with the relevant authorities. This may represent an more environmentally sustainable option than disposal at sea.

Land Reclamation

It is proposed to use 74,000m^3 of material as fill material. It is anticipated that approximately 5,100m^3 of dredged material could be used to fill in an open quay area at the eastern end of the Queens Wharf. In addition, it is anticipated that approximately 2,900m^3 of dredge material could be used to fill in and replace an old wooden jetty at the western end of the Northern Wharf. The remaining dredged material could be used to replace an existing derelict jetty on the western side of the road connecting the Queens Wharf with the main docks area

2.2 OPERATIONAL PHASE

The operational phase commences on completion of the construction phase of the scheme. For the purposes of this scoping study, the operational phase is defined as a period of 25 years following the completion of the construction phase.

2.2.1 Maintenance Dredging

During the operational phase, periodic maintenance dredging of the channel may be required in order to maintain the declared channel depth of –7.5mCD and berth depths of -9.5mCD. The need for maintenance dredging has not been established, FHC and FDEC anticipate that the declared depths will remain operational for a number of years without maintenance dredging. This assumption is made on the back of previous dredging requirements. For example, the navigation channel and berths were last dredged in 1965, so the rate of sedimentation is presumed to be very low. Maintenance dredging is infrequent because of the low levels of suspended sediment in the Fal Estuary and its tributaries.

2.2.2 Cruise Terminal

Future Port Operations

The existing and improved cruise terminal will provide facilities for two types of cruise operations: day calls and turnarounds. The total number of cruise calls to Falmouth in 2005 was 45 and in 2006 65 cruise calls are expected. Once operational, the new cruise terminal will improve the existing cruise vessel and passenger operations and promote further growth of the business.

In 2005, Falmouth attracted 22 day calls bringing approximately 11,000 passengers to the town and West Cornwall. Day calls are made throughout the year but tend to be during the period April to September. Of the passengers coming ashore in 2005, approximately 50% visited Falmouth by walking or shuttle bus, while the other 50% visited other parts of West Cornwall by coach. Allowing for 45 passengers per coach, day calls generated in the region of 122 coach movements last year with up to 15 coach movements per call.

With the dredging, improved berth and new cruise terminal in place the number of day calls is anticipated to increase to 39 per annum by 2015 bringing 59,000 passengers. The number of visitors per vessel may increase from around an average of 700 to a maximum of approximately 1400. The distribution of day visitors between Falmouth and other Cornish destinations is not expected to change significantly. The number of coach movements is predicted to increase from 122 per annum in 2005 to 655 per annum in 2015. Assuming an equal distribution of day calls and passenger numbers and concentrating all calls into the main part of the season (i.e. 25 weeks from April to September), there will be an average of two day calls per week. The number of coach movements per call may increase to a maximum of 29 for a vessel carrying 2600 passengers.

Falmouth was the homeport for 18 turnaround cruises during 2005. This enabled 17,700 passengers to embark and disembark for cruises to the western European seaboard, the Mediterranean and the Caribbean on board the *M/V Van Gogh*. Turnarounds are made on a regular basis throughout the year. With the new cruise terminal in place, the number of turnaround operations is anticipated to increase to 33 per annum by 2015 with 50,000 passengers.

Turnaround passengers arrive and depart the existing cruise terminal by a combination of coach (50%), car (45%), which are parked at the Docks during the cruise, and public transport (5%). At present, the terminal building is the Princess Pavilion which is situated outside the Docks. This would still be required after the completion of this project

Although the main thrust of the wharf improvements is to increase cruise calls, it can be assumed that there would be other benefits to FDEC's business. FDEC believe that the deeper navigation channel, berths and wharf improvements will facilitate two additional ship repair contracts per annum. These contracts will not require any change to FDEC's existing operations for ship repairs alongside berths.

2.3 CONSIDERATION OF ALTERNATIVES

2.3.1 Introduction

This section outlines the alternatives to the proposed cruise terminal improvements and harbour works. Further detail on alternatives considered will be presented in the Environmental Statement.

2.3.2 Do Nothing Scenario

At present the size of cruise vessels visiting the Docks is restricted by the depth of the channel. However, the Docks do not operate at full capacity i.e. it could receive a greater number of cruise vessels (of the same size that currently use the Docks) with the existing facilities.

If the proposed scheme does not go ahead, it is predicted that for a limited period the number of cruise vessels using the port would be able to increase in line with growth in the cruise market sector. However, this growth would soon stop and could potentially be followed by a decline in the number of visiting vessels as water depth continues to reduce and the size of the vessels increases. Furthermore, without the channel improvements the Docks will not be able to attract the increasing number of larger cruise vessels which have a greater number of passengers aboard. Although some vessels would anchor in the Carrick Roads and bring passengers ashore via ferry shuttle, most cruise vessels like to berth alongside a quay and therefore many of the larger cruise ships will not call at Falmouth.

If the scheme does not go ahead, the potential economic benefit to the Docks and the local economy of being to accommodate an increasing number of cruise vessels would be lost. The long-term economic viability of the port would also not be as secure as it would be if the scheme had gone ahead.

2.3.3 Cruise Terminal

Alternative Wharf Improvements

As an alternative design for the wharf improvements (see ***Section 1.2.1***), it may be possible to carry out the wharf improvements using sheet steel piling. The sheet steel piling may be driven through the alluvium and bedrock using the same method as described for the reconstructed Queens Wharf. The sheet piling would enclose the two open wharf areas and could be filled in part using material arising from the capital dredge (see ***Section 1.2.3***). Deck construction and additional installations may take the same form as that described for the reconstructed Queens Wharf.

Alternative New Cruise Terminal

A variety of alternative designs are possible for the new cruise terminal building which could include variations in the size, orientation and finishes of the building. No alternative location is possible because the terminal building would need to be situated adjacent to the quay alongside which the cruise vessels will berth.

2.3.4 Capital Dredge

Alternative Capital Dredge

As an alternative alignment for the eastern navigation channel, the existing alignment could be dredged to the required depth. The existing navigation channel is designed to provide vessels with safe access to FDEC's dry Docks, but not the wharves. At present, accessing the wharves requires vessels to be lined up for the dry Docks approach and then manoeuvred northwards around the wharves and vessels moored against them. The realigning of the vessels' tracks to northwards requires course alterations and a period of settling onto the new track. This adds an unwelcome complexity to the manoeuvre and reduces the margins of safety for larger vessels. Therefore although, the existing channel could be made deeper, it is considered by FHC that due to the complexity of the manoeuvres required, the channel in its existing alignment compromises the safety margin's of use by larger vessels.

2.3.5 Disposal of Dredged Material

Deposit at sea at the Fal Bay offshore disposal site is the preferred disposal option for the dredged material for the following reasons:

- The site is the closest offshore disposal site to the location of the dredging; and
- There is no land disposal site nearby capable of accommodating large quantities of dredged material.

Accordingly, deposit at the Fal Bay site is the cheapest option for disposal of large quantities of dredged material.

Alternative Disposal Sites

As described in ***Section 2.1.3***, it will not possible to deposit all of the dredged material at sea because some of the sediment contain elevated levels of contaminants, so a range of alternative disposal options are under consideration. These options do not constitute direct alternatives because it is likely that one or more of them may be used in combination with deposit at sea.

In addition to deposit at sea, the following options are described in ***Section 2.1.3***:

- Beneficial use of dredged material;
- Commercial use;
- Land reclamation;
- Land improvement; and
- Disposal to landfill site.

3 HYDRODYNAMIC AND SEDIMENTARY REGIME

3.1 OVERVIEW OF THE EXISTING ENVIRONMENT

The Fal Estuary is a drowned valley or ria which covers a total area of 2482 ha (Barne *et al.*, 1996). It extends in a north-south direction with a number of sheltered creeks running off it. Although the Fal is a ria, a number of small rivers and streams flows into the estuary at the head of the creeks. These include, amongst others the River Kennel and the Carnon River at Restronguet Creek, the River Allen at Truro and the River Fal.

Much of the estuary (69.9%) is subtidal and most of the shoreline of the estuary comprises rocky cliffs. Although most of the shoreline is rocky, at the head of the creeks mudflats which are found where it is sheltered from wave action.

The north-south orientation of the estuary means that it is sheltered from the prevailing southwesterly wind by the presence of Pendennis Point. Carrick Roads, however, is open to southerly winds. The main channel extends up the centre of the Fal Estuary and is approximately 18km long. The channel is approximately 200m wide and around 30mCD deep over most of its length. Subtidal banks of between 2m and 5m+CD deep are found either side of the channel.

At Falmouth there is a mean spring tidal range of 4.6m and a mean neap tidal range of 2.2m. Mean tidal levels are as follows:

- Mean high water springs: 5.4m+CD;
- Mean high water neaps: 4.3m+CD;
- Mean low water neaps: 2.1m+CD; and
- Mean low water springs: 0.8m +CD.

Very little maintenance dredging is carried out in the Fal estuary. The main channel was last dredged in 1965 and therefore the rate of sedimentation is presumed to be low.

3.2 IDENTIFICATION OF KEY ISSUES

Table 3.1 summarises the potential key impacts associated with the proposed scheme with respect to the hydrodynamic and sedimentary regime.

Table 3.1 Potential impacts on the hydrodynamic and sedimentary regime associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Approach channel deepening	• Change in tidal propagation/tidal range within the Harbour • Resuspension, dispersion and deposition of fine material during dredging	• Increase in wave energy • Alteration to tidal current speeds • Localised erosion and accretion of intertidal areas • Siltation within subtidal channels
Cruise terminal improvement works	• No significant impacts envisaged	• Potential alteration of hydrodynamic regime due to presence of new improved wharf.
Reclamation using dredged arisings	• Potential change in tidal flows and sediment transport regime due to presence of new structures	• Potential change in tidal flows and sediment transport regime due to presence of new structures
Beneficial use	• Resuspension, dispersion and deposition of fine material during placement of dredged material	• Change in coastal processes regime due to decrease in depth
Disposal at sea	• Potential for accumulation of material on the seabed at the disposal ground • Dispersion of fine material from the disposal ground • Deposition of fine material outside of the disposal ground	• Dispersion of fine material during disposal of maintenance dredgings
Maintenance dredging (if required)	• Resuspension, dispersion and deposition of fine material during dredging	• Long-term erosion of intertidal areas due to sediment depletion arising from disposal of maintenance dredgings (i.e. affect on intertidal morphology)

3.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

As part of the EIA, it is proposed that numerical modelling is carried out to investigate the potential effects of the proposed scheme as identified above.

It is proposed that a flow model is set up which will be calibrated and validated against historic data. The proposed channel deepening will then be incorporated within the flow model in order to determine its effects on current speeds and direction on both flood and ebb tides for spring and neap tidal conditions.

The results from the flow modelling described above will be combined with the results of wave modelling in the Fal Estuary and then be used to drive sediment transport models to simulate the effect of the proposed scheme on both mud and sand transport. This work will be the means by which the potential effects of the proposed channel deepening on intertidal and subtidal areas (e.g. erosion and deposition of fine sediment) would be determined.

The longer term implications of the proposed scheme will also be determined. The assessment on longer term impact is a process of identifying underlying trends in the morphology of the estuary and offshore area and then considering the predicted changes against what is known, and can be demonstrated, about the sediment budget of the estuary. This aspect of the assessment will enable conclusions to be drawn about the potential for effect on mudflats, saltmarsh and channels.

The dispersion of fine material from the channel dredging will also be assessed by use of an appropriate dispersion model. This model, driven by the results of flow modelling, will allow the potential extent of dispersion, and the footprint of any deposition of fine material, to be assessed.

The implications of the proposed scheme for waves that are generated due to vessel movements will also be considered. Such effects of the proposed scheme will be assessed in the context of the existing effects of ship wash on intertidal areas within the Fal Estuary its approaches.

It is should be noted that the focus of the assessments described above will be to determine what change (if any) the proposed scheme would cause compared to the existing environment. It may also be necessary to undertake modelling of the effects of disposal at the licensed offshore disposal ground and also the effects of any beneficial use scheme. The need for such studies will be determined in the EIA by consultation with relevant consultees.

4 SEDIMENT AND WATER QUALITY

4.1 OVERVIEW OF THE EXISTING ENVIRONMENT

4.1.1 Introduction

The sediment and water quality of the Fal estuary are affected by various contaminants and notably by metals and organo-tin compounds such as tributyl-tin (TBT). A study by the Marine Biological Association (MBA) on behalf of the Environment Agency and English Nature established the contaminant issues summarised in Table 4.1. The study was based on published literature and unpublished reports and interrogated data sets, notably raw data provided the Environment Agency (MBA, 2003).

Table 4.1 Contaminants in the Fal Estuary (source: MBA, 2003)

Contaminant	Location	Sources
Organotins	Entire system, especially Falmouth Docks	Falmouth Docks, shipping, sediments, sewage discharges
Metals (As, Cd, Cu, Fe, Zn)	Restroguet and Mylor area, upper Fal	Mine drainage, sediments, discharges
Nutrients	Upper Fal (Truro area)	Sewage discharges, land run-off, mine drainage
Turbidity	Upper Fal (Truro and Tresillian areas)	Sewage discharges, maerl extraction
Microbiological parameters	Upper Fal (Tresillian area), Penryn River	Sewage discharges, farm animal (land run-off)
Hydrocarbons and PAHs	Lower Fal (oils), unknown distribution (PAHs)	Discharges, shipping, urban run-off, atmospheric deposition
Pesticides, herbicides and other synthetic organic compounds	Poorly defined (probably silty sediments)	Not quantified (probably agricultural run-off and declining inputs from sewage discharges)

The MBA study indicates that the primary toxic contaminants of concern to the lower Fal estuary, and particularly the area around the proposed scheme, are:

- Organotins.
- Metals.
- Oils and possibly PAHs.

In addition, it is acknowledged that the proposed scheme including dredging activities would inevitably release sediments into the water column with potential effects on concentrations of suspended solids. Under baseline conditions, concentrations of suspended solids (as related to turbidity) are consistently higher in the upper estuary. Lower concentrations in the lower estuary may be intermittently affected by maerl extraction.

4.1.2 Environmental Quality Standards

Environmental quality standards (EQSs) for sediment and water quality effect compliance limits for contaminants and other parameters, and facilitate regulation and monitoring. EQSs are typically determined using toxic effects data for aquatic life, and

contain an implicit assumption that contaminants at concentrations below EQSs would be unlikely to cause adverse effects, while concentrations above EQSs would probably cause adverse effects.

There are no quantified environmental quality standards (EQSs) for sediments except that the EC Dangerous Substances Directive requires “standstill (no deterioration)" for List 1 substances including metals (mercury and cadmium only) and various synthetic organic compounds. Hence, there are no EQSs for most of the primary contaminants of concern to the proposed scheme; that is organotins, metals (including arsenic, copper, iron and zinc), oils and PAHs.

In the absence of quantified EQSs, concentrations of contaminants in sediments can be compared to informal guidance (e.g. the CEFAS action levels for assessing the chemical quality of dredged material to be disposed of at sea) and legislation in other countries (e.g. Canadian sediment quality guidelines for the protection of aquatic life).

Water quality within the Fal estuary is regulated according to a number of EC Directives which set EQSs for water quality and impose monitoring requirements. The Environment Agency monitors water quality in the Fal estuary for three directives with particular focus on a range of water quality parameters (see Table 4.2).

Table 4.2 EC Directives which govern water quality within the Fal Estuary

Directive	Principal Monitoring Parameters
Dangerous Substances	TBT, metals (dissolved), suspended solids, salinity
Shellfish Waters	Dissolved oxygen, pH, metals (dissolved), salinity, synthetic organic compounds, faecal coliforms
Urban Waste Water Treatment	Dissolved oxygen, pH, BOD, nutrients, suspended solids, salinity

4.1.3 Contaminants of Concern in Sediments

Metals

According to MBA (2003), metal concentrations in the Fal estuary’s sediments are dominated by high concentrations in and around Restronguet Creek. In particular, concentrations of copper, lead and zinc are high when compared to EQSs based on the Canadian sediment quality guidelines for the protection of aquatic life.

Unfortunately the MBA study does not include substantial data for the sediments in and around Falmouth Docks, but a previous survey by Posford Haskoning (the Posford Duvivier, 1998) on behalf of FDEC indicate that concentrations of copper, lead, mercury and zinc are high in the fine-grained sediments at the Northern Wharf and in the existing navigation channel east of the FOS jetty. To a lesser extent, concentrations of arsenic and cadmium are elevated as well.

Organotins

There is no EQS for TBT in sediments, although the MBA (2003) suggest that various research indicates that toxic effects are expected to occur in the range 0.1-0.3µg/g. of

dry weight sediment. On this basis, the MBA suggest that large areas of the Fal estuary, particularly around the estuary mouth, contain high concentrations of TBT.

According to Posford Haskoning (1998), a survey of the Docks found TBT concentrations in excess of the MBA's suggested EQS in fine-grained sediments including those in the area of the northern Wharf. Sediments in the existing navigation channel to the east of the FOS jetty exhibited TBT concentrations both below and within the range of 0.1-0.3µg/g.

Oils and PAHs

The MBA (2003) reported that there do not appear to be any data for oils and PAHs in the Fal estuary's sediments.

4.1.4 Contaminants of Concern in Water

Metals

The MBA's study (2003) found that former mining activities have promoted high concentrations of some metals in the Fal estuary (notably zinc, arsenic, cadmium and copper). Concentrations appear to reduce with distance from Restroguet Creek and are around backgrounds levels in the lower estuary and typically meet EQSs established under the Dangerous Substances Directive. Concentrations for lead and nickel are below or near analytical detection limits in the lower estuary.

Organotins

The MBA (2003) identified that the estuary is widely affected by organo-tin. Water quality data for TBT are high and the EQS established under the Dangerous Substances is exceeded in many areas. Of the point discharges around the estuary, the Docks and sewage treatment works are the principal sources of TBT. The Docks' inputs are expected to have been reduced by the installation and operation of an active-carbon treatment plant. The sediment is another principal source of TBT and is thought to contain particles of anti-fouling paint which sustain high TBT partitioning rates between the sediment and overlying water.

Oils and PAHs

The MBA's study (2003) found that many water samples yield data below analytical detection limits, but suggest that discharges from the FOS tank farm and other point and diffuse sources contribute hydrocarbon oils to the estuary system.

4.1.5 TBT Characteristics

A sediment investigation undertaken for FDEC in 1997 / 98 (Posford Duvivier, 1998) included tests to identify the following characteristics of TBT in sediments at the Docks including the Northern Wharf and the approach channel. These tests included:

- Determination of TBT concentrations in the whole sediment;
- Determination of TBT concentrations associated with the sediment's different particle size fractions;
- Determination of TBT mobility from re-suspended sediment into sea water; and

- Determination of TBT leachability from sediment into fresh water.

The investigation concluded that:

- TBT is present in the whole sediment at high concentrations;
- TBT is evenly distributed through different particle size fractions, possibly due to high organic matter content or the presence of anti-fouling paint particles;
- TBT could be mobilised from sediment re-suspended into the sea (e.g. by dredging), potentially at concentrations greater than water quality EQS; and
- TBT could be leached from sediment into fresh water (e.g. at a landfill site).

4.1.6 Environment Agency Surveys

The Environment Agency has undertaken sediment quality surveys of the Fal estuary, with particular focus on TBT and its effects. This data will be available for the purposes of EIA.

4.2 IDENTIFICATION OF KEY ISSUES

4.2.1 Sediment Quality Issues

The key issues for sediment quality are summarised in Table 4.3.

Table 4.3 Potential impacts on sediment quality associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital dredging	• Remobilisation, dispersion and redistribution of potentially contaminated sediment in the Fal estuary, particularly metals and TBT and possibly oils and PAHs	• No significant impacts envisaged
Cruise terminal improvement works	• Potential disturbance to sediment during piling work	• Potential increase in sediment disturbance due to propeller wash
Reclamation using dredged arisings	• Potential for remobilisation of contaminated sediments during placement process	• Potential release of contaminants from disposal facility if incorrectly designed.
Beneficial use	• Placement of potentially contaminated sediment on the seabed	• No significant impacts envisaged
Disposal at sea	• Disposal of potentially contaminated sediment at the offshore disposal ground	• Potential for offshore disposal of contaminated material arising from maintenance dredging
Maintenance dredging (if required)	• Remobilisation, dispersion and redistribution of potentially contaminated sediment in the Fal estuary, particularly metals and TBT and possibly oils and PAHs	• No significant impacts envisaged

4.2.2 Water Quality Issues

The key issues for water quality are summarised in Table 4.4.

Table 4.4 Potential impacts on water quality associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital dredging	• Medium term increase in suspended solids concentrations during capital dredging • Medium term increase in water column concentrations of contaminants through dissolution via resuspension of contaminated sediment , particularly metals and TBT and possibly oils and PAHs	• No significant impacts envisaged
Cruise terminal improvement works	• No significant impacts envisaged	• No significant impacts envisaged
Reclamation using dredged arisings	• Potential for remobilisation of contaminated sediments during placement process	• Potential release of contaminants into water from disposal facility if incorrectly designed.
Beneficial use of dredged material	• Increase in suspended sediment concentration and increased turbidity due to outwash of fine material during placement • Potential for release of sediment contaminants into the water column	• No significant impacts envisaged
Disposal at sea	• Increase in suspended sediment concentration and increased turbdity at and around the disposal ground • Potential for release of sediment contaminants into the water column	• Periodic increases in suspended sediment concentrations and increased turbidity during the disposal of maintenance dredgings
Maintenance dredging (if required)	• No significant impacts envisaged	• Periodic short-term increase in suspended sediment concentrations during maintenance dredging • Periodic short-term increase in water column concentrations of contaminants through dissolution via resuspension of contaminated sediment , particularly metals and TBT and possibly oils and PAHs

4.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

4.3.1 Sediment Quality

In order to define the existing sediment quality within the dredging areas, a survey has been undertaken to characterise the sediments. This survey has been coordinated with a licence application to dispose of the dredged material at sea – an application which is to be made to Defra via the Marine Consents & Environment Unit (MCEU) under the Food and Environment Protection Act (FEPA) 1985.

In accordance with the advice of CEFAS (on behalf of Defra / MCEU concerning the FEPA licence application), three individual sediment samples were collected from 11 cores sunk at sampling stations within the capital dredging area (see Figure 1.1). The three samples per core were taken at depths that represent the upper, middle and lower extents of the material to be dredged from the seabed. Table 4.5 identifies the sampling areas, stations and depths. The purpose of these samples is to represent the vertical profile of contaminants from the sea bed down to the proposed bed level of the new channel.

Table 4.5 Sampling Areas, Stations and Depths

Sampling Area	Stations	Depths
1 Western navigation channel	Cores 1, 2 and 3	0m (surface), 1m, 1.8m
2 Northern and Queens wharves	Cores 1 and 2	0m (surface), 1.5m, 3m
3 FOS jetty	Cores 1 and 2	0m (surface), 2m and 4m
4 Eastern navigation channel	Cores 1, 2, 3 and 4	0m (surface), 1m and 2.5m

The samples were analysed by CEFAS for the following list of contaminants:

- Metals including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc;
- PCBs (25 congeners);
- PAHs (23 individual PAHs);
- TBT and DBT.

Informal consultation with the Environment Agency (letter of 23/10/04) indicates that additional analyses may be required to better define the distribution of contaminants in the dredged material.

In addition to the above, some of the sediment samples could be analysed for additional parameters that will help to identify and assess the potential impacts associated with the proposed scheme. The additional analyses could include:

- Leachate tests to determine the mobility of contaminants between the solid and liquid phases (i.e. partitioning);
- Bioassay tests to determine the toxicological exposure effect on biological indicators species (e.g. mortality).

The need for further analyses will be discussed with consultees at the start of the EIA. The impact assessment will compare the results of CEFAS's sediment analyses with sediment quality guidance criteria. The purpose of this comparison is to indicate

whether the contaminants in the sediments in the dredged material individually pose a potential threat to the environment in terms of the well being of aquatic life.

In the absence of formal UK standards, the impact assessment will compare contaminant concentrations with the Canadian sediment quality guidelines for the protection of aquatic life. These guidelines are more comprehensive than alternative international sediment quality guidelines such as the Dutch standards for the disposal of dredged material. In the absence of a Canadian standard for TBT, reference will be made to CEFAS's guideline action levels for the disposal of dredged material (which are not statutory contaminant concentrations for dredged material but are used as part of a weight of evidence approach to decision-making on the disposal of dredged material to sea) and appropriate research (e.g. that identified in MBA, 2003; see ***Section 4.1.3***).

If bioassay analyses are conducted, the impact assessment will compare the test results to relevant toxicity criteria used by CEFAS and the US Environmental Protection Agency. The purpose of this comparison is to indicate whether the contaminants in the sediments in the dredged material synergistically pose a direct threat to the environment in terms of the well being of aquatic life.

4.3.2 Water Quality

In order to define the existing water quality within the lower Fal estuary, it is proposed to undertake data collation and a desk study to present information available from the Environment Agency's water quality monitoring databases.

An impact assessment of suspended solids within the estuary will be investigated through the numerical modelling work described in ***Section 3***. One of the outputs from the modelling work will be plots showing the predicted extent of sediment dispersion and the concentration of suspended solids within the sediment plume. Suspended solids concentrations will be compared to relevant EQSs.

The impact assessment of contaminants on water quality will be investigated through quantitative predictions of the dissolved concentrations of contaminants mobilised into the water column due to disturbance of sediments during dredging. These predictions will be made using partitioning theory and the results of leachate analyses performed on the sediment samples (see ***Sections 4.1.5 and 4.3.1***). Contaminant concentrations will be compared to relevant EQSs.

Further examination of the impacts on water quality may be necessary, subject to regular liaison with the Environment Agency.

5 MARINE AND COASTAL ECOLOGY

5.1 OVERVIEW OF THE EXISTING ENVIRONMENT

The Fal Estuary is generally recognised as being of major nature conservation interest (Barne *et al.,* 1996) and in recognition of this it has been put forward as a SAC. The estuary supports a high diversity of marine habitats, communities and species with a number of sites within it being of particular importance. Near the mouth of the Percuil River, Place Cove is a sheltered sediment cove with nationally important rich communities of burrowing species (Powell *et al*. 1978). Patches of sublittoral rock, an uncommon habitat within marine inlets, provide a substratum for a rich sponge and sea squirt community (Davies, 1997). The St. Mawes Bank to the west of the Roseland peninsula is also of national importance for its extensive (approximately 150 ha) bed of living maerl, an unusual calcified seaweed. This is the best developed maerl bed in England. The three dimensional nature of these maerl bed provides a wide range of niches for infaunal and epifaunal invertebrates. Therefore the bed harbours a very high diversity of organisms, some of which are more or less confined to the maerl habitat (Keegan, 1974; Bosence, 1976). Within the estuary, coarse sediment is colonised by eelgrass *Zostera marina*, which also has a rich and distinctive community associated with it. Further north, at Turnaware Point, the tide-swept stony sediment has a diverse array of species of regional importance (Rostron, 1987).

The Fal and Helford SAC is designated for the following habitats:

- Large shallow inlets and bays;
- Sandbanks which are slightly covered by seawater all the time;
- Mudflats and sandflats not covered by seawater at low tide; and
- Atlantic salt meadows.

The conservation objectives for the site are listed in English Nature's Regulation 33 guidance. Maerl beds are a key sub-feature of the sandbanks habitat.

A number of marine ecological studies have already been carried out in the Fal Estuary such as:

- Hardiman, Rolfe and White, 1976;
- Farnham and Bishop, 1985;
- Davies and Sotheran, 1995;
- Perrins *et al*., 1995;
- Dyer and Worsfold, 1998;
- Posford Haskoning, 1998; and,
- Posford Haskoning, 2003.

Some marine biological data is already available for the proposed dredge area. It is known that part of the dredged area, in particular Area 4, comprises dead maerl gravel and a high diversity of species have been recorded in this area.

5.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on marine ecology is presented in Table 5.1.

Table 5.1 Potential impacts on marine ecology associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital dredge	• Direct loss of benthic community within the footprint of dredge • Implications for flora and fauna through increase in suspended sediment concentrations and water column turbidity (e.g. filter feeding organisms, algal communities, etc) • Sedimentation of material resuspended by capital dredging with possible smothering effect • Remobilisation of potentially contaminated sediments and deposition of intertidal and subtidal communities	• Possible alteration of benthic community of the dredged channel due to a change in substrate type following dredging or due to a change in the frequency of maintenance dredging • Changes to the hydrodynamic regime (e.g. increased current speeds) resulting in localised erosion of intertidal communities • Increased wave activity over intertidal areas leading to localised erosion of intertidal communities • Impacts on benthic communities due to erosion of intertidal mudflats and/or saltmarsh due to trapping of fine sediment within the deepened channel • Potential increase in ship wash resulting in localised erosion of intertidal areas
Cruise terminal improvement works	• Disturbance to seabed during piling works. • Possible loss of subtidal seabed in footprint of new wharf improvements include reclamation.	• No significant impacts envisaged.
Reclamation using dredged arisings	• Loss of seabed habitat within footprint of any new reclamation	• No significant impacts envisaged
Beneficial use of dredged material	• Smothering of habitats and species within footprint of placement area • Increase in suspended sediment concentration and water column turbidity with potential impact on marine communities • Sedimentation of material disposed from the placement site and possible smothering	• Recolonisation of the area by benthic invertebrates
Disposal at sea	• Increase in suspended sediment concentration and water column turbidity with potential impact on marine communities • Dispersal and deposition of fine material with possible smothering of marine communities	• Introduction of contaminants into the offshore environment during the disposal of maintenance dredged material.

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
	• Introduction of contaminants into the offshore environment during the disposal of capital dredged material	
Maintenance dredging (if required)	• Direct loss of benthic community within the footprint of dredge • Implications for flora and fauna through increase in suspended sediment concentrations and water column turbidity (e.g. filter feeding organisms, algal communities, etc) • Sedimentation of material resuspended by capital dredging with possible smothering effect • Remobilisation of potentially contaminated sediments and deposition of intertidal and subtidal communities	• No significant impacts envisaged

5.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

In order to determine the magnitude and significance of the impacts on marine communities, it is necessary to characterise the nature of marine communities which currently exist within the potentially impacted areas. As part of this environmental scoping exercise, a search of the existing available data was carried out in order to provide an overview of the marine communities present. It is proposed that this information will be summarised in the Environmental Statement in order to provide an overview of the communities present within the Fal Estuary.

As part of the EIA it is proposed that a marine biological survey be undertaken of the proposed dredge area in order to characterise the type of communities that will be affected by the scheme. It is recommended that the marine biological survey be undertaken by marine ecologist divers in order to provide a visual description of the nature of the seabed and epibenthos. In addition it is recommended that a series of cores or grabs are taken during the survey to characterise the infauna of the seabed. The exact number of cores/grabs and location of sampling stations should be discussed with English Nature prior to carrying out the survey. It is anticipated that the samples would be sieved through a 0.5mm mesh. Each sample would be sorted and the organisms identified and enumerated. Wet weight biomass to major taxonomic group level (e.g. Polychaeta, Oligochaeta, Mollusca, etc) would be determined. All analysis should be undertaken by a laboratory that participates in the National Marine Biology Analytical Quality Control (NMBAQC).

If a beneficial use scheme is pursued, it is likely that surveys of the proposed placement site will also be required to characterise the site and determine the effects of placement.

The predictive modelling studies described in ***Section 3*** will be used as the basis for the assessment of the potential impacts of the proposed scheme on the marine ecological

interest of the Fal Estuary. The modelling will allow an assessment of the implications of the proposals for designated habitats, and the benthic invertebrate that they support, to be made.

6 MARINE AND COASTAL ORNITHOLOGY

6.1 OVERVIEW OF THE EXISTING ENVIRONMENT

The Fal estuary covers a total area of 2,482 ha of which 69.9% is subtidal (Barne *et al.,* 1996). As such it does not contain extensive tracts of mud or sandflats to support large populations of waders and wildfowl, but is more important for populations of grebes and divers. The estuary as a whole supports three bird species which are list on Annex 1 of the Birds Directive. These are black-throated diver *Gavia artica*, great northern diver *Gavia immer* and the Slavonian grebe *Podicpes auritus*. The estuary is also of county importance for wintering red-breasted merganser *Mergus serrator* (ERCCIS, 2004).

Bird numbers in certain parts of the estuary are counted as part of the national Wetland Bird Survey (WeBS). Figures 6.1 and 6.2 illustrate the areas of the estuary covered in the WeBS core count sectors (highwater) and low tide count sectors. This suggests that Falmouth harbour and lower estuary are not covered within any count sectors. This suggests that the bird interest of this area is too low to warrant bird counts.

Figure 6.1 WeBS Core count sectors within the Fal Estuary

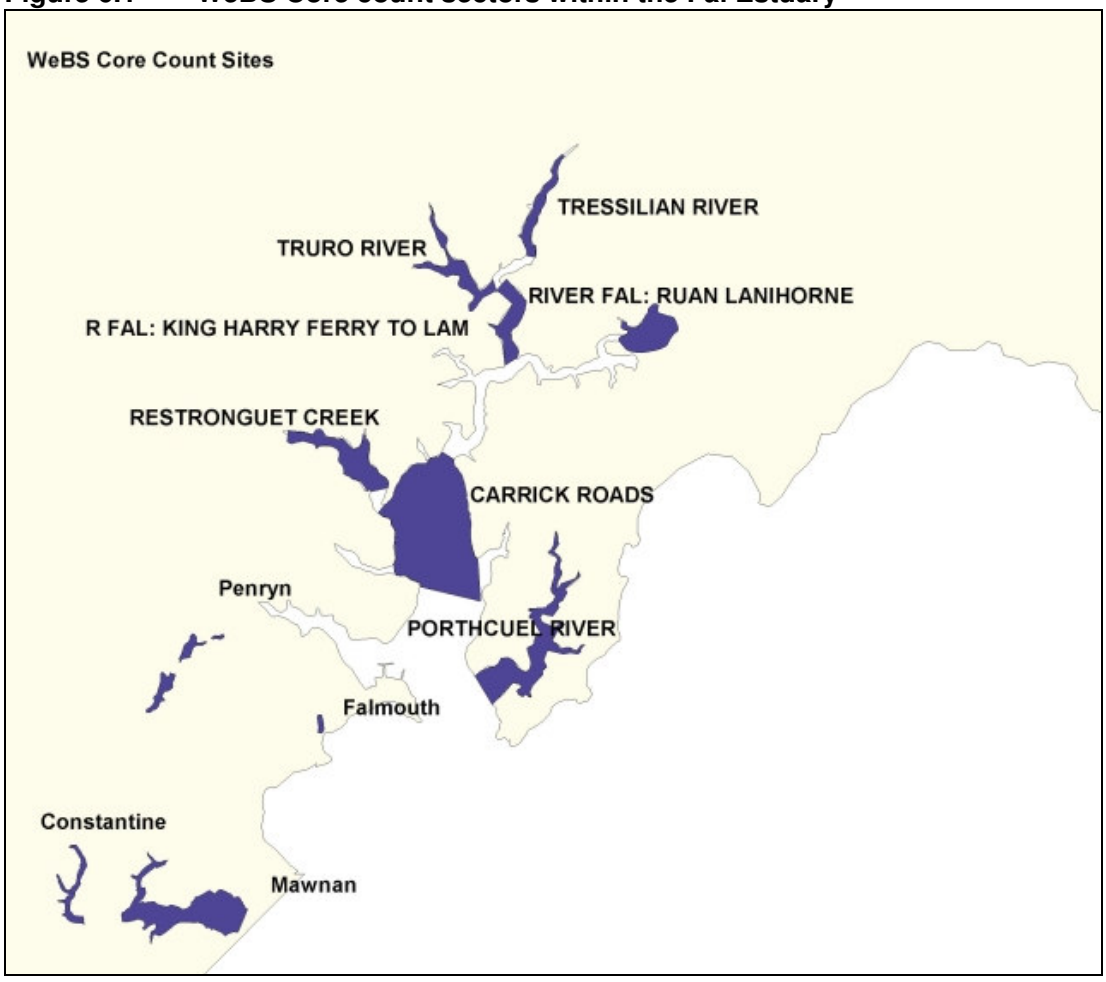
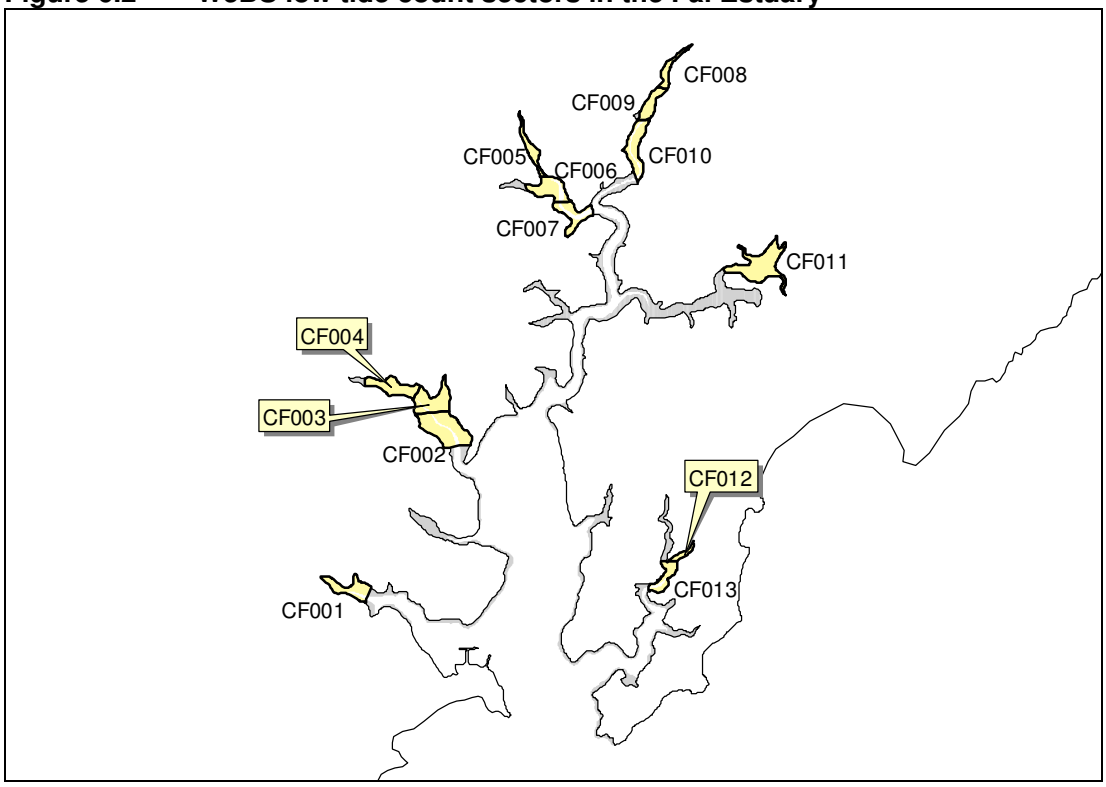


Figure 6.2 WeBS low tide count sectors in the Fal Estuary



6.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on ornithology is presented in Table 6.1.

Table 6.1 Potential impacts on ornithology associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• Effects on feeding and roosting areas or food sources (i.e. prey availability and/or species) due to the sedimentation of material that is resuspended during dredging onto intertidal areas • Effects on prey items (benthic invertebrates) due to deposition of potentially contaminated sediments (i.e. prey palatability) • Disturbance to feeding and roosting waterfowl due to the presence and movement of dredging plant and noise generated	• Effects on intertidal feeding areas due to changes in the hydrodynamic regime. • Localised changes in prey availability or species due to wave action • Longer term erosion of intertidal mudflats and/or saltmarsh due to effects on the sediment budget of the Harbour • Localised effects on intertidal mudflats and/or saltmarsh due to increased ship wash • Disturbance to feeding waterfowl due to vessel wash
Cruise terminal improvement works	• Loss of bird roosting areas (if present) through construction of terminal building. • Loss of bird roosting areas (is present) through wharf improvements	• No significant impacts envisaged
Reclamation using dredged arisings	• No significant impacts envisaged	• No significant impacts envisaged
Beneficial use of dredged material	• No significant impacts envisaged	• No significant impacts envisaged
Disposal at sea	• No significant impacts envisaged	• No significant impacts envisaged
Maintenance dredging (if required)	• No significant impacts envisaged	• No significant impacts envisaged

6.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

The predictive modelling studies described in ***Section 3*** will be used as the basis for the assessment of the potential impacts of the proposed scheme on the ornithological interest of the Fal Estuary. The modelling will allow an assessment of the implications of the proposals for designated habitats, and the benthic invertebrate and waterfowl populations that they support, to be made.

The importance of intertidal mudflats and areas of saltmarsh within the Fal for feeding and roosting waterfowl will be described using existing data.

7 TERRESTRIAL ECOLOGY

7.1 OVERVIEW OF THE EXISTING ENVIRONMENT

Data on the ecological interest of the study area has been obtained from the Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS). ERCCIS collate data on notable species and non-statutory designations. A number of notable species have been recorded within 1km of the Docks. Many of these records date from the 1800s and therefore it is not known whether they are still at the site.

To the north of the Inner Harbour, the Flushing Beach is a non-statutory County Wildlife Site which extends down to mean low water. The site covers about 2km from Flushing towards Pennarrow Point and comprises areas of mixed broad-leaved woodland plantation, scrub, maritime grassland, coarse neutral grassland and cliff communities. The cliff communities are reportedly the most interesting habitats of the sites and they support typical maritime species as well as some nationally important species.

Close to the Docks, lies a road verge inventory site. In 1990, a survey of this area was carried out which recorded the prostrate toadflax (*Linaria supina)*, a nationally scarce plant. This was found next to the adjacent railway track and was thought capable of seeding into any similar open habitat.

The vast majority of the proposed works are subtidal and therefore do not have the potential to affect terrestrial habitats or species. The only works which are above mean high water are the creation of the new cruise terminal building at the Docks. The majority of the Docks comprises hard standing, (i.e. concrete, tarmac or hard core surfaces). Most of the land is also used for storage or other facilities. Therefore it is unlikely to support plants or animals of nature conservation interest.

7.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on coastal ecology is presented in Table 7.1. This table should be read in conjunction with Table 5.2, which considers the effect of the scheme on marine ecology.

Table 7.1 Potential impacts on terrestrial ecology

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• No significant impacts envisaged	• Effects on coastal and terrestrial habitats through change in coastal processes
Cruise terminal improvement works	• Effects on terrestrial fauna and flora in area of new cruise terminal building	• No significant impacts envisaged
Reclamation using dredged arisings	• No significant impacts envisaged	• No significant impacts envisaged
Beneficial use of dredged material	• No significant impacts envisaged	• No significant impacts envisaged
Disposal at sea	• No significant impacts envisaged	• No significant impacts envisaged
Maintenance	• No significant impacts envisaged	• No significant impacts envisaged

dredging (if required)		

7.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

As part of the EIA it is proposed that a walkover survey of the site of the new cruise terminal building be carried out to characterise the type of habitats present. The results of this survey would then be discussed with English Nature. Depending on the results of this survey, further specialist survey work may be required.

8 COMMERCIAL FISHERIES

8.1 OVERVIEW OF THE EXISTING ENVIRONMENT

Within the Fal Estuary, the Environment Agency is the sea fisheries authority and enforces statutory legislative controls on the fisheries. Outside the estuary, the Cornwall Sea Fisheries Committee is the sea fishery authority.

The following statutory controls on fishing activity exist in the Fal Estuary:

- Any form of trawling is prohibited by the Environment Agency byelaw in the Fal and Helford Estuary;
- Mechanical collection of cockles has been made illegal in all Cornish estuaries. A size limit was introduced in November 2002;
- The Fal Estuary is a designated DEFRA bass nursery area. There is also a minimum landing size of 37.5cm; and,
- Scallop dredging is prohibited.

Within the estuary the main fishing that is carried out is potting which are set for prawns, velvet crab and brown crab. The main grounds for this are in the Carrick Roads and in the winter months this takes place in the deeper channel. The prawn industry in the Fal Estuary over the past five years has thrived and has an estimated turnover of £50,000 per year (Environment Agency, 2004).

Oyster beds are present in the Fal, with the main beds being north of Pennarow Point. Oysters are traditionally dredged under sail as the use of power is prohibited. The oyster fishery is managed by the Port of Truro under a byelaw which restricts the season, days and hours of fishing effort, whilst restricting the size of oysters taken. Between 1st October and 31st March, native oysters are dredged using sail and hand power.

As well as being a designated bass nursery area, it is likely that the estuary is a good nursery ground for a number of other fish species such as flounder. The estuary offers protection from marine predators and storms and provides rich food supplies. Juvenile fish typically live close inshore and migrate back to sea as they become mature.

A number of shellfish beds are found within the estuary which have been classified into a number of production areas, in accordance with the Shellfish Hygiene Directive. A list of these sites is presented in Table 8.1.

Table 8.1 List of shellfish production areas (from www.cefas.co.uk)

Production area	Bed name	Species	Class
Truro River	Grimes Bar and Maggoty Bank	Native oyster	B
	Tregothnan	Mussels	B
	Calenick Creek Lambe Creek and Malpas	Mussels	C
Tresillian River	All beds	Mussels	B
Fal	Ruan Creek	Mussels	B
	South Wood	Mussels	B
	Flushing and Falmouth Wharves Meads	Native oyster	C
	Mylor Creek	Mussels	B
	All other beds Pandora Beach	Native oyster Pacific oyster	B
Percuil	All beds	Native oyster Pacific oyster	B

8.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on commercial fisheries is presented in Table 8.2.

Table 8.2 Potential impacts on commercial fisheries associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• Impacts on fisheries and shellfisheries through physical effects of deepening • Impacts on fish and shellfish (such as increased mortality and increased levels of stress) through adverse effects on water quality and sediment quality • Impacts on fisheries shellfisheries due to deposition of suspended sediment	• No significant impacts envisaged
Cruise terminal improvement works	• No significant impacts envisaged	• No significant impacts envisaged
Reclamation using dredged arisings	• No significant impacts envisaged	• No significant impacts envisaged
Beneficial use of	• Adverse impacts on fisheris	• No significant impacts envisaged

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
dredged material	through effects on water quality • Adverse effects on fishing community by navigational conflict due to presence of pipeline	
Disposal at sea	• Possible beneficial impact by short-term increase in fish catches • Impacts associated with the potential deposition of material on seabed	• No significant impacts envisaged
Maintenance dredging (if required)	• Impacts on fish and shellfish (such as increased mortality and increased levels of stress) through adverse effects on water quality and sediment quality • Impacts on fisheries shellfisheries due to deposition of suspended sediment	• No significant impacts envisaged

8.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

The effect of the scheme on commercial fisheries will be informed by the investigations into the hydrodynamic and sedimentary effects of the works and effects on sediment and water quality. The work planned to investigate these is detailed in ***Sections 3 and 4*** respectively. The assessment of effects on fisheries will also be informed by consultation with local fisheries organisations such as the St Mawes and Falmouth Fishermen's Association and the Oyster Dredgerman's Association.

9 COMMERCIAL NAVIGATION

9.1 OVERVIEW OF THE EXISTING ENVIRONMENT

Falmouth, with its deepwater harbour, is used by a wide range of commercial vessels, many of which are based in the harbour but many of which are visiting to make use of the various facilities on offer.

The harbour provides excellent sheltered anchorages which are used by a number of commercial vessels while awaiting orders, seeking shelter or undertaking stores and crew changes. Deepwater lay-up moorings for vessels up to 219 metres in length are also available in a sheltered location on the River Fal.

The harbour offers a number of facilities for commercial vessels, most of which are situated in the Docks area. Shiprepair, including casualty acceptance, is available at the shipyard operated by FDEC Falmouth, which offers in-service repairs and overhauls including specialist capabilities such as aluminium welding and in-situ machining. FDEC operate five berths in total and three graving Docks. The berths has a total length of 2,440 metres (Table 9.1 and 9.2). Bunkering is also available with FOS being the UK's largest offshore bunker station. The port is well located with minimum deviation from main shipping lanes for passing vessels.

Commercial cargo handling facilities are available alongside the Docks in Falmouth and further upriver at Lighterage Quay in Truro. Cargoes currently handled include bulk, bagged, packaged and palletised goods.

Table 9.1 Berths available at Falmouth Docks

Berth	Length	Depth alongside (metres)
County wharf	204	8
Duchy wharf	240	8
Queen's wharf	198	6.5
King's wharf	190	6.5
Empire wharf	150	6.5

Table 9.2 Dry Docks available at Falmouth Docks

Dock	Length	Width	Entrance width	Depth of sill below chart datum
Dock No 2	252.8	39.6	39.6	5.5
Dock No 3	220.98	26.82	26.82	3.19
Dock No 4	172.5	26.21	26.21	3.00

FHC are the statutory harbour authority for the lower half of the Fal Estuary, whilst the Port of Truro covers the northern half. Both harbour authorities have a duty to regulate navigation within the estuary. They have the power to make bye-laws which provide general rules for navigation and the conduct of a vessel within the jurisdiction of a harbour authority. In addition to these powers, the harbour masters are able to give directions to vessels within his area of authority in respect of when and how they may enter the harbour.

Entrance to Falmouth Harbour is divided into two channels by Black Rock, a drying rock situated 3.5 cables east of Pendennis Point. Larger vessels use the Eastern Channel which has a minimum depth of 5.0 m. There is a well marked channel to Carrick Roads. The approaches to Falmouth Docks have a minimum depth of 5.2 m.

9.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on commercial navigation is presented in Table 9.3.

Table 9.3 Potential impacts on commercial navigation associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• Navigational conflict due to presence of dredger	• Improved sea access to the Docks
Cruise terminal improvement works	• Potential for navigational conflict due to presence of construction plant	• Improved facilities for commercial vessels due to increase in length of available wharf
Reclamation using dredged arisings	• Potential for navigational conflict due to presence of construction plant	• No significant impacts envisaged
Beneficial use of dredged material	• Potential for navigational conflict due to presence of dredger	• No significant impacts envisaged
Disposal at sea	• Potential for navigational conflict due to presence of dredger	• No significant impacts envisaged
Maintenance dredging (if required)	• Navigational conflict due to presence of dredger	• Improved sea access to the Docks

9.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

The approach to assessment of the potential impacts on commercial navigation will be to discuss the key issues with the Harbour Master and pilots. This consultation process will establish the level of concern over potential impact to commercial navigation, determine the likely significance of potential impacts and reveal any measures that are considered necessary to ensure the safe navigation of commercial vessels within the Fal Estuary and approaches.

10 ARCHAEOLOGY AND HERITAGE

10.1 OVERVIEW OF THE EXISTING ENVIRONMENT

Comprehensive information about the historic resource of the Fal estuary has been collated by the Fal Estuary Historic Environment Audit (Ratcliffe, 1997). This audit was carried out by Cornwall Archaeological Unit, funded primarily by English Heritage. The aim of the audit, which included a desktop assessment and limited fieldwork, was to gain an overall of impression of the historic environment of the estuary. The report provides a comprehensive list of archaeological sites and historic structures within the estuary and also describes their historical and landscape context, and assesses the present state of the archaeological resource.

Human activity around the Fal Estuary probably dates back to the Mesolithic, when sea level in south west England was an estimated 35 metres lower than today. Submerged forest deposits recorded at a number of locations are probably of this date. Evidence for later prehistoric and Romano-British occupation is provided by the remains of barrows, cliff castles, and defended farmsteads. From medieval times, the Fal Estuary became a major focus in Cornwall for local and foreign trade and its position on the south coast made it ideal for contact with the continent. Falmouth's strategic location at the gateway to the English Channel made it very important in terms of coastal defences and it was successfully fortified over a period of 400 years (from 1540 to World War II), and Pendennis Headland is one of the most important military complexes in the country (Ratcliffe, 1997).

Falmouth inner harbour was a valley at the end of the last Ice Age which has been submerged as sea level has risen. The Fal Estuary Historic Audit notes that peat was uncovered on the waterfront (at the Moor) in the early 20th century, confirming that former land surfaces survive in places.

10.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on archaeology and heritage is presented in Table 10.1. English Heritage have expressed concern about the impacts of the proposed capital dredging. The dredging could potentially remove organic and inorganic remains dating from the earlier prehistoric period and later. These could include peats and silts (former land surfaces) with biological evidence preserving a record of environmental change in the local area, flint scatters and/or early encampments, fishing structures, boats of all dates and associated finds.

Table 10.1 Potential impacts on archaeology and heritage associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• Potential removal of features of archaeological interest during the capital dredging • Potential coverage of features of archaeological interest due to the deposition of fine sediment disturbed during dredging	• Potential erosion or burial of features of archaeological importance due to effects tidal current speeds and, potentially, intertidal and subtidal erosion and accretion • Potential exposure of features of archaeological importance due to possible effects on sediment budget of the estuary and, therefore, intertidal erosion rates • Potential localised exposure or burial of features of archaeological interest due to changes in wave energy
Cruise terminal improvement works	• No significant impacts are envisaged	• No significant impacts envisaged
Reclamation using dredged arisings	• No significant impacts envisaged	• No significant impacts envisaged
Beneficial use of dredged material	• Potential burial of archaeological resources	• No significant impacts envisaged
Disposal at sea	• Potential burial of archaeological resources	• No significant impacts envisaged
Maintenance dredging (if required)	• No significant impacts are envisaged	• No significant impacts envisaged

10.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

Following advice from English Heritage, it is proposed to adopt a staged approach to investigate the likely impact of the proposed scheme on the historic environment. Initially a desk-based assessment will be carried out, which will identify all known terrestrial and maritime archaeological sites within the study area and also establish the archaeological potential for these areas. This will be carried out by a competent marine archaeologist and involve the collation of all known information on the seabed surface and subsurface stratigraphy to be affected by the dredging. This will make use of appropriate datasets and records including UKHO and NMR datasets, the local Historic Environment Record and the Fal Estuary Historic Audit.

In order to investigate the potential for impact on submerged prehistoric archaeology, it is proposed that a proportion of the vibrocores that are taken for the site investigation will be examined by an appropriately qualified archaeologist. This analysis will comprise

a description of the various horizons present and an indication as to the archaeological potential of the sub-surface deposits down to the proposed dredge depth.

As part of the desk-based assessment, the requirement for further archaeological investigations, such as geophysical surveys (side scan sonar etc), will be considered and recommendations made for any further stages of work.

11 RECREATION AND LEISURE

11.1 OVERVIEW OF THE EXISTING ENVIRONMENT

Falmouth is an historic maritime town. As such it is popular destination for tourists and attractions include Pendennis Castle and the recently completed National Maritime Museum Cornwall. The coastline around the Fal is also very scenic and popular for informal recreation such as walking along the South West Coast Path.

Tourism and leisure play an important role in the economy of Cornwall. Events are held to attract people to the town, such as the four day Oyster Festival held in October, and a three day festival of literature and arts which takes place in September. A number of hotels, restaurants and cafes are found in the town which rely heavily on the tourist trade.

Falmouth and the surrounding area is particularly popular for water-based recreation, such as sailing, diving and waterskiing. A number of marinas and yacht clubs are situated in the estuary and Falmouth Bay and Carrick Roads regularly host the internationally recognised sailing regattas. In 2004 a number of sailing club regattas were held including the Dragon gold cup regatta. The town's regatta week is held annually at the beginning of August and has become a major community event combining sailing with the town at large. The port is also visited by a number of historic tall ships.

Recreational diving is popular in Falmouth Bay and Carrick Roads. Popular diving areas include Pendennis Point and the East Narrows. Watersking also takes place in Carrick Roads. There is a marked waterski area on the eastern side of the channel.

There are several designated bathing waters in Falmouth Bay. They are situated outside the estuary at Gyllyngvase, Swanpool and Maen Porth.

Recreational angling for a number of species is extremely popular within the Fal Estuary. The relatively sheltered environment provides safe angling from a number of vantage points for shore and boat fishing. Many local angling clubs hold competitions within the Fal. Recreational angling has an important socio-economic value to Falmouth and the surrounding area for both visiting and resident anglers.

11.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on recreation is presented in Table 11.1.

Table 11.1 Potential impacts on recreation associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• Effects of construction on recreational users of the Fal Estuary through navigational conflict due to presence of dredging plant	• Increase in safety of recreational navigation by presence of wider and deeper channel • Effects on recreational navigation through possible siltation of channels • Possible effects on recreational navigation through changes to current speeds
Cruise terminal improvement works	• Conflict with recreational navigation due to presence of construction vessels	• No significant impacts envisaged
Reclamation using dredged arisings	• No significant impacts envisaged	• No significant impacts envisaged
Beneficial use of dredged material	• Conflict with recreational craft due to presence of dredger	• No significant impacts envisaged
Disposal at sea	• Conflict with recreational craft due to presence of dredger	• No significant impacts envisaged
Maintenance dredging (if required)	• No significant impacts envisaged	• No significant impacts envisaged

11.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

The potential impacts on recreational navigation by siltation of channels and increase in current speed will be investigated as part of the studies into the effects of the scheme on hydrodynamic and sedimentary regime (see ***Section 3***). The effects due to the presence of the dredging plant will be investigated by identifying the number and type of vessels that will be required during the works, the duration for which they will be required for and their location. This information will be used to determine the restriction, if any, that this would represent to recreational navigation.

12 NOISE AND VIBRATION

12.1 OVERVIEW OF THE EXISTING ENVIRONMENT

The Fal Estuary in general is rural and relatively sparsely populated. Ambient noise levels are likely to be low. Noise levels are likely to be mostly natural generated, such as wind and waves.

Noise levels around the Docks are likely to be higher than within Carrick Roads. The main source of noise is likely to be road traffic travelling along the main roads, such as Dracaena Avenue. Some noise is also likely to be generated by dock operations, such as loading and unloading of cargos and vessel engines. Complaints about noise levels are occasionally made by local residents to Carrick District Council about noise generated by the port. These tend to be from vessels operating their engines at unsociable hours. The most sensitive noise receptors are likely to be residential properties closest to the Docks area such as along the waterfront.

12.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on noise and vibration is presented in Table 12.1.

Table 12.1 Potential impacts on noise and vibration associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• Noise generation and disturbance during capital dredging	• Noise generated by shipping activity
Cruise terminal improvement works	• Noise generation during construction of new cruise terminal and wharf improvements	• Noise generation from traffic if the cruise terminal generates increased numbers of traffic
Reclamation using dredged arisings	• Noise generation during construction works and any treatment	• No significant impact envisaged
Beneficial use of dredged material	• No significant impact envisaged	• No significant impact envisaged
Disposal at sea	• No significant impact envisaged	• No significant impact envisaged
Maintenance dredging (if required)	• Noise generation and disturbance during capital dredging	• No significant impact envisaged

12.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

It is envisaged that noise and vibration impacts will be of relatively minor significance given the nature of the proposed construction works and the operational use of the channel. The greatest source of noise is likely to be piling during construction of the wharf improvements. Therefore, although the implications of the proposed scheme noise and vibration levels will be described and assessed and simple noise calculations

derived, it is not considered at this stage that detailed assessment work (e.g. modelling) will be required.

13 AIR QUALITY

13.1 OVERVIEW OF THE EXISTING ENVIRONMENT

Air quality in Cornwall is monitored through the Cornwall Air Quality Forum. Monitoring has been carried out so far in many of Cornwall's town and in other locations where air pollution might be a problem. A monitoring study has taken place in Falmouth, where a suite of five pollutants has been monitored at three sites to examine the relationship between traffic flows and monitored pollution levels. The study monitored the levels of the following pollutants:

- PM_{10} particulate matter of diameter <10 microns;
- Benzene;
- PAH polycyclic aromatic hydrocarbons;
- NOx nitrogen oxides; and
- CO carbon monoxides.

The study found that levels of pollutants were higher at the roadside sites than a background site, indicating that the levels of roadside pollutants were traffic related. Exceedences of the National Air Quality Strategy objectives occurred at Dracaena Avenue and Church Street for PM_{10}.

13.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on air quality is presented in Table 13.2.

Table 13.2 Potential impacts on air quality associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• Effect on air quality due to emissions from dredging plant	• Additional effect on air quality due to increased number of vessels using the Docks
Cruise terminal improvement works	• Effect on air quality due to emissions from plant required for construction of terminal building and improvement works	• Effects on air quality due to increased number of vehicles using the Docks
Reclamation using dredged arisings	• Effect on air quality due to emissions from plant required for construction reclamation and any treatment works required	• No significant impacts envisaged
Beneficial use of dredged material	• Effect on air quality due to emissions from dredging plant	• No significant impacts envisaged
Disposal at sea	• Effect on air quality due to emissions from dredging plant	• No significant impacts envisaged
Maintenance dredging (if required)	• Effect on air quality due to emissions from dredging plant	• No significant impacts envisaged

13.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

Although the potential impacts on air quality are highlighted in Table 13.2, it is envisaged that impacts will be of relatively minor significance given the nature of the proposed construction works and the operational use of the channel. Therefore, although the implications of the proposed scheme for local air quality will be described and assessed, it is not considered at this stage that detailed air quality assessment work (e.g. modelling) will be required.

14 GEOLOGY, LANDSCAPE AND VISUAL SETTING

14.1 OVERVIEW OF THE EXISTING ENVIRONMENT

14.1.1 Geology and Geomorphology

An overview of the geology and geomorphology of the Fal Estuary has been obtained from (Pirrie *et al*, 2004). No Regionally Important Geological Sites (RIGS) are found within 1km of the Docks (ERCCIS, 2004).

The geology around the Fal Estuary is dominated by Devonian metasedimentary rocks, the Carnmenellis Granite to the west and the St Austell Granite to the east. The shoreline around the estuary is made up of Devonian metasedimentary rocks assigned to the Portscatho Formation, the Mylor Slate Formation and the Porthleven Breccia Member (of the Mylor Slate Formation) (Leveridge *et al.,* 1990). Devonian metasediments of the Mylor Slate Formation form the rocky shoreline around much of the estuary

During the Devensian glaciation, sea level would have been much lower and the large scale valley systems such as the Fal would have extended considerably further away from our present-day shoreline. These valleys would have been partially infilled by head deposits. It is also likely that large scale river systems were present at this time. These river sediments reworked mineral veins exposed at the surface and the stable resistant tin mineral cassiterite was reworked and locally concentrated within these sediments forming placer deposits (Camm, 1999). These placer deposits formed the tin grounds which were then worked from the Bronze Age onwards. At the end of the Devensian glaciation, sea level rose and the coastal valleys were inundated by the sea. Evidence that the landscape would have been wooded at this time comes in part from the presence of submerged fossil forests and peat beds around the Cornish coastline, including at The Moor (Falmouth) and at Maenporth. Samples from Mounts Bay have been dated at 4278 ± 50 years before present (Leveridge et al., 1990). Over the Holocene period (the last 10,000 years) sea level initially rose quite rapidly at about 1 m per century (Healy, 1999), drowning the river valleys to form the estuary; in the latter part of the Holocene the rate of sea level rise decreased to about 0.1 m per century, such that the rate of sediment supply outpaced the rate of sea level rise so that the upper parts of the estuary started to infill with sediment creating an apparent sea level fall. This type of flooded valley system is referred to as a ria, which is defined as an 'inlet formed by partial submergence of unglaciated river valleys', synonymous with a 'drowned valley mouth usually with a branching dendritic or tree-like outline' (Bird, 2000).

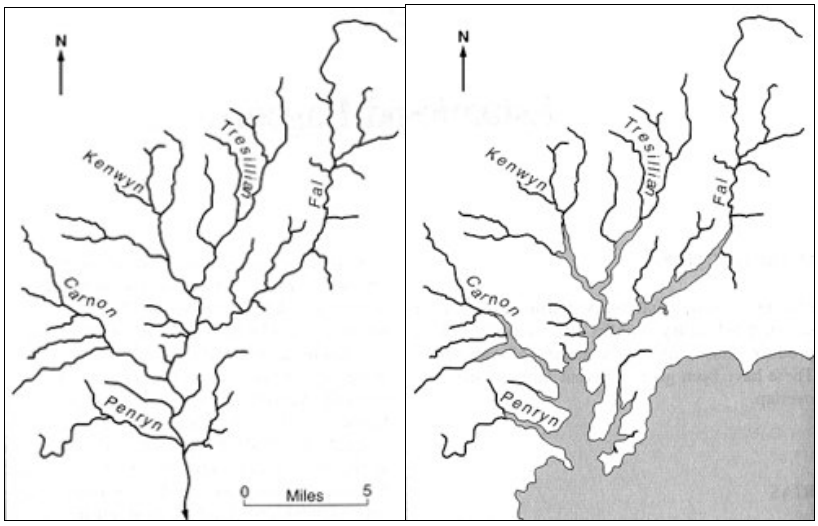


Figure 14.1 Diagram illustrating how the local geography of the Fal area has changed over the last 18,000 years. From Pirrie *et al.*, 2004.

The geomorphology of the landscape around the Fal Estuary is characterised by steep sided valleys separated by gently rounded interfluves. Most of the larger towns (Truro, Falmouth, Penryn) are on the western side of the estuary whilst the eastern side of the estuary is predominantly rural in nature.

14.1.2 Landscape

The majority of the Fal Estuary lies within the Cornwall Area of Outstanding Natural Beauty (AONB). This AONB consists of 12 separate stretches and covers 958 sq km. The AONB extends northwards from a line between St Anthonys Head and Trefusis Point. The Docks is therefore outside of the AONB but has the capacity to affect views from it.

The location of the proposed cruise terminal lies at the northern end of the Docks, which extends into the Inner Harbour. This area is visible from the waterfront area of Falmouth.

14.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on geology, landscape and visual setting is presented in Table 14.1. Due to the fact that all the dredging is below mean low water, there is limited potential for the dredge to impact on landscape and visual resources.

Table 14.1 Potential impacts on geology, landscape and visual setting associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• No significant impacts envisaged • Potential for effect on sites of geological interest, either directly or indirectly (i.e. through change in coastal processes)	• No significant impacts envisaged
Cruise terminal improvement works	• Effects on landscape and visual resources due to presence of construction plant	• Change in visual appearance of due to presence of cruise terminal building • Change in visual appearance of due to wharf improvement works
Reclamation using dredged arisings	• Effects on landscape and visual resources due to presence of construction plant •	• Change in visual appearance of port due to presence of new reclamation
Beneficial use of dredged material	• No significant impacts envisaged	• No significant impacts envisaged
Disposal at sea	• No significant impacts envisaged	• No significant impacts envisaged
Maintenance dredging (if required)	• No significant impacts envisaged	• No significant impacts envisaged

14.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

As part of the EIA it is proposed that a visual assessment be undertaken of the presence of new cruise terminal building and wharf improvements. This should comprise the following tasks:

- Description of existing landscape character;
- Description of existing visual resources; and
- Assessments of the effects of the proposed development on the above.

15 TRAFFIC AND TRANSPORTATION

15.1 OVERVIEW OF THE EXISTING ENVIRONMENT

15.1.1 Primary Routes

The position of Falmouth and the position of the Docks within the town mean that access is limited. Dracaena Avenue provides the main route between the Docks and the outskirts of town for other destinations such as Penryn, Truro and Helston. This busy road avoids the town centre but is flanked by residential and other properties. Improvements were made to Dracaena Avenue's junctions with Kimberley Park Road and North Parade Road in the late 1990s. A roundabout junction provides access to Penryn or access to another roundabout junction leading to the A39 to Truro and the A394 to Helston.

15.1.2 Traffic Counts

Traffic counts in 1998 identified an annual average daily traffic (ADDT) flow for the A39 on the outskirts of Falmouth to be 23,000 vehicles. Summer weekday traffic flows were 26,900 vehicles and annual average daily heavy commercial flows were 940 vehicles (Cornwall County Council, 1999).

15.1.3 Cruise Terminal Traffic

In 2005, Falmouth attracted 22 day calls bringing approximately 11,000 passengers to the town and West Cornwall. Day calls tend to be concentrated from April to September. Of the passengers coming ashore in 2005, approximately 50% (5,500 passengers) visited Falmouth by walking or shuttle bus, while the other 50% (5,500 passengers) visited other parts of West Cornwall by coach. Allowing for 45 passengers per coach, day calls generated in the region of 122 coach movements last year with up to 15 coach movements per call.

Falmouth was the homeport for 18 turnaround cruises during 2005. This enabled 17,700 passengers to embark and disembark for cruises. Turnarounds are made on a regular basis throughout the year. Turnaround passengers arrive and depart the existing cruise terminal by a combination of coach (50%; 8850 passengers), car (45%; 7,965 passengers), which are parked at the Docks during the cruise, and public transport (5%; 885 passengers). Assuming 45 passengers per coach and 2 passengers per car, the traffic generated by existing operations approximates to 197 coaches and 3,983 cars per annum.

15.2 IDENTIFICATION OF KEY ISSUES

15.2.1 Construction Traffic

It is anticipated that the majority of the construction traffic associated with the proposed improvements to the Docks, particularly large construction equipment, will arrive and depart Falmouth by sea. Some road traffic may be generated by construction workers and bringing other materials to the Docks.

15.2.2 Cruise Terminal Traffic

Cruise terminal traffic will increase in Falmouth in relation to the increased number of visiting day call passengers and turnaround passengers. The increased numbers of coaches and cars associated with the increased number of passengers could affect traffic on local road network, particularly the roads and junctions near the Docks and Dracaena Avenue.

With the dredging, improved berth and new cruise terminal in place the number of day calls is anticipated to increase to 39 per annum by 2015 bringing 55,000 passengers. The number of visitors per vessel may increase from around 1200 to a maximum of approximately 2600. The distribution of day visitors between Falmouth and other Cornish destinations is not expected to change significantly. The number of coach movements is predicted to increase from 122 per annum in 2005 to 655 per annum in 2015. Assuming an equal distribution of day calls and passenger numbers and concentrating all calls into the main part of the season (i.e. 25 weeks from April to September), there will be an average of two day calls per week. The number of coach movements per call may increase to a maximum of 29 for a vessel carrying 2600 passengers.

With the new cruise terminal in place, the number of turnaround operations is anticipated to increase to 33 per annum by 2015 with 50,000 passengers. Assuming the same combination of coach, car and public transport and passenger distributions, then traffic generated by future operations approximates to 555 coaches and 11,250 cars per annum.

15.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

15.3.1 Traffic Count Data

The County Council hold highways data for primary transport routes in and around Falmouth and this will be available for the purposes of EIA. There is no intention to undertake additional traffic counts for the EIA unless specific traffic or junction issues arise in Falmouth and the County Council advise that additional data is required to provide a robust impact assessment.

The predicted traffic increases due to construction traffic and busier cruise terminal operations will be compared to traffic count data. If a significant change is calculated, then consultation will the County Council will be undertaken to determine the need for further assessment or mitigation measures.

16 SOCIO-ECONOMICS

16.1 OVERVIEW OF THE EXISTING ENVIRONMENT

Falmouth Docks contributes directly to the economy of Falmouth through the employment of staff. 556 staff are directly employed by the FDEC Group, whilst an additional 364 staff are employed by other companies on the Docks estate. In turn, the presence of the Docks stimulates business in associated sectors in the Falmouth/Penryn area.

The use of the Docks by cruise vessels, contributes to the local economy through the money that cruise visitors and crew spend while in port. Current cruise visitor spending in Falmouth and West Cornwall has been calculated by FDEC using an average spend of £75 per head by passengers and £50 per head by crew (who are equal to 25% of the passenger numbers). Based on these figures, the benefit to the local economy in 2005 has been:

- Passengers: 28,700 x £75 = £2.15M;
- Crew: 7,175 x £50 = £0.36M; and,
- Total = £2.51M.

A study by Fisher Associates for the North West Regional Development Agency on a 'New Cruise Ground in the Irish Sea Area' used spend figures of £80 per passenger and £50 per crew (who are equal to 20% of the passenger numbers). Using Fisher Associates' figures the benefit to the local economy in 2003 would be:

- Passengers: 28,700 x £80 = £2.29M;
- Crew: 7,175 x £50 = £0.36M; and,
- Total £2.65M.

16.2 IDENTIFICATION OF KEY ISSUES

A summary of the potential impacts of the proposed scheme on socio-economics is presented in Table 16.1.

The provision of a deeper straightened channel and improved cruise terminal is predicted to increase the number of cruise visitors to Falmouth which is predicted to have a beneficial impact on the local economy.

Using data collated by A& P Ltd, In 2015, assuming 105,000 cruise visitors use the Docks, it would be:

- Passengers: 105,000 x £75 = £7.87M;
- Crew: 26,250 x £50 = £1.31M; and
- Total £9.18M.

Using Fisher Associates' estimates of cruise spending, the value spent by cruise visitors in 2012 it would be:

- Passengers: 105,000 x £80 = £8.4M;
- Crew: 26,250 x £50 = £1.31M; and
- Total £9.71M.

Other Economic Benefits

There is also the indirect benefit of the port fees paid to FDEC and FHC, spend by tourists who come to see the ships in port, the provision of services by other companies from outside the port, etc.

FDEC believe that the wharf improvements will facilitate two additional ship repair contracts per annum with a value of £1M. The contracts will increase FDEC's ship repair turnover from £28M to £29M per annum and help to protect jobs.

Table 16.1 Potential impacts on socio-economics associated with the proposed scheme

Scheme component	Potential impacts during the construction phase	Potential impacts during the operational phase
Capital Dredge	• Temporary employment created for dredging staff	• Potential beneficial impact in maintaining the existing business at the Docks and ensuring its role in the local and regional economy • Beneficial effect on tourism and related industries through increased revenue
Cruise terminal improvement works	• Temporary employment created for construction staff	
Reclamation using dredged arisings	• No significant impacts envisaged	• No significant impacts envisaged
Beneficial use of dredged material	• No significant impacts envisaged	• No significant impacts envisaged
Disposal at sea	• No significant impacts envisaged	• No significant impacts envisaged
Maintenance dredging (if required)	• No significant impacts envisaged	• Beneficial impact by maintaining depth of channel and therefore allowing vessels to continue to access the Docks

16.3 RECOMMENDATIONS FOR FURTHER WORK AND APPROACH TO EIA

The implications of the proposed scheme for the local socio-economic situation (e.g. future business at the Docks, local tourism, employment, etc) will be described and assessed in the ES. At this stage, it is not expected that further work, in terms of primary data collection or detailed economic assessment, will be a necessary part of the EIA.

17 PROPOSED SCOPE OF THE ENVIRONMENTAL IMPACT ASSESSMENT

17.1 EIA METHODOLOGY

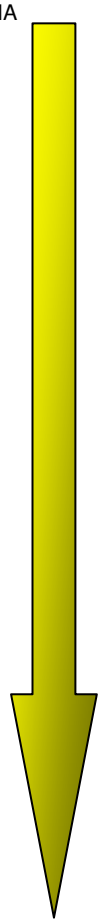
This environmental scoping report presents the findings of the first stage of the EIA process (the scoping study). An overview of the subsequent stages of the EIA is provided in Table 17.1 below.

17.1.1 In-combination assessment

Under Article 6(3) of the Habitats Directive, the effects of a plan or project on a European site must be considered in-combination with other plans or projects. This is because although in isolation the impacts associated with a particular project may not result in an adverse effect on the integrity of a European site, the impacts in-combination with those of other projects may have an adverse effect. Therefore, when carrying out such an appropriate assessment, it is necessary to consider the impacts from past, present and reasonably foreseeable future plans or projects on a particular environmental resource.

By definition, the impact of the scheme in-combination with existing projects will be included in the main-body of the EIA. This is because the presence of existing projects will be included in the baseline environment. It is therefore proposed to restrict the scope of the in-combination assessment to other schemes in the foreseeable future which are likely to have a significant impact on the SAC. Geographically, plans or projects will be limited to those within the SAC or which are outside but could affect the SAC.

Table 17.1 Overview of the EIA process

Stage	Task	Aim/objective	Work/output (examples)
Scoping study	Scoping	To identify the potentially significant direct and indirect impacts of the proposed Capital Dredge, beach nourishment schemes and offshore disposal of dredged material	Preliminary consultation with key consultees Targets for specialist studies (e.g. hydrodynamic studies, sediment quality)
EIA 	Consultation	Consult with statutory and non-statutory organisations and individuals with an interest in the area and the proposed scheme	Local knowledge and information
	Primary data collection	To characterise the existing environment	Background data including existing literature and specialist studies
	Specialist studies	To further investigate those environmental parameters which may be subject to potentially significant effects	Specialist reports (e.g. marine archaeology)
	Impact assessment	To evaluate the existing environment, in terms of sensitivity To evaluate and predict the impact (i.e. magnitude) on the existing environment To assess the significance of the predicted impacts	Series of significant adverse and beneficial impacts
	Mitigation measures	To identify appropriate and practicable mitigation measures and enhancement measures	The provision of solutions to minimise adverse impacts as far as possible Feedback into the design process, as applicable
	Environmental Statement	Production of the Environmental Statement in accordance with EIA guidance	Environmental Statement

17.2 Consultation

Consultation plays an important role in the EIA process. Without a comprehensive approach towards consultation it is not possible to effectively incorporate information and views which are important to a thorough consideration of the potential impacts of the proposed scheme.

Although some consultation has already been undertaken as part of the environmental scoping stage, consultation will be continued during the EIA process. The aim of this is mainly to inform all relevant consultees of the proposed scheme, to identify available information, and to identify consultee's issues and concerns. Selected consultation will also be undertaken to agree the scope of certain EIA investigations. Consultees will include at least the following:

- Carrick District Council;
- CEFAS;
- Cornwall County Council;
- Cornwall Sea Fisheries Committee.
- Cornwall Wildlife Trust;
- Countryside Agency;
- Crown Estate;
- Defra - Sea Fisheries Inspectorate;
- English Heritage;
- English Nature;
- Environment Agency;
- Falmouth Town Council
- General public (through press and adverts);
- Local fishermen's associations e.g. St Mawes and Falmouth Fishermen's Association and Oyster Dredgermens Association ;
- Local watersports clubs, e.g. Port of Falmouth Sailing Association;
- Sea angling associations; and
- South West Water;

17.3 OUTLINE STRUCTURE OF ENVIRONMENTAL STATEMENT

The Environmental Statement is a formal report that documents the findings of the EIA process. Broadly, the Environmental Statement is likely to take the form of:

- Project introduction, including a statement of need and a description of the EIA process, including details on screening, scoping, consultation and impact assessment;
- Detailed description of the proposed works, including the alternative options/locations considered, and the reasons for selecting the preferred option;
- Detailed description of the existing environment;
- Detailed description of the potential impacts and mitigation measures identified during the EIA process for each of the environmental issues under consideration. This part of the Environmental Statement will cover both the construction and operational phases of the scheme and both beneficial and adverse impacts;
- Description of the implications of the scheme on sites designated for nature conservation interests, in light of their conservation objectives;
- Description of effects on the project in-combination with other plans or projects within the SAC;
- Summary of findings, including a table showing the predicted impacts and the residual impacts remaining following mitigation;
- Proposals for monitoring;
- A list of references of information and publications cited in the Environmental Statement;
- Appendices, containing relevant survey information and reports that may be produced during the undertaking of the EIA; and,
- A non-technical summary.

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Appendix 1
Consultation Replies

Appendix 2
Vibrocore survey report