Item: 9

Development and Infrastructure Committee: 8 June 2021.

Proposed Scapa Deep Water Quay.

Report by Executive Director of Development and Infrastructure.

1. Purpose of Report

To consider a Stage 1 Capital Project Appraisal in respect of the proposal to provide a new pier and associated facilities in Scapa Flow.

2. Recommendations

The Committee is invited to note:

2.1.

That, in April 2020, the Council approved the Orkney Harbours Masterplan Phase 1 as a Strategic Plan for the Statutory Harbour Authority.

2.2.

That one of the proposals contained within the Orkney Harbours Masterplan Phase 1 is to construct a new pier and associated facilities within Scapa Flow.

2.3.

The Stage 1 Capital Project Appraisal in respect of the proposed Scapa Deep Water Quay, attached as Appendix 8 to this report.

2.4.

That, should the project progress through the Capital Project Appraisal process, resources of up to £2,628,675 are required to produce the Stage 2 Capital Project Appraisal, which could be met from the Miscellaneous Piers and Harbours Fund.

2.5.

Options for the proposed Scapa Flow Deep Water Quay, as outlined in section 4 of this report, with the preferred option being to progress to a detailed Stage 2 Capital Project Appraisal.

2.6.

That, on 25 May 2021, the Harbour Authority Sub-committee recommended to the Development and Instructure Committee that the Executive Director of Development and Infrastructure should submit a report, to the Policy and Resources Committee, regarding funding required to develop the Stage 2 Capital Project Appraisal in respect of the proposed Scapa Deep Water Quay.

It is recommended:

2.7.

That the Executive Director of Development and Infrastructure should submit a report, to the Policy and Resources Committee, regarding funding required to develop the Stage 2 Capital Project Appraisal in respect of the proposed Scapa Flow Deep Water Quay.

2.8.

That, subject to resources being secured, as an exception to the Capital Project Appraisal process, in order to ensure that progress with the proposed project is in line to meet the preferred developer announcement for the ScotWind offshore leasing round due in early 2022, the Executive Director of Development and Infrastructure should submit, to the Policy and Resources Committee, a Stage 2 Capital Project Appraisal in respect of the proposed Scapa Deep Water Quay.

3. Background

3.1.

On 17 March 2020, the Harbour Authority Sub-committee recommended that the Orkney Harbours Masterplan Phase 1 (OHMP1) be approved as a Strategic Plan. The Masterplan Phase 1 was subsequently approved by Council on 16 April 2020.

3.2.

One of the proposed projects contained within the OHMP1 is to provide a new pier and facility on the east side of Scapa Flow, called Scapa Deep Water Quay (SDWQ).

3.3.

Officers and consultants have worked on developing the proposal. Details regarding the proposed Scapa Deep Water Quay project are attached as the Appendices 1 to 7 to this report.

3.4.

Due to the large-scale nature of this proposed project, it is proposed to report to the Development and Infrastructure Committee, as well as the Harbour Authority Sub-committee, to enable enhanced scrutiny.

3.5.

On 25 May 2021, the Harbour Authority Sub-committee recommended to the Development and Instructure Committee that the Executive Director of Development and Infrastructure should submit a report, to the Policy and Resources Committee, regarding funding required to develop the Stage 2 Capital Project Appraisal in respect of the proposed Scapa Deep Water Quay.

4. Options Appraisal

The following options are available:

4.1.

Option 1 - do nothing.

4.1.1.

There are no pier and associated facilities in Scapa Flow capable of handling large vessels alongside and quay area with sufficient space to be able to load/unload goods, equipment etc. These types of facilities are rare in the north of Scotland especially within a well-known and proven sheltered anchorage such as Scapa Flow. Doing nothing would allow marine business to be missed/lost and thereby affecting the sustainability of Orkney Harbours and the Orkney economy well into the future.

4.2.

Option 2 – construct a new pier and associated facilities in Scapa Flow.

4.2.1.

During summer/late autumn/early winter 2020, as a result of detailed conversations and meetings with developers proposing to submit applications for the ScotWind offshore leasing round being undertaken by Crown Estate Scotland, it became very apparent that the original plans for Scapa Deep Water Quay would not be suitable for offshore wind developers.

4.2.2.

After due consideration, in particular to the amount of land area and quay length being suggested by some of the developers, together with the results of initial studies described below in section 4.2.4, and on advice from the engineering consultants, the location of Scapa Deep Water Quay was moved south of Deepdale Burn. This would allow the original method of construction to be used, ie no major rethink on construction methods; the depth of water to be relevant to the use, ie not all of the proposed quay would be at -20m chart datum – the majority would be at -15m chart datum, yet keeping and using all the data collected thus far without having to redo any of the previous investigation or works.

4.2.3.

The details contained in Appendices 1 to 7 to this report provide the engineering, environmental and economic results of in-depth studies carried out over the last year.

4.2.4.

Studies indicate that it should be possible to build a new pier and associated facilities at the revised location on the east side of Scapa Flow.

- Environmental studies need to continue – at present there are no known serious problems, in order to provide sufficient data and information as part of applications

to Marine Scotland and the Council, in the event that this proposed project proceeds planning permission, marine licencing and eventual construction. This is not, as such, part of the Capital Project Appraisal process but as it requires a long-term data gathering exercise, it is mentioned in this report.

- There is a good economic case in providing a new pier facility and associated quay area.
- There are, in addition to the base details provided in Appendix 1a, a whole set of detailed technical drawings which further back-up the engineering feasibility study contained within Appendix 2. The proposed construction is for a cut and fill operation in conjunction with a sheet piled structure to form the new pier and land/quay area.

4.2.5.

The construction of the proposed pier and associated facilities at Scapa Flow would be virtually self-sustaining in that apart from some large rock armour stone, which is not available in Orkney, there would be no need to import any fill material to site. All unused material from the cut and fill method of construction would be kept on site and used as a bund.

4.2.6.

The details and layout of the proposed pier and associated facilities at Scapa Flow have been generated with close co-operation of many different industry leaders and companies in order that it will be able to fulfil multiple types of use, including (but not limited to) the construction/assembly of offshore wind turbines and the provision of a Future Fuels Hub (Islands Deal project).

4.2.7.

An integral part of the exemplar design process has been regular contact with the many developers who are proposing to apply for leases for the ScotWind areas as presently being advertised by Crown Estate Scotland. This has led to the design and other characteristics of the proposed Scapa Deep Water Quay being in line with the vast majority of their suggested requirements. This has resulted in excess of 10 Memorandums of Understanding (MoU) and Non-Disclosure Agreements (NDA) being signed by the Council with regard to future possible use of the proposed Scapa Deep Water Quay. These MoU/NDA include the majority of the large offshore wind turbine developers presently operating around the UK and Europe and are backed by large financial institutions. Feedback from these companies is very positive in respect of the proposed project itself and the way in which the project is being approached, ie collaborative and working together.

4.3.

The estimated cost of carrying out further studies, investigations and preparing all the necessary documentation for a Stage 2 Capital Project Appraisal is £2,628,675, as indicated in Appendix 7 to this report.

4.4.

Due to the positive overall economic effect, confirmation that the pier and associated facilities should be able to be built and the need to continue with environmental studies, it is proposed that option 2 is the only viable proposal.

5. Links to Council Plan

5.1.

The proposals in this report support and contribute to improved outcomes for communities as outlined in the Council Plan strategic priority of Enterprising Communities.

5.2.

The Orkney Harbours Masterplan Phase 1 relates directly to priority 4.4 – development of Scapa Flow and other Orkney Harbours for oil and gas activity and continue to diversify and grow all marine business activity, and to stimulate marine and non-marine employment.

6. Links to Local Outcomes Improvement Plan

The proposals in this report support and contribute to improved outcomes for communities as outlined in the Local Outcomes Improvement Plan priority of A Vibrant Economy.

7. Financial Implications

7.1.

The cost of developing the detailed Stage 2 Capital Project Appraisal has been quantified at a total cost of £2,628,675, to be incurred across financial years 2021/22 and 2022/23, comprising £1,325,000 for site investigation works in 2021/22, with the remaining split 50% between each of the two years, as indicated in the Appendices to this report. It is proposed that this is funded from Miscellaneous Piers and Harbours Account revenue budget utilising prior year accumulated reserves.

7.2.

As an exception to the Capital Project Appraisal process and in order to ensure that this proposed project remains in line with the expected announcement of preferred developers for the ScotWind off-shore leasing round due in early 2022, consideration should now be given to submitting a Stage 2 Capital Project Appraisal to the Policy and Resources Committee.

7.3.

With a deficit budget of £404,800 approved for financial year 2021/22, reflecting the uncertainty that still exists around the impact of COVID-19 on the Miscellaneous Piers and Harbours Account in the year ahead, there is currently no capacity within the existing revenue budget to absorb this spending pressure.

7.4.

On the basis that the Miscellaneous Piers and Harbours Account carried an accumulated surplus balance position of £6,889,891 as at 31 March 2020, there is, however, scope to utilise prior year balances for this purpose. It is also notable that while the approved budget for financial year 2020/21 was set to generate a surplus of £1,879,100 on the Miscellaneous Piers and Harbours trading account, the impact of COVID-19 has resulted in a significant shortfall in harbour dues income being realised for last financial year. In advance of the outturn position being finalised for financial year 2020/21, based on the Period 9 budget monitoring position which reported a shortfall of £3,047,300, a deficit of £1,168,200 is being forecast for the financial year end position. Taken together, this means that an accumulated balance position of approximately £5,316,891 is forecast as at 31 March 2021.

7.5.

In addition to the £2,628,675 required to develop the Scapa Deep Water Quay project to the detailed Stage 2 Capital Project Appraisal level over financial years 2021/22 and 2022/23, a further £1,553,838 is also being sought in respect of a sister project at the Hatston Pier. This can be summarised as follows:

	2021/22	2022/23	Total
Scapa Deep Water Quay	£1,976,838	£651,837	£2,628,675
Hatston Pier	£1,151,919	£401,919	£1,553,838
Total	£3,128,757	£1,053,756	£4,182,513

7.5.1.

It should be noted that these figures do not allow for the number of other Harbours related projects that are already in the Capital Project Appraisal pipeline and will require additional resources to be made available if they are to proceed.

7.6.

While uncertainty still exists around the actual level of harbour dues income that will be generated over the year ahead, overall, this still indicates that scope exists to use these reserves to fund this spending, albeit the margins for risk will be significantly eroded. Beyond this, the underlying assumption remains that the Miscellaneous Piers and Harbours Account will return to a surplus trading position in financial year 2022/23 with a normal level of activity and associated harbour dues, but given the scale of these proposals, this does mean that the trading accounts ability to weather any storms in the years ahead and contribute financially to these or any other developments will be severely restricted.

7.7.

Any recommendation to vary the current approved revenue budget for the Miscellaneous Piers and Harbours Account in financial year 2021/22 in respect of this projects will be as a spending recommendation to the Policy and Resources Committee.

8. Legal Aspects

There are no legal implications arising directly from the recommendations in this report.

9. Contact Officers

Gavin Barr, Executive Director of Development and Infrastructure, email gavin.barr@orkney.gov.uk

James Buck, Head of Marine Services and Transportation and Harbour Master, email james.buck@orkney.gov.uk

David Sawkins, Deputy Harbour Master: Strategy and Support, email david.sawkins@orkney.gov.uk

10. Appendices

Appendix 1: Scapa Deep Water Quay Client Design Brief.

Appendix 1a: Orkney Harbours Masterplan Phase 1 – Scapa Deep Water Quay revised location.

Appendix 2: Scapa Deep Water Quay Feasibility Study.

Appendix 3: Scapa Deep Water Quay High Level Costs and Phasing.

Appendix 4: Wintering Bird Survey Interim Report.

Appendix 5: Orkney Harbours Masterplan Phase 1 Economic Review.

Appendix 6: Tasks Completed and Milestones for Scapa Deep Water Quay.

Appendix 7: Stage 1 Capital Project Appraisal – Stage 2 Capital Project Appraisal Estimated Costs for Scapa Deep Water Quay.

Appendix 8: Stage 1 Capital Project Appraisal – Scapa Deep Water Quay.

Scapa Deep Water Quay

Client Design Brief Report

Stewart Building
Esplanade, Lerwick
Shetland, ZE1 0SE
Tel: 01595 695512
www.arch-henderson.co.uk
lerwick@arch-henderson.co.uk

Orkney Islands Council
Marine Services, Scapa
Orkney, KW15 1SD
Tel: 01856 873636
www.orkneyharbours.com
harbours@orkney.gov.uk

Document Information

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Client Representative	David Sawkins
Project Manager	Shane Jamieson
Project Partner	Andrew Sandison

Document Controls and Verification

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02/04 /2021	Rev 3	Adjustments Made to Text	SSJ	APS	
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Table of Contents

1.0 Introduction

1.1 Overview

Following the adoption of the Orkney Islands Council Harbour Authorities (OICHA) Harbours Masterplan, Scapa Deep Water Quay (SDWQ) has been identified as a development in which OICHA wish to be progressed. The Scapa Deep Water Quay development is for the design and construction of a new harbour facility south of Burn of Deepdale, Scapa Flow, Orkney (58.922808, -2.9538907) with a minimum of 300+m quay berthing length to a final dredge depth of -15mCD and -20mCD. Figure 1.1 identifies the proposed location. A site location to the north of the Deepdale was discounted after assessment of access constraints and poor suitability of existing topography relative to minimum laydown extent now required.

Figure 1.1 – Scapa Deep Water Pier Location

The aim of this document is to provide the baseline agreement of the design information to be considered for the SDWQ development to allow for the design to be progressed through the feasibility stage and beyond. The feasibility stage design based on the agreed client requirements in this document shall also allow for an order of magnitude of cost for the whole project (and individual elements) to be updated from the OICHA Masterplan. Optimism Bias (OB's) are to be considered Economic Assessment which is supplementary to this report.

The constraints and requirements to be considered during design and obtaining of consents shall also be outlined as well as an updated anticipated programme to completion.

This is a live document that will be updated as the design brief develops in conjunction with the client and stakeholders. This document may be updated following the conclusion of the feasibility design to inform further design development.

1.2 Design Development

From the adoption of the OIC Harbour Masterplan Phase 1, the overall concept and business case for the final end-user design requirements has altered from that intended at master planning stage. The changes to be considered in the feasibility study and design therein that were not accounted for at Masterplan stage have been driven by potential industry and end-user requirements of the Harbour Authority. Explanation of design development is described throughout this document. The main design requirements and developments to be considered at this stage but not at master planning stage are listed below;

1. Change in overall potential end-users / industries.
2. Land / Storage area requirements of potential users.
3. Vessel types.
4. Requirements of load-in and load-out operations and the proximity of operations to the quay and land / storage areas.

2.0 SDWQ Outline Client Design Requirements

2.1 Design Vessels

The design vessels to be used for the feasibility study design and costing of the SDWQ have been set out in the table below;

Vessel Type (Name)	LOA(m)	Beam (m)	Draft (m)	Notes on Berthing
OICHA Tugs Odin/ Thor of Scapa	32m	13.2m	6m	80m of berth for 3Nr. tugs. Tugs can berth alongside each other. Tugs/ pilot boats can use same quayside area.
OICHA Pilot Boats Scapa Pathfinder/ John Rae	21m	6m	1.9m	30m of berth for 2Nr. Pilot Boats. Pilot boats can berth alongside each other. Tugs/ pilot boats can use same quayside area.
Semi-Submersible Platforms	75m	75m	15m to 20m	Require 150m of berth length
Offshore Wind MV Les Alizes	240m	52m	9 to 10m	
Offshore Wind MV Voltaire	180m	60m	9 to 10m	
Future Fuels Bunker Vessel	150m			

Table 1. Design Vessels

2.2 Tidal, Current, Wind and Wave Data

2.2.1 Tidal Data

The following tidal information has been derived from Admiralty Charts and has been utilised within the feasibility study design works. The worst case tidal data has been used as it is understood there is a tidal gradient between Saint Mary's and Stromness.

All levels have been given to Chart Datum. At the Scapa Flow site, Chart Datum is 1.65m below Ordnance Datum at Saint Mary's, Orkney.

Tidal Data	Metres Chart Datum (mCD)
Cope Level	+7.0 mCD
Mean High Water Springs (MHWS)	+3.6 mCD
Mean Low Water Springs (MLWS)	+0.7 mCD
Ordnance Datum (Newlyn)	+1.69 mCD

Table 2. Tidal Data

2.2.2 Current Data

Current Data shall be confirmed by OICHA, as required. Wave buoys are being considered at present.

2.2.3 Wind Data

Wind data is available from OICHA and shall be utilised at the relevant phases for the design.

2.2.4 Wave Data

A wave height study for the Bay of Deepdale, Scapa Flow was conducted by Orkney Islands Council Marine Services. The study highlights the waves are wind generated and therefore are dependent on fetch. Wave Height values were calculated as 1.06m (17.8km fetch from the West) and 1.44m (33.1km fetch from a restricted SSE direction). The report dated 7th December 2020 is appended.

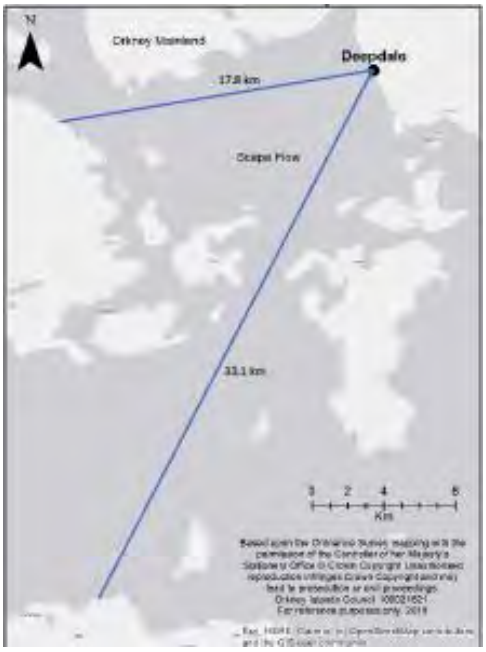


Figure 2.1 Sketch of fetch lines within OIC Report.

It is intended that an in depth wave study shall be conducted prior to the commencement of construction. The form of construction of SDWP shall be required to be known prior to study being commissioned.

2.3 Water and Dredge Depths

The minimum quayside dredge depth requested by OICHA was -20mCD. Following the design development undertaken post master planning and prior to the feasibility study design this has been refined to -15mCD along the quayside in phases 1 and 2 with a -20mCD design dredge allocated to phase 3 of the works. Please refer to AH sketch AH-SK09112020-03 (South Alternative) Phase 3 for further information.

2.4 Quay/Berth Geometry

The geometry and the layout of the quay at SDWP have been further developed from end-user input and further interest in the development from the industry following the publication of the OICHA masterplan document. The general principle of utilising site-won fill material to advance land reclamation and act as infill material for the quay development has not altered, but the layout, proposed location and size has transformed. Also refer to Section 1.2 on Design Development.

2.4.1 Masterplan Location and Layout

The original masterplan location of the SDWP development was to the North of the Burn of Deepdale. This location was primarily selected as it appeared to offer substantial rock material for reclamation due to the slope gradients in the location and access to the -20mCD seabed contour was in close proximity to the shoreline.

The original masterplan layout was to use site-won material from Gaitnip Hill to reclaim land at the inshore area amounting to a minimum of 5 hectares and develop a quay 300m long quay on the -20mCD contour with a 75m wide approach-way to the main quay area from the inshore reclaimed land area. An AH drawing which forms part of the final masterplan is inserted below for information purposes.

Following trial pit investigation post masterplan approval of the north and south site areas around the Burn of Deepdale it was the found that the South site was more advantageous in the progression of the SDWP development and therefore was agreed and selected as the preferred location. The site location to the north was discounted after assessment of access constraints and poor suitability of existing topography relative to minimum laydown extent now required. The feasibility study location and layout therein focuses solely on the south site area.

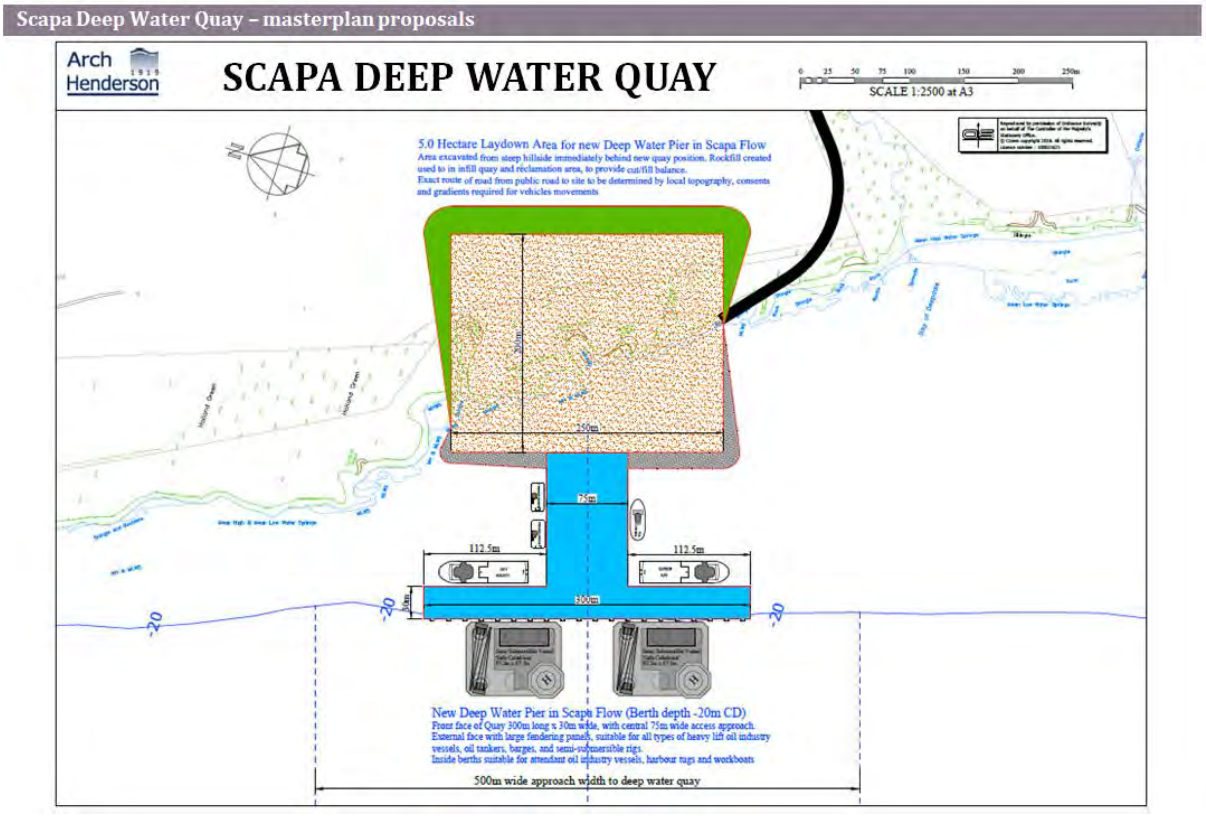


Figure 2.2 Masterplan Scapa Deep Water Pier Layout. Source: OIC Harbours Masterplan Ph. 1 2020.

2.4.2 Feasibility Study Location and Layout

In the interim period between completion of the masterplan and commencement of the feasibility study and exemplar design works the location of the site has been moved to the south side of the Burn of Deepdale. This change has been unanimously agreed.

Also in the interim period the end-user requirements have changed which has led to significant alteration to the quay layout and quantity of reclamation, increasing from a minimum of 5 hectares to a minimum of 8.4 hectares required. For information on the overall layout changes, please refer to AH Sketch named sketch AH-SK09112020-03 (South Alternative) Phase 3 appended.

<u>The above described location and layout described in this sub-section has been used for the basis of the feasibility study and exemplar design.</u>

2.4.3 Proposed Quay Deck Level

The proposed quay deck level for the Scapa Deep Water Development is +7.0mCD. The proposed +7.0mCD deck level is set for the main quay faces only to facilitate the larger vessels proposed to utilise SDWP.

It is the intention of OICHA to utilise an inner or sheltered shallower quay area to act as permanent berths for harbour tugs and pilot boats. To facilitate these vessels and negate vertical ladders, steps are to be built into the construction in this agreed area.

2.5 Navigation Risk Assessment

Navigational risk assessments do exist for the channel approaches into Scapa Flow and within. It is likely a further navigational risk assessment shall be conducted for the new SDWQ relative to the new and varying types of vessel that could be attracted to the facility.

2.6 Quay Deck Loading

2.6.1 General Loading

The quay is to design to withstand a UDL of 25T/m^2 up to 30m from the quay edge. Laydown areas are to be designed to withstand 10T/m^2.

2.6.2 Cranage / Specialist Loading Requirements

In discussion with industry, cranes such as the Mammoet SK350 ring crane has been identified as a possible cranage for lifting operations at the new SDWP facility to allow for loading and unloading of offshore wind construction components.

From information received, ground bearing pressures can be circa. 30T/m^2. See table below.

MAMMOET SK350		
POSITION	Worst Case Jacket Lift	TYP. Lift Jacket
Units	METRIC	METRIC
Main Mast	124.6m	124.6m
Jib	37.7m	37.7m
Jib Angle	10.0°	10.0°
Ballast to Mast Foot	49.2m	49.2m
Ballast	4000t	4000t
Outreach	40.0m	40.0m
Capacity	3000.0t	3000.0t
Lift Block	120t	120t
Rigging	80t	80t
Load	2667t	2500t
5% D.A.F.	133t	125t
Total Lift Weight	3000t	2825t
Utilisation	100%	94.2%
Average GBP Beneath Mast Foot (Lifting)	30.1t/m²	28.8t/m²
Average GBP Beneath Mast Foot (Not-Lifting)	8.8t/m²	8.8t/m²
Average GBP Beneath Ballast (Not-Lifting)	21.7t/m²	21.7t/m²

Figure 2.3 Mammoet SK350 Crane Details. Source: Mammoet.

Specialist loading or cranage identified shall be incorporated into the design as required.

2.7 Bollards

Bollards are to be a minimum of 100T. OICHA may require bollards ranging from 60T to 200T in areas to be identified.

2.8 Fenders

The vessel types scoped above to utilise SDWP are similar or specific to certain areas of the development. It is likely that differing vessel types from differing areas of sea-going industry shall utilise the facility over its lifespan. Given the significant capital cost associated with

fixed fender units and the requirement to understand the likely vessel type to utilise the facility this has been ruled out of the design at this stage. This may be re-visited should a single user with specific vessel type(s) be identified by OICHA.

It has been agreed for the feasibility design, reporting and costing purposes, that tyre fendering shall be used across the quay facility, with the adoption of a removable pneumatic 'Yokohama' fendering system for larger vessels with differing fender requirements and arrangements.

2.9 Quayside Services & Drainage

2.9.1 Power

The power to be provided to site shall be required to facilitate the power requirements for 2Nr. shore power connections (minimum), lighting towers, warehousing (and offices) and general use.

The new power line is to be buried from tie-in location to existing network.

2.9.2 Lighting

Lighting towers are to be used and are required to be safely clear of all quayside crane operations.

2.9.3 Water

100mm Water main and water storage tanks (4Nr. 250 cubic metre storage). There will be a requirement to pump fresh water to the quay edge from tanks.

2.9.4 Foul Water (Septic Tank)

Klargester with sea outfall or sewage station and pumping main to local sewage system.

2.9.5 Surface Water

Perimeter cut-off drains are to be allowed for in conjunction with standard SUDS systems for compliance with water management directives. Sea outfall location has been preliminarily identified on drawing number AH Sketch AH-SK09112020-03 (South Alternative) Phase 3.

2.9.6 Surfacing and Water Collection

Concrete surfacing with quayside surface water drainage is required

In the rear yard area, hard-core surfacing and drainage is to be considered.

2.9.7 Gas Oil

OICHA have confirmed no requirement for gas-oil provision.

2.9.8 Other Client Service (Future Fuels)

An area may be identified on the drawings for potential Future Fuels Hub (FFH).

2.9.9 Local Service Network Information

Local network provisions for Scottish Water (SW), British Telecom (BT) and Scottish and Southern Energy (SSE) for this area of Orkney are appended to this document. All services

are located in the vicinity of the existing main carriageway, A961. Services shall be required to be provided to the site.

2.10 Design Life

2.10.1 Quay Design Life

The design life of all quay structures is to be a minimum of 50 years.

2.10.2 Corrosion Allowance (Piling)

Additional corrosion protection systems may be considered, however it shall require a minimum of 20 years' design life until first maintenance.

2.11 Quay Laydown and Yard Areas

The following areas have been identified as potential reclaimed land yard areas for potential end-users of the SDWP development;

- Offshore Wind (Construction): Minimum requirements of laydown and yard areas for offshore wind are 10 hectares, exclusive of quay areas.
- Warehousing and Offices: Minimum area requirements are 2 hectares for 3Nr. warehouse units.

3.0 Design

3.1 Design Standards

All designs within the feasibility study and exemplar detailing are to be carried out to the latest applicable Eurocodes, associated National Annexes and relevant British Standards.

The design standards are to be maintained throughout the whole design process with any new codes and standards released in this design period to be considered by both the Client and Designer.

4.0 Consents

4.1 Environmental Consents

At the time of writing, EnviroCentre Ltd is currently completing an environmental screening and scoping document for SDWP.

As a minimum it is anticipated that the following consent shall be required:

- Marine Scotland
- Crown Estates
- OIC Works Licence
- SEPA Discharge Consents

No HRO is required under Orkney County Council Act (1974), Section 7. Orkney County Council Act 1974: section 7 of this Act provides that "*The Council may construct, place, maintain and operate in and over a harbour area such works as are required for or in connection with the exercise by them of any of their functions under this Act an may alter, renew or extend any works so constructed or placed.*"

4.2 Planning Permission

Planning Permission shall be required for the overall works.

5.0 Programme Requirements

5.1 Overall Project Programme

5.1.1 High Level Programme

No detailed programme was developed within the Masterplan. As part of the feasibility study it is anticipated that a programme shall be developed.

Orkney Islands Council Harbour Authority's main programme requirement is that as a minimum Phase 1 & 2 of the development is operational in 2026. A draft of OICHA implementation plan for SDWP is included below, Figure 5.1.

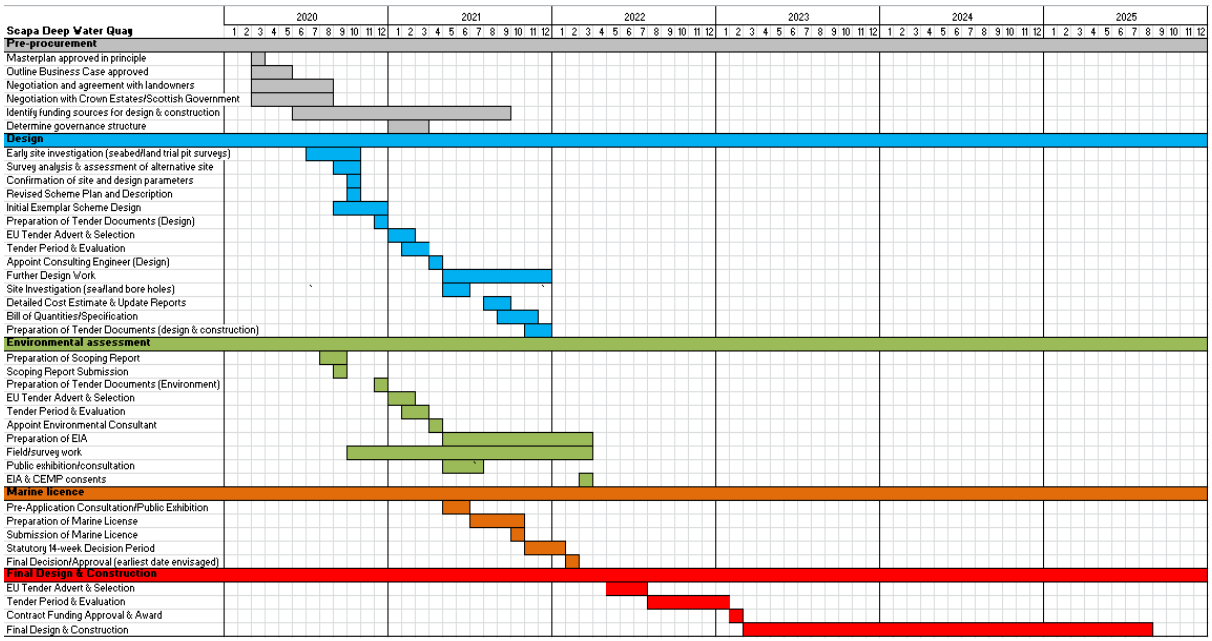


Figure 5.1 OICHA SDWP Implementation Plan

5.1.2 Phasing

Due to the scale and nature of the works it is anticipated that the works shall be carried out in phases. The outline phasing of the works has been set out in Arch Henderson sketches AH-SK09112020-01 (South Alternative) Phase 1, AH-SK09112020-02 (South Alternative) Phase 2 and AH-SK09112020-03 (South Alternative) Phase 3, and surmised in short below.

Phase 0 (Enabling Works)

Prior to the first stage of the main SDWP project commencing, works to create an access road and installation of site services is required to be carried out. This may also include or exclude the proposed realignment of the main A961 which shall directly influence the proposed junction to the SDWP site.

At this stage it is proposed this shall go out as a separate contract from the OIC to the main SDWP works.

Phase 1

Phase 1 is to include the following;

- Creation of cut and fill reclamation from the existing foreshore. From existing land to be cut and the reclaimed area, an initial 12 hectare laydown area is to be created. Rock armour will be required to protect the reclaimed area.
- Creation of 450m of berthing. The main quay face is to be 300m long.
- ***A dredge campaign to create a -15mCD dredge pocket along the 300m main quay face.

Phase 2

Phase 2 is to include the following;

- Creation of a further 6 hectares of laydown area by undertaking a further cut and fill exercise to the South of Phase 1.
- Extension of the main face with a further 275m of main face berthing.
- ***Further dredging to maintain a -15mCD berthing pocket on extension.

It is the anticipation of OICHA that phases 1 and 2 shall run back-to-back despite being broken down in this requirement document. It is anticipated both shall be constructed and operation by 2026.

Phase 3

Phase 3 is to include the following;

- 110m x 75m quay extension at the North end of the main quay face.
- ***Dredging to the North side to undertaken to ensure a -20mCD dredge pocket on 3 side of the structure.

***Dredging has been outlined above in line with the specified phases; however dredging may be undertaken at any point throughout the above phases. Consideration to the timing of the dredging and size of the dredge campaign shall be dependent on a number of factors, in particular the end-user vessel requirements, and if the dredged material is required for use in land reclamation and quay infill

Throughout all phases an unsuitable material bund shall be created around the perimeter of the laydown area. This shall also facilitate an access road around the laydown yard area.

6.0 SDWP Project Budget

6.1 Masterplan Budget

6.1.1 Overall Budget

The project presented in the Masterplan is now likely to be superseded given the current design changes detailed in this document, specifically Section 1.2 and Section 2.4.

The Masterplan cost plan has been presented below in figure 6.1. It is likely given the design development and vast changes to the proposed scheme to be taken forward at Feasibility Study level that the project budget shall alter in line with the changes and requirements. This shall be presented in the output feasibility study.

Masterplan proposals at Scapa Deep Water quay – high level cost estimate (£m)

Project component	Cost[1]	Contingency[2]	Fees[3]	Total (£m)
Deep water facility in Scapa Flow (250m quayside and -20m CD water depth, 75m wide approach quay and 5+ hectares of land reclamation	**65.660**	**4.050**	**6.566**	**76.276**

- 1.Costs, as developed by Arch Henderson, are based on actual costs incurred on similar projects elsewhere. They are high level estimates and assume that each project is stand alone – should projects be grouped together then there may be savings through shared mobilisation and general item costs. Where a proposal is unlikely to be delivered by the Harbour Authority no cost estimate has been provided.
- 2. Contingency is assumed to be 10% construction risk and does not included Optimism Bias, which will still need to be assessed based on procurement routes finally chosen coupled with client knowledge of potential development constraints.
- 3. Consultant fees associated with design, feasibility and construction; excludes costs relating to HRO, legal aspects, EIA and VAT.

Figure 6.1 Scapa Deep Water Pier HLCE. Source: OIC Harbours Masterplan 2020.

6.1.2 Optimism Bias

The above project cost does not account for capital cost optimism bias (OB), see figure 6.2. Within the Masterplan the OB for SDWP was set by the Engineering Consultants as 70%. The feasibility study, despite the sizable changes to the layout and design requirements shall aim to reduce the optimism bias.

Summary results by proposal

There are considerable uncertainties regarding the capital costs, particularly for Scapa Deep Water Quay. As the projects progress and more information from surveys and design work becomes available, these risks will be reduced as costs are refined. We have included Optimism Bias on the capital costs as shown below. **Even allowing for substantial escalation in capital costs, the proposals still return a positive economic NPV overall as summarised below.**

Proposal (£000s)	Capital cost Base case	Optimism Bias	Capital cost (with Optimism Bias)	ENPV Base case	ENPV (with Optimism Bias)
Kirkwall Pier	34,118	30%	39,927	£12.0m	£6.7m
Hatston	45,092	30%	52,828	£68.0m	£61.1m
Scapa Pier	12,988	30%	15,187	-£13.6m	-£15.7m
Scapa Deep Water Quay	76,276	70%	115,673	£37.9m	£3.3m
All projects	168,474		223,615	£106.9m	£58.1m

The following page presents further details on the substantial positive impacts on GVA and employment.

Figure 6.2 Scapa Deep Water Pier HLCE with OBs. Source: OIC Harbours Masterplan 2020.

7.0 Feasibility Study Deliverables

The Feasibility Study is the next phase of the project development to be undertaken in conjunction with the Outline Business Case (OBC). The feasibility study shall be presented in report form. The report shall be supplemented with an exemplar design basis statement and exemplar design drawings. This document shall also sit in partnership with the feasibility study.

The key deliverables of the feasibility study are as follows;

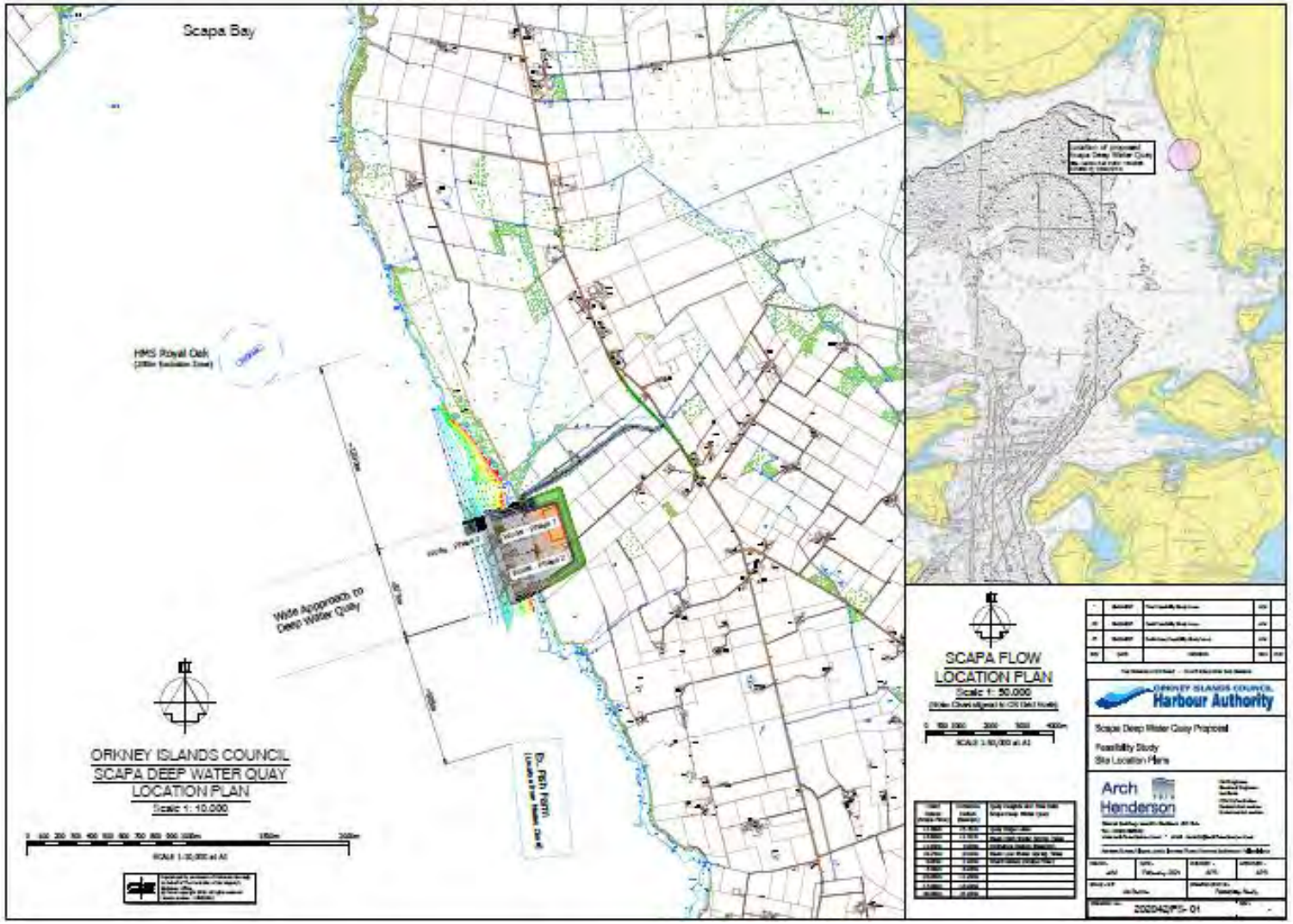
1. Provide an overall commentary on the Scapa Deep Water Quay development for the consideration of OIC and OICHA.
2. Provide detail in the form of construction of the SDWQ development by undertaking exemplar design using the information available.
3. Provide an exemplar design.
4. Provide exemplar design drawings for the development.
5. Provide detail on overall project budget, in line with Economic Assessment.
6. Provide an outline programme for procurement and the preferred procurement route.
7. All feasibility study details required for the Economic Assessment to be supplied as required.
8. Based on the findings and outcomes of the feasibility study, provide recommendations on the potential project procurement routes and Contract Forms for construction.

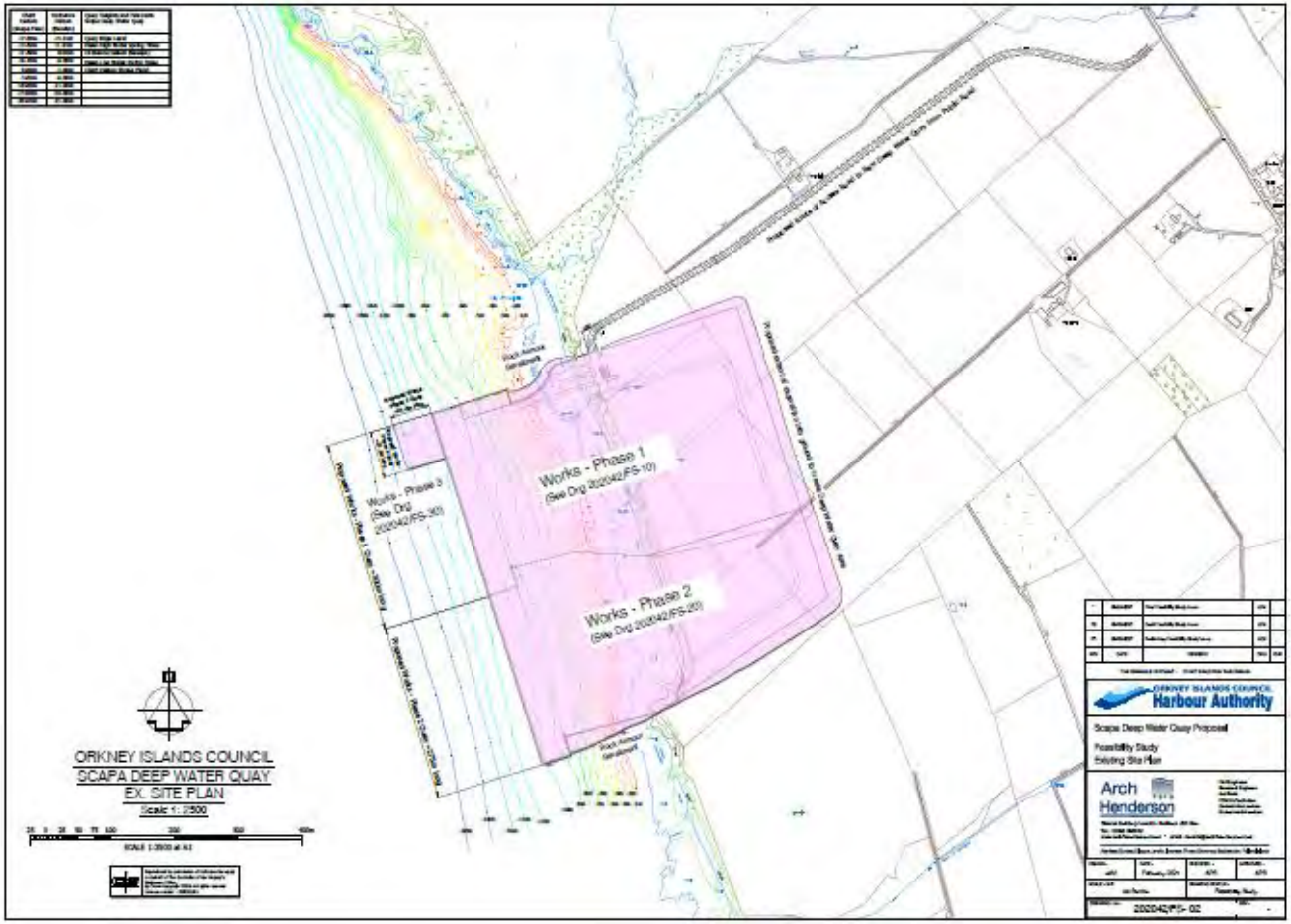
8.0 Appendices

Appendices:

- OIC Wave Study (Scapa)

Appendix 1a – Scapa Deep Water Quay – location drawings

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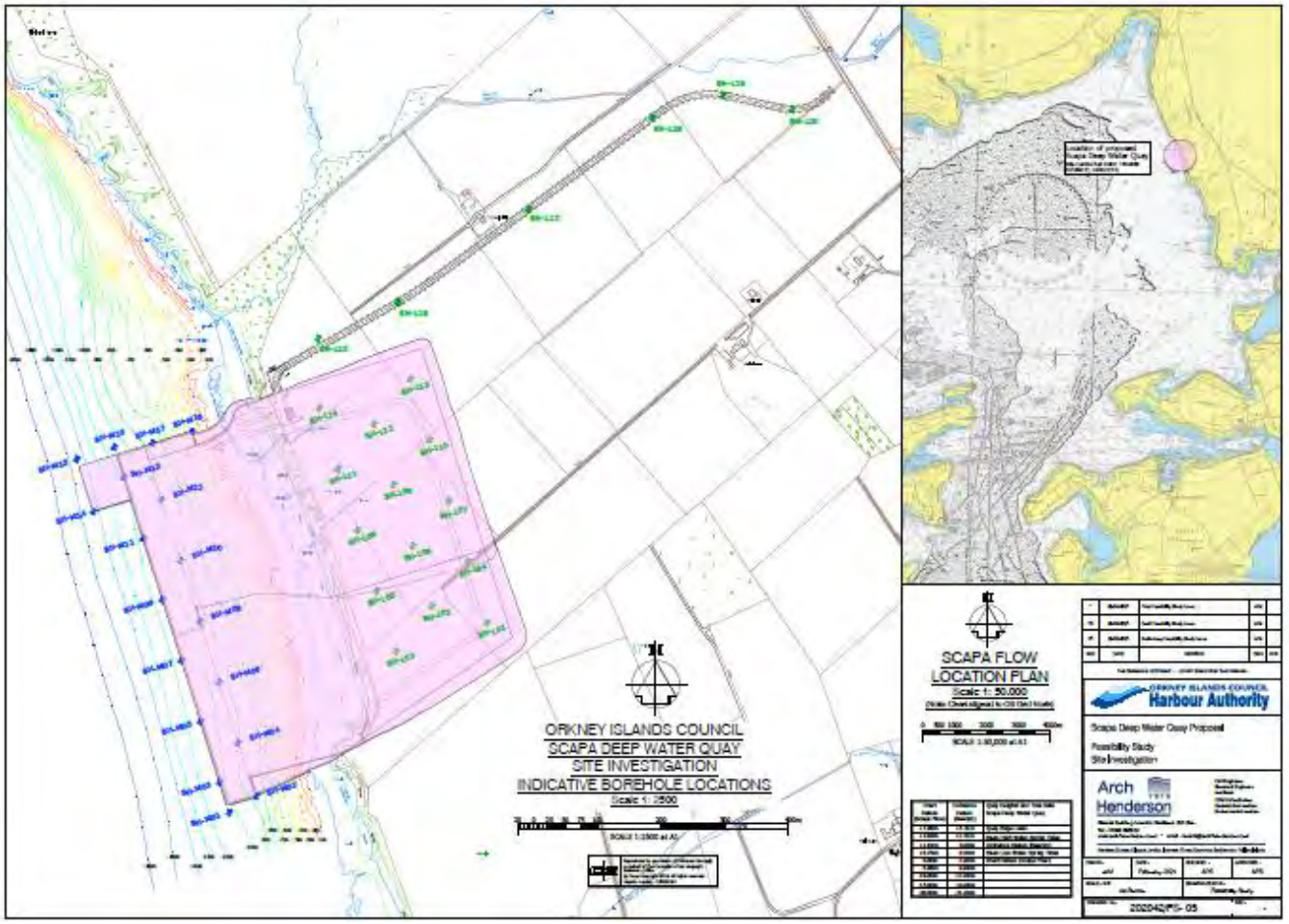
(See Drg 202042/FS-10)
Works - Phase 2
(See Drg 202042/FS-20)
Works - Phase 3
(See Drg
202042/FS-30)
ORKNEY ISLANDS COUNCIL
SCAPA DEEP WATER QUAY
EX. SITE PLAN
Scale 1 : 2500
ORKNEY ISLANDS COUNCIL
Harbour Authority
Scapa Deep Water Quay Proposal
Feasibility Study
Existing Site Plan
Arch Henderson
202042/FS- 02


ORKNEY ISLANDS COUNCIL
SCAPA DEEP WATER QUAY
SITE INVESTIGATION
INDICATIVE BOREHOLE LOCATIONS
Scale 1:2500
SCAPA FLOW
LOCATION PLAN
Scale 1: 50,000
Orkney Islands Council
Harbour Authority
Scapa Deep Water Quay Proposal
Feasibility Study
Site Investigation
Arch
Henderson
2020421FS-05

Scapa Deep Water Quay

Feasibility Study

Report

Stewart Building
Esplanade, Lerwick
Shetland, ZE1 0SE
Tel: 01595 695512
www.arch-henderson.co.uk
lerwick@arch-henderson.co.uk

Orkney Islands Council
Marine Services, Scapa
Orkney, KW15 1SD
Tel: 01856 873636
www.orkneyharbours.com
harbours@orkney.gov.uk

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Project Manager	Shane Jamieson
Project Partner	Andrew Sandison

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List of Tables and Figures

1.0 Executive Summary

The Orkney Harbours Masterplan Phase 1 (Masterplan Ph1) identified Scapa Flow as a suitable location for the development of a new deep water quay facility which will be able to service heavy marine operations in the surrounding Orkney area. At the time of writing the renewables industry, in particular the development of offshore wind farms in proximity to Orkney, could benefit from a deep water quay and associated laydown. The demand for offshore wind turbines around the coast of Orkney could bring substantial benefits to the community, providing jobs and revenue, and contributing to the decarbonisation of Scotland.

As part of the exemplar engineering at this Feasibility Study phase Arch Henderson has produced a three-phase engineered exemplar scheme for Scapa Deep Water Quay (SDWQ) the proposed new deep water quay facility in Scapa Flow. SDWQ comprises a new 575m quay with water depth of -15m below Chart Datum (CD), a further quay extension of 110 x 75m with -20m CD, 125m of ancillary return quay and a substantial area of new laydown from the prescribed cut and fill excavation.

The Feasibility Study sets out the client and stakeholder requirements for the project, explains the engineering decisions behind the Exemplar Design, the decision over the revised location for the quay, and discusses the risks regarding the lack of detailed information on wave climate and ground conditions that would need to be addressed as a priority in order to confidently progress the project.

Please refer to the appended drawing package prepared by Arch Henderson as part of the Feasibility Study which shall act as visual supplement to this report.

In addition to this document and supplementary information appended, all users should also refer to the Economic Assessment prepared by Fisher Associates and the Environmental Scoping Document and opinion(s) prepared by EnviroCentre.

2.0 Introduction

2.1 Overview

Following the adoption of the Orkney Harbours Masterplan Phase 1, Scapa Deep Water Quay (SDWQ) has been identified as a development which Orkney Islands Council Harbour Authority (OICHA) wishes to be progressed. The Scapa Deep Water Quay development is for the design and construction of a new harbour facility south of Burn of Deepdale, Scapa Flow, Orkney (58.922808, -2.9538907) with a minimum of 300+m quay berthing length to a final dredge depth of -15mCD and -20mCD. Figure 1.1 identifies the proposed location. A site location to the north of Deepdale was discounted prior to the start of the Feasibility Study after assessment of access constraints and the unsuitability of existing topography relative to minimum laydown extent now required.

Figure 1.1 – Scapa Deep Water Quay Location

The Feasibility Study is a holistic assessment of all aspects of the Scapa Deep Water Quay capital works and aims to set out the most efficient and effective means of progressing the project. This report sets out the findings of the Feasibility Study and provides commentary on the works undertaken by Arch Henderson to complete the study and conclude.

3.0 Client Requirements and Design Criteria

The requirements of OICHA as the client have been fully captured in the Client Design Brief document. This document shall act as a supplementary 'live' document to the Feasibility Study report. The Client Design Brief was collated at the start of the Feasibility Study to act as a baseline and to inform the overall study in more detail when moving from Masterplan Ph1. Additionally, the document has been further revised throughout the Feasibility Study as the client requirements evolved and/or the study presented findings which fundamentally improved or altered the requirements of the overall scheme.

The client requirements documented at the date of completion of this Feasibility Study have been captured within the study as far as reasonably possible. As the projects move through the pre-construction procurement phases this document may evolve from the baseline requirements presented.

The design and performance criteria that is tied to the Client Brief and the Exemplar Design conducted as part of this Feasibility Study has been captured in the appendices within the Design and Performance Specification.

The Economic Assessment is being prepared in parallel with this Feasibility Study by Fisher Associates. The Economic Assessment report and information contained within this study should be read in conjunction.

4.0 Masterplan Phase 1 (Ph1) Development

Since the adoption of the Orkney Harbours Masterplan Phase 1, the overall concept and business case for Scapa Deep Water Quay has evolved and been redefined. This is expected to be highlighted in the Economic Assessment presented in conjunction with this Feasibility Study. Most notably the end-user industry and requirements of the facility therein have altered since the completion of the master planning stage.

The primary driver in considering the changes as a client and project team is the identification of a new end-user by OICHA, and the quay and land requirements to facilitate the operations of the potential user(s). The main design developments, which have been redefined since Masterplan Ph1 adoption, require further consideration within this Feasibility Study and are listed as follows:

1. *Change in overall potential end-users / industries*
   The types of industry and the requirements of the end-user identified by OICHA as likely operators of the SDWQ facility have evolved. This includes a shift in focus in identifying SDWQ as a construction & assembly base for offshore wind development.

2. *Land / Storage area requirements of potential users*
   With the shift in end-user towards wind power developers and turbine construction, the land and storage requirements of these industries are vastly different from the original Masterplan Ph1. From this industry it has been identified that a land storage requirement of 10+ hectares is required.

3. *Vessel types*
   The vessel types have evolved to align with the potential industries now identified. The vessels do not necessarily draw the depth of water as semi-submersibles or the like, but are much longer and require berth lengths and mooring arrangements to be considered.

4. *Requirements of load-in and load-out operations and the proximity of operations to the quay and land / storage areas*
   The requirements of load-in / load-out operations and the proximity of land/storage to the berth line is possibly the greatest change being considered from Masterplan Ph1 to the Feasibility Study. The offshore wind industry, particularly relating to construction of offshore wind turbines requires a very definitive set of facility parameters. This includes, but is not limited to: berthing capacity for vessels (water depth and quay length); a uniform distributed load on the quayside of a minimum 25T/m^2; storage of 10+ hectares close to the quay for turbine transport operations; and specialist cranage.

5. *Quay position and water depth*
   With reference to point 4 above, the quay alignment proposed at Masterplan Ph1 was positioned on the -20mCD contour. This is now considered inefficient in achieving a cost-effective engineered solution in relation to the offshore wind industry requirements. A new quay alignment shall be considered in conjunction with a dredging proposal to ensure deep water availability is achieved.

When considering the above points the proposed T-shape quay highlighted in the adopted Masterplan Ph1 would not be suitable to meet the above requirements. The T-shaped quay was adopted to fit a partially superseded client base where gaining a water depth (-20mCD contour) at the quayside was critical. The Feasibility Study has a developed starting point of a solid straight quay with a return and reclamation immediately to the rear. This has been developed in the interim period when discussing SDWQ with the OICHA, industry and potential users.

6. Existing Scapa Pier (OICHA Tug / Pilot Boat Operations)

At Masterplan Ph1 stage the existing Scapa Pier was identified as a potential project whereby the existing pier could be extended and dredged to accommodate the new tug vessels and pilot boats. The locality of the tug and pilot boat berths has been shown on the North return of the SDWQ following discussion and design development. This proposal has been included within the Exemplar Design and budget for this study. The budget allocated at Masterplan Ph1 stage for Scapa Pier upgrades could be considered for re-allocation as additional budget to SDWQ. Budget allocated within Masterplan Ph1 is circa. £13M.

5.0 Site Selection and Locations

Since the publication of the Orkney Harbours Masterplan Ph1, as well as the changes noted in Section 4.0, the site location has altered from the original location due to the change in emphasis on end-users (and requirements), and following further investigatory and consultation works - particularly relating to engineering and environmental considerations.

The adopted Masterplan Ph1 concluded that SWDQ (in its T-shape form at that time) should be located to the North of the Burn of Deepdale. This was deemed the most advantageous location in obtaining large volumes of infill from a minimal land take area, this element was driven by the topography of the Hill of Gaitnip, and the close proximity of the -20mCD contour to the immediate foreshore, for reclamation purposes.

Following Masterplan Ph1 Arch Henderson and EnviroCentre conducted a site visit to undertake a site walkover to assess the practicality of constructing at the proposed Masterplan Ph1 location. Arch Henderson's primary role was to access topography of the site and oversee and report on land trial-pit excavations undertaken. EnviroCentre undertook a site walkover to inform any environmental survey requirements and to inform the scoping report(s).

Two main considerations evolved from the site visit which then placed the South of the Burn of Deepdale as the preferred location. These were, firstly, the overburden material exposed and exhibited on each side of the burn by the excavator. The overburden and unsuitable material found at the north site was deemed to be significantly greater than that on the South. Secondly, the access to the site had to cross the Burn of Deepdale and this posed significant challenges to the project, both engineering and environmentally.

In addition to the above, during the consultation with industry that may be interested in utilising SDWQ following the identification by OICHA of offshore wind opportunities, the site requirements and layout required had altered from the Masterplan Ph1 proposal – as discussed in Section 4.0.

The above factors therefore aided agreement between all Project Team Members and Stakeholders that the site for the project should be to the South of the Burn of Deepdale. This has been carried forward as the starting point for the Feasibility Study.

6.0 Exemplar Design and Commentary

6.1 Codes and Standards

The Exemplar Design elements undertaken at this Feasibility Study stage were carried out in line with all up to date Eurocodes, British Standards and supplementary National Annexes and industry best practice.

Elements of the main quay wall initial Exemplar Design were undertaken utilising PLAXIS 2D finite element computational software. Only the primary marine elements for the Feasibility Study have been considered in design at this stage within the computational model.

6.2 Access Road

The access road has been preliminary designed to run from the main A961 road to the site. Arch Henderson considered all works from the junction to the SDWQ site to be included within the study.

The proposed roadway is circa 1.05km with all alignments following a 'best fit' route minimising cut and fill with no gradient exceeding 5% in line with road development guidance for heavy vehicles. The road is proposed to be of a general fill and type 1 surface construction (tarmac at junction to main road only) during the construction period of the overall SDWQ facility, with tarmac road surfacing to be placed on completion of the overall works.

A single remote footpath, hard-core surfaced, is to run on the South side of the proposed access road together with a sustainable urban drainage swale ditch down the opposite side.

Lighting ducts for the roadway are to be installed but is envisaged that lighting shall not be installed other than at junction to A961 and thus to allow future installation to be considered at a later date. It is proposed that all services (via ducting) to the site, namely power, telecoms and water, are to be positioned in the footpath alignment.

Note, Orkney Islands Council (OIC) is considering the realignment of the existing A961 road, and the new SDWQ has been designed to meet with the new alignment, however this section of work is outwith the scope of this document. It is understood that OIC Engineering is considering this section of works.

Consideration must be given to the access road's importance to SDWQ in opening up access to the site location. It is therefore proposed that the access road is constructed as an enabling works to the SDWQ capital project. This is further captured in the Budget (Section 9.0), Programme (Section 10.0) and Risks and Opportunities (Section 11.0) of this report.

6.3 Site-Won Material, Land Creation and Reclamation

The exemplar scheme presented within this Feasibility Study is based on the principle of winning suitable infill material from the land adjacent to the foreshore with a balance being struck between the site-won material volume, and land creation, and the volume of material placed in the water to reclaim land to the rear of the quay edge.

As highlighted in the Client Design Brief document, OICHA has requested a minimum overall storage area of 10 hectares to the rear of the quay, and a minimum of 300m of quay side, extending to 520m in Phase 2. These parameters formed the basis of the cut and fill exercise conducted by Arch Henderson to derive the site layout and boundaries.

As described previously Arch Henderson conducted a trial-pit exercise to both the north and south of the Burn of Deepdale to assess the volume of overburden and depth to hard material. This exercise was undertaken to inform the cut and fill volume exercise and the areas and volumes set out are based upon this study and existing topographical (contour) information freely available. It is proposed at a later date in the procurement route that a land ground investigation exercise is undertaken by a suitable contractor to gain certainty of volumes of suitable and unsuitable material for land reclamation.

Preliminary Volumes are set out in the table below;

Phase 1		**Phase 2**	
Total Cut	925,000m^3	Total Cut	765,000m^3
of which is unsuitable material	110,000m^3	Of which is unsuitable material	60,000m^3
Useable Cut	815,000m^3	Useable Cut	705,000m^3
Infill Reclamation Volume	918,500m^3	Infill Reclamation Volume	815,000m^3
Rock Armour Area	7,625m^2	Rock Armour Area	3,125m^2
Dredge Volume	41,500m^3	Dredge Volume	42,500m^3

Table 1. Cut and Fill Volumes

It envisaged that the material volumes shown above shall be site-won via general excavation, ripping, drilling and blasting of the rock face(s) encountered depending on degree of weathering present. Once the rock face is removed, material can be graded and selected to suit the works. All unsuitable material excavated on the site is to remain on site in the form of a bund to the rear of the site. A proportion of hard-core stone fill and Type 1 material for the initial access road will need to be imported from local quarries. At this stage no consideration has been given to importing stone from off the island, other than rock armour stone for marine slope protection works that may not be available locally.

This element of work, much like the road, is required to be well progressed prior to the commencement of the main marine works and could be conducted partially separate to the quay works by a specialist earthworks contractor.

Please refer to the appended drawing package prepared by Arch Henderson as part of the Feasibility Study within Appendix 4.

6.5 Main Quay Design

6.5.1 Overview

The Phase 1 and Phase 2 quay consists of a main solid berthing face and return positioned on, or as closely aligned to, the -10mCD contour with the design allowing for the quay to be future dredged to -15mCD to accommodate vessel drafts. This quay alignment has been driven by the factors relating to the client and end-user requirements, namely;

- The quay's proximity to land / storage,
- The required volumes of infill material for reclamation to the rear of the proposed quay line;
- The load to be designed for (25T/m^2);
- The deep water quay at -15mCD for the vessels (and their drafts) likely to utilise the quay.

The Phase 3 quay is to be constructed at the north of Phase 1 to provide a main outer berthing face positioned on the -16mCD contour with the design allowing for a soft dredge campaign to achieve -20mCD dredge level.

During this Feasibility Study phase, Arch Henderson has given much consideration to design efficiency and value engineering options to achieve the requirements of OICHA and is further presented in the Risk and Opportunity section of the report. In terms of the main quay structural elements the feasibility design considers the difference in main the structural elements (and budget cost) relate to a 25T/m^2 UDL and the impact this would have on pile size at a -15mCD design depth and a -20mCD design depth, buildability and cost.

The main design elements have been analysed using PLAXIS 2D at a high level, using correlated site investigation from other sites and use of the British Geological System. Other than sub-bottom profiling commissioned during 2020 to determine depth of soft over burden over hard strata, no ground information for Scapa was available and engineering judgement had to be utilised within Exemplar Design.

6.5.2 Main Quay Structural Elements

The SDWQ Exemplar Design proposed the main quay walls for phase 1 and 2 are to be constructed of a tubular steel combi-wall solution using AZ infill sheet piles. To accommodate the 25T/m^2 UDL, the tubular pile is a 2032mm dia. (X70) tubular pile with AZ52-700 infill sheets. The tubular piles are to be drilled 4.0m in the rock to a minimum depth of -19.0mCD. The quay has been considered as balanced anchorage at this stage with a rear anchor wall at 35.0m from the quay face and M150 / 115 ASDO 500 tie rods at +2.5mCD installed within each tube. The cope level has been taken as +7.0mCD to accommodate existing tide & wave data, potential future vessel parameters and potential global warming sea level rises.

The north return of the quay is to be a tubular combi-wall for a minimum of 30+ metres to maintain the UDL and transitions thereafter to a steel sheet pile wall with built in steps to accommodate the pilot and tug vessels likely to berth on the return. The steel sheet piles have been sized as AZ52-700N (S460).

A solid quay construction has been selected for Phases 1 and 2 as it offers retained height support of fill material to construct a quay facility, with large areas of reclamation immediately to the rear, and is capable of having high UDL and crane loadings.

Phase 3 has been prescribed as a tubular pile suspended deck construction with an overall dimension of 61.5m x 73.5m. The tubular bearing piles are to be constructed from the North end of Phase 1 and are to be 914mm dia. (X70) piles in a 6m x 6m grid. The deck is to be formed of precast concrete units with in situ concrete poured to finished cope level. Panel fenders have been shown on this phase of works with a brace to the secondary row of piles to spread the load. At present, the primary reason for choosing a suspended deck for Phase 3 is to mitigate wave reflection back onto Phase 1-2, together with omitting earthworks that would need to transit and disrupt potential harbour operation in Phase 1-2 area.

Please refer to the Arch Henderson Exemplar drawing package produced for the SDWQ within the appendices.

6.5.3 Dredging

In order to strike an efficient balance in the cut and fill exercise to create land immediately to the rear of the proposed quay the new quay line is to be positioned on the -10mCD contour. To achieve the -15mCD and -20mCD depth at the quay face dredging has been specified. The overburden at Scapa from the sub-bottom profiling survey commissioned and undertaken during 2020 appears to show a minimum of 4m overburden on the site from -10mCD and -16mCD, therefore, it is believed that the dredge can be achieved by 'soft' dredging and 'ripping' of the weathered rock region without need for more expensive pre-treatment. The dredge volumes have been identified in the relevant SDWQ drawing package.

The values specified and the confidence in the dredging approach shall be further clarified when a marine site borehole investigation is completed. At this stage it is assumed the dredge material shall be utilised within the development and no offshore dumping shall be required. OIC do have designated licensed offshore disposal sites and these could be considered further if this suits future construction phasing or dredged material unsuitable for reclamation works is present.

6.6 Ancillary Quay Equipment

6.6.1 Bollards

Bollards are generally shown as 100T bollards at circa 25m centres along the main quay face with 4Nr. 200T bollards shown at positions Arch Henderson believes to be appropriate for the larger vessels envisaged to call at SDWQ. The north return, where the pilot and tug vessels are likely to berth, may be suitable for smaller bollards, circa 50T.

6.6.2 Fendering

It has been agreed for the feasibility design, reporting and costing purposes that basic tyre fenders shall be used across the quay facility with the adoption of a removable pneumatic 'Yokohama' fendering system for larger vessels with differing fender requirements and arrangements.

The above has been agreed as the vessel types scoped to utilise SDWQ are similar or specific to certain areas of the development. Differing vessel types are utilised dependant on the type of sea-going industry and this is likely to vary over the facility's lifespan. Given the significant capital cost associated with fixed fender units and the requirement to understand the likely vessel type to utilise the facility this has been ruled out of the design at this stage. This may be re-visited should a single user with specific vessel type(s) be identified by OICHA.

6.6.3 Lighting

The requirement for lighting across the facility is important, but should not cause light pollution outwith the site towards habitable areas or over the quay edge as far as possible. The prescribed lighting has been specified to minimise light pollution and aims to be in the best possible location when considering potential phasing of the works (see Section 10) and is positioned to not hinder any likely heavy cranage operations.

Arch Henderson (and OICHA) engaged with a lighting specialist during the Feasibility Study phase for the SDWQ due to the size of the potential development. Signify UK has undertaken a preliminary design of lighting for SDWQ Phase 1 and 2 which consists of 9Nr. High Lighting Masts (HLM) on a 3x3 grid across the site. All lights on the edges of the site are believed to be adequate, however two HLMs are placed in central locations to the site and could cause issues for lifting operations in particular.

To alleviate this we believe that the lights in this area could be on masts that can be lowered from time to time as required. We believe the lighting masts required shall be in the order of 40m tall GL800 in line with provider Abacus' catalogue.

6.7 Site Layout

As described above, the site location and overall quay shape has been driven by the requirements of OICHA and its discussion with industry relating to the development. The Feasibility Study has gone into further detail in prescribing an overall site layout which we believe is how the SDWQ facility would operate as a functioning facility on a day-to-day basis.

The proposed new access road enters the site on the north side. At this location an overall site access compound is shown separate to the main facility which is assumed to be an area which would be operated by a third party. Security fencing is proposed to separate the areas.

The site entrance compound shall have all site parking (including bus turning), main welfare facilities, weighbridge, site water tanks and septic tank. The entrance compound also allows OICHA to access the north quay edge for the operation of the pilot and tug vessels with their own allocated parking and potential for fuel storage and ancillary services.

A gated entrance shall allow access to the main 18.8 hectare (Phase 1 and 2) operational compound. At this stage only a site road runs around the perimeter edge of the site at the base of the unsuitable fill bund as well as a service trench. The bund shown is prescribed to

meet the volume of unsuitable fill which has been calculated to be present on site, and shall be further confirmed at the ground investigation stage.

Potential drainage of the main yard area has been shown as well as a potential industrial development area at the rear of the site. The overall layout assumes a single operator shall be using the site, but consideration to splitting the operational areas is possible.

Please refer to the appended Arch Henderson drawing package for further details.

6.8 Outline Construction Method Statement

Arch Henderson prepared a brief outline construction method statement of how SDWQ could be constructed. Our method statement set out is based on our experience of works of a similar nature being successfully constructed in the Northern Isles.

6.8.1 Overall Site

The primary principle of creating the deep water development site is to maximise and balance all excavated inert stone excavation from land to fill, and form reclaimed land and quay works in the sea, with all waste material not suitable for this purpose (organic soil, vegetated peat and clays) deposited and managed into material bunds on perimeter of the phased development site.

An initial enabling works construction contract is envisaged and would commence to form the access road to main cut and fill site, together with the laying of all ducts and services to the site within road verge. Initial Bitmac surfacing will only be at new junction onto main A961 road until completion of deep water development site, at which time, the final road surfacing would take place.

The site would then have perimeter V ditches cut and silt retention installed ahead of land being stripped of all non-inert material (organic soil and peat along with unsuitable clays). This shall be temporally and environmentally stockpiled until the initial laydown areas are created to commence site perimeter storage bunds. Excavation would then progress to select, screen and stockpile inert stone and suitable glacial till that are free from all organic and clay material. This operation is likely to take place over months / years dependant on the phased construction timetable and will involve heavy tracked plant to both excavate and rip material, together with pre-treatment of the harder strata through drilling and controlled delayed explosives.

The stockpile material described above would then become the main inert material fill source for future reclamation and quay works. Future site investigation works during design will provide more confidence on likely yield of suitable inert stone.

6.8.2 Reclamation and Quay Works (Phase 1 and 2)

Once sufficient suitable stockpiles of inert fill material is won the initial reclamation works would commence by forming the north perimeter reclamation bund leading from the access road to the rear of proposed quay works. The north slope face would have geotextile placed as the bund is progressed in order to mitigate the migration of fines, followed by the placement of secondary and primary rock armour. While some secondary armour may be

won on site, it is considered that the majority of primary armour stone will need to be imported to the site, by either road or sea, to cover a rock armour slope area in two interlocking layers. Once this reclamation perimeter bund and armour slope is formed it will provide the main land route to access the quay works construction site (-10m Chart Datum) for labour, plant and construction materials. It could be considered that the north return sheet pile wall is constructed as a 'Construction Jetty' to allow for the larger marine construction components to be shipped to site for the main quay works. This could be further considered as a separate enabling works contract ahead of the main Phase 1 quay works.

The main quay berth face is currently proposed as a solid quay constructed of steel tubular piles with interlocking sheet piles forming a combi wall solution with a further inner tied sheet pile anchor wall. This combi quay wall will support a concrete cope and deck directly behind, followed by general hard-core surfaced laydown reclamation area outside immediate wall active wedge area.

Circa. 2.0m tubular steel piles for the quay wall are anticipated to require drilled rock sockets to provide suitable pile toe fixity below -15m Chart Datum seabed overburden. Drill rigs will work over water from temporary piling platforms from the reclamation bund or a jack up barge. Drill cuttings would be directed to temporary filter and silt beds with no discharge of cuttings to watercourse. Tubular piles and sheet piles are expected to be vibro hammered to required depth with no impact hammers anticipated at this stage. Piles will then be filled with tremie concrete where required, tie rods installed and secured between front face and rear sheet pile wall and concrete cope formed.

As the quay works advance south the reclamation fill would advance behind, thus affording additional sea fetch protection together with added silt boom used to shore.

Once suitable vibro-treatment of quay fill has been undertaken to compact and reduce future consolidation and settlement (H-pile on vibro-hammer or other similar methods) the concrete deck immediately behind quay face will be placed (generally no less than 6 months after fill and vibro-treatment takes place) with remaining reclamation and laydown area capped and compacted with graded hard core surface with falls to V ditch and French drains. The vibro treatment and compaction of all reclamation and quay core fill material is a very important engineering requirement to minimise, as far as possible, future differential settlement and this aspect of construction contract planning must be well programmed and adequately resourced.

Phase 3 is prescribed to be constructed of tubular bearing piles from the completed Phase 1 quay. The Contractor is anticipated to work over water from the existing quay (Phase 1) driving the tubular bearing piles with toe pins or driving shoes to achieve required penetration into the rock / hard strata, and working seaward as the grids of piling advances. On completion of piling, precast concrete units shall be lifted into place to form the main pile caps and beam system and final suspended deck soffit. Reinforcement and in situ concrete thereafter shall be placed within the precast units to form the final cope.

6.8.3 Dredging

A further construction phase to the development is to dredge in front of new quay face(s) to a depth of -15mCD for Phase 1 and 2, and -20mCD for Phase 3 using back-hoe dredging technique followed by transfer of inert stone waste to split hopper barge for deposit within reclamation behind quay wall or, if unsuitable (silts), to a licenced offshore disposal site. These dredge campaigns could be completed in individual phases but it is recommended that repeated mobilisation is reduced due to prohibitive cost.

6.9 Design Development and Information

In order to progress the design beyond Exemplar Design, and not dependant on the most efficient procurement route, the following investigation, studies and reports shall be required to be carried out as a minimum. The suggested informational requirements are not definitive or exhaustive.

6.9.1 Site / Ground Investigation

Landward trial pits have been undertaken but only exposed the first 1.5 to 2.0m with no rock quality data taken, only visual inspection and to quantify unsuitable material volumes. A marine sub bottom seabed profiling survey has been undertaken to record depth of overburden to hard strata. No marine borehole site investigation or land-based ground investigation has been undertaken to date.

In order to proceed with scheme design development, rock depth and quality information are required.

All design development to date has been done by correlating the minimal amount of freely available information against previous Arch Henderson works, and utilising our marine design experience to form an Exemplar Design.

6.9.2 Wave Study

A wave height study has been preliminary conducted for the Bay of Deepdale, Scapa Flow by OIC. The study looks at wind generated waves reliant on fetch. The study highlights the waves are wind generated and therefore are dependent on fetch. Wave Height values were calculated as 1.06m (17.8km fetch from the West) and 1.44m (33.1km fetch from a restricted SSE direction).

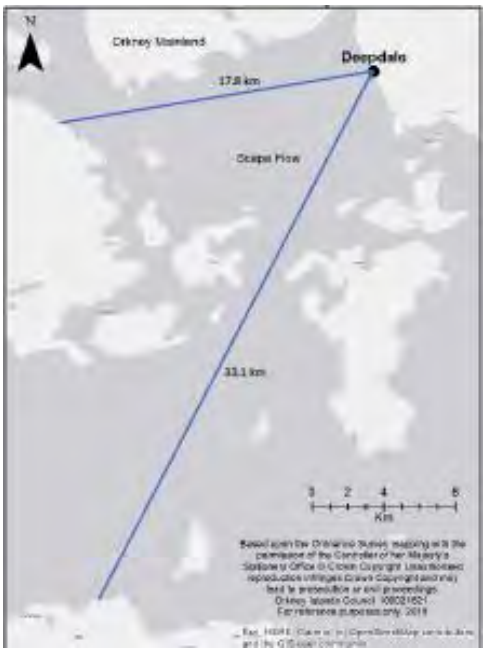

Figure 6.1. Sketch of fetch lines within OIC Report.

A more detailed wave study and modelling should be conducted which considers the geometry proposed for SDWQ. The study should consider elements of the proposed design such as quay shape, quay construction type, wave reflection etc. A proposal for undertaking this study has been received from experienced specialist port wave modelling consultants and would be undertaken subject to OIC approval.

6.9.3 Navigational Risk Assessment

It is our understanding at this stage that given the operations that currently take place in Scapa Flow that a navigational risk assessment (NRA) does exist for the wider area. It would be anticipated that this is extended to include the new Scapa Deep Water Quay and navigational approach for the specified vessels at an appropriate time.

The navigational risk assessment has not been looked at in any further detail at this stage apart from that it is a factor that will need to be considered in the future development of the project.

6.9.4 Berthing and Mooring Study

A berthing and mooring study should be considered as part of the design development as the project progresses. The study shall be linked to both the wave study and the NRA. Given the size and operational requirements / loads of the vessels proposed at SDWQ it would be prudent to ensure the quay and ancillary infrastructure design are suitable. The study would inform the loading placed on the infrastructure for inclusion at the detailed design phase as well as ancillary equipment design, such as bollards and fenders.

6.9.5 Detailed Design Development

The development of the scheme and detailed design for SDWQ shall be dependent on the procurement route decided upon and the timeframes for procuring the above studies. The

detailed design development shall aim to further detail the scheme and gain further certainty on budget and buildability.

7.0 Service Provision

This section aims to set-out the availability for service provision to the Scapa Deep Water Quay facility from the current Orkney network and the information gathered to provide provision to the facility during the Feasibility Study.

The overall SDWQ site has a service trench shown. The trench runs around the main perimeters of the yard area and behind the quay offering service opportunities to key areas of the site.

7.1 Power (SSE)

Arch Henderson engaged with SSE, with the approval of OICHA, regarding the availability of power to the proposed site location and the connections from the exiting network. A sub-station was located on the site at the entry point and is shown on drawings AH202042FS-10 & 11. SSE is currently carrying out a feasibility study looking at 1.0,1.5 and 2MW capacity options. A cost allowance has been estimated at this stage.

2Nr. quayside shore power points have been allowed for this stage, and positions to be agreed on the quayside.

Findings / outcomes of SSE report will be made available on receipt.

7.2 Fresh Water (Scottish Water)

Arch Henderson has allowed for a water main to be connected from the main network to the proposed site via the ducting to be provided within the access road verge.

Fresh water availability at the quay edge has been considered within the study and positions to be agreed on the quayside.

The fresh water is to be stored in water tanks (minimum 4Nr. 250m^3). Please refer to AH202042FS-10 & 11 for details.

7.3 British Telecom

BT provision will be connected from the existing roadway and transferred to site as required via the service ducts in the access road verge.

7.4 Foul and Surface Water

Foul Water drainage and a septic tank has been allowed for at SDWQ and are shown on AH202042FS-11 for information. The septic tank has been rated such that the treated water can discharged via a sea outfall.

Surface water yard drainage has been indicated on all plan drawings provided for Scapa Deep Water Quay. The surface water drainage is a combination of V-ditches, French drains and solid pipe works which lead to respective outfalls on the north and south sides of the site. Two outfalls have been prescribed to account for both Phase 1 and Phase 2 works. An allowance for sustainable urban drainage has been considered but will require to be developed as part of future statutory consenting process.

7.5 Fuel

Fuel delivery is anticipated to be via tankers at this stage and suitable access and egress allowed. A small amount of fuel storage has been provisionally considered for the OICHA vessels on the North side. Please refer to drawing AH202042FA-11.

8.0 Programme

An updated programme has been prepared for the project in line with the feasibility works undertaken. The programme has been split into two; overall project and procurement programme which features the next stops following completion of this phase.

Key dates have been highlighted in the table below. For a full breakdown please refer to Appendix 2.

Project Milestone	Time to Complete (Months)	Planned Completion Date
Completion of Exemplar Design	5	Q2 2021
Management & Completion of Site Investigation	9	Q1 2022
Appointment of Lead Consultant	7	Q2 2022
Detailed Design	12	Q2 2023 (Enabling works design captured in this date)
Tender for Enabling Works Tender of Main Construction Works	4 4	Start of Q4 2022 End of Q3 2023
Award of Contract Enabling Works Contract Main Contract	 3 3	 Award – Start Q1 2023 Site - End of Q1 2023 Award – Start Q1 2024 Site – End of Q1 2024
Enabling Works Access Road and Construction Jetty	12	Q1 2024
Quay Construction Works	24 Months + (6 months float)	End Stop Date: Q1 2026 (Float until Q3 2026) *For Phases 1 & 2*
Environmental Assessments	18	August 2022
Consents (e.g. Marine Licence)	12	December 2022

Table 2. Key Project Dates

With reference to the additional Site Investigation required, highlighted in the Programme above, Arch Henderson would recommend that this may be considered prior to tendering and appointing Lead Consultant Services. For more information please refer to Section 11 on Procurement Routes.

9.0 Updated Budget

An updated budget cost has been collated in line with the Feasibility Study work and the Exemplar Design. The budget provided is aligned to the drawings presented and is appended in Appendix 3. The budget presented with this report for SDWQ project should not be compared to the original Masterplan Ph1 budget due to the developments and evolution of the project from Masterplan Ph1 phase, as detailed. All rates used for assessing budget cost estimates are based on actual tendered rates received within the Northern Isles within the last 5 years where applicable.

Contingency sum allowance of 10% has been applied to all cost totals*.

** It is worth noting at this stage no allowance to costs have been made based on the Global COVID-19 Pandemic or the effects of Brexit. Both of which shall have some effect on overall project budgets but is not yet quantifiable.*

Optimism Bias percentage requires to be applied to all cost estimates depending on stage of procurement.

Risks and Opportunities are highlighted in Section 10 below. This section highlights areas which are foreseeable at this stage that may present cost savings or escalations relating to the project and any intrinsic effect this may have on programme and overall project.

As previously highlighted the Feasibility Study is being prepared in conjunction with the Economic Assessment, undertaken by Fisher Associates. The capital works project budget appended should be read in conjunction with the Economic Assessment report.

10.0 Risks and Opportunities

This section of the report sets out the engineering risks and opportunities identified by Arch Henderson within this phase of work. The risks and opportunities to be discussed below will likely have a potentially significant impact on Cost and Programme of the project.

10.1 Phasing

Arch Henderson has proposed the SDWQ is split into phases for the purpose of breaking the large project into manageable sections and future funding streams. Phases have been identified to meet with project and client requirements and also the 'type' of construction works required. Phasing also allows for budgeting and interfaces of the project to be managed effectively; however it does not stop several phases being undertaking concurrently as the project requires or allows. Examples of phases tying together have been set out at the end of this section.

The outline phasing of the works has been set out in Arch Henderson sketches AH202042FS-20 for Phase 1, AH202042FS-20 for Phase 2 and AH202042FS-30 for Phase 3, and surmised in short below (also refer to Section 6.8 Construction Method Statement).

Phase 0 (Enabling Works) – Access Road and Construction Jetty

Prior to the first stage of the main SDWQ project commencing, works to create an access road, turning and laydown compound area and installation of site services shall require to be carried out. This may also include or exclude the proposed realignment of the main A961 which shall directly influence the proposed junction to the SDWQ site. Please refer to the appended drawings AH202042FS-40, 41 & 42 for information.

At this stage it is proposed this shall go out as a separate contract from the OIC to the main SDWQ works.

A further potential enabling contract phase could be the construction of the north "construction berth" (OIC pilot / tug berth) which in turn gives direct access to the main front Phase 1 quay works.

Phase 1 – Land Creation, Reclamation and Quay Works

Phase 1 is to include the following;

- Creation of cut and fill reclamation from the existing land and foreshore. From the area of existing land to be cut and the reclaimed area, an initial 13.8 hectare laydown area (including entrance welfare compound & quay) is to be created. Rock armour is to be used to protect the reclaimed area, not within the quay walls.
- Creation of 425m of berthing. The main works phase 1 quay face is to be 300m long with 125m north return ancillary berth including pilot & tug boat use.
- **A dredge campaign to create a -15mCD dredge pocket along the 300m main quay face.

As part of the above, it may be possible to look at the opportunities relating to progressing land reclamation prior to the main quay works. This may also include the creation of a steel

pile construction jetty which would form the tug and pilot boat berths on completion of Phase 1. The creation of a construction jetty would allow for quay construction materials to delivered to site by sea, for example tubular piling and rock armour.

For further details on the Phase 1 refer to Arch Henderson drawings AH202042FS-10 to 17 within the appendices.

Phase 2 – Further Land Creation, Reclamation and Quay Works

Phase 2 is to include the following;

- Creation of a further 10.4 hectares of laydown area by undertaking a further cut and fill exercise to the South of Phase 1.
- Extension of the main face with a further 275m of main face berthing.
- ***Further soft dredging to maintain a -15mCD berthing pocket on extension.

It is the anticipation of OICHA that phases 1 and 2 shall run consecutively despite being broken down into phases for the feasibility report. It is anticipated both shall be constructed and operational by 2026. By breaking down into succinct phases alleviates risk and presents opportunity to OICHA in having in-built flexibility in the proposals which can be tailored dependant on available budget, programme and end-user requirements.

For further details on the Phase 2 refer to Arch Henderson drawings AH202042FS-20 to 27 within the appendices.

Phase 3 – Finger Extension to -20mCD

Phase 3 is to include the following;

- 73m x 61m suspended deck quay extension at the North end of the main quay face.
- ***Soft d*redging to the main quay face to undertaken to ensure a -20mCD dredge pocket.

***Dredging has been outlined above in line with the specified phases; however dredging may be undertaken at any point throughout the above phases. Consideration to the timing of the dredging and size of the dredge campaign shall be dependent on a number of factors, in particular the end-user vessel requirements, and if the dredge material shall be required for use in land reclamation and quay infill

Throughout all phases an unsuitable material bund shall be created around the perimeter of the laydown area. This shall also facilitate an access road around the laydown yard area.

10.2 Form of Quay Construction

The Exemplar Design carried out has considered both solid quay construction and suspended deck construction. The main Phase 1 and Phase 2 quay sections have been detailed as solid forms of construction in the Exemplar Design supporting this Feasibility Study report. This construction type was selected as the most economical due to desired dredge depth, required 25 tonne/m^2 deck UDL and potential prescribed operations at the facility (cranage).

Phase 3 has been prescribed as a tubular pile suspended deck construction with an overall dimension of 61.5m x 73.5m. The tubular bearing piles are to be constructed from the north end of Phase 1 in a 6m x 6m grid. At present, the primary reason for choosing a suspended deck for Phase 3 is to mitigate wave reflection back onto Phase 1-2, together with omitting earthworks that would need to transit and disrupt potential harbour operation in Phase 1-2 area.

All quay works have a provision for cathodic corrosion protection.

Alternatives to the forms of construction proposed within the Exemplar Design are available and should tenders proceed for construction works then some Contractors may propose alternatives to suit their construction methods. This would require to be assessed on a case-by-case basis at the time of tender review.

10.3 Quay Design Risks

During the Exemplar Design exercise which included running preliminary computational modelling of the proposed quay construction (combi-wall solution), several key design risks were identified which would have a potential weighty impact on cost, in particular. The high level specific design risks identified in the exemplar detailing have been highlighted below.

1. Site Investigation
   No Site Investigation or Ground Investigation exists at the proposed location of SDWQ. OIC / OICHA could also not locate any existing data, at the time of writing this report, for the existing Scapa Pier. Ground / rock data has been assumed at this stage. All design development to date has been done by correlating the minimal amount of freely available information against previous Arch Henderson works, and utilising our marine design experience to form an Exemplar Design solution. Also see section 10.4 below.
2. Quay Loading
   The quay loading has been prescribed as 25T/m^2 across the whole quay. This is a significant load when considered in tandem with -15mCD dredge level. The loading has a direct effect on the required pile size which implications on overall project cost. Revisions to the loading may offer cost reduction or escalation dependant on user requirements and value-engineered solutions if the loadings can be determined in more specific detail or defined Heavy lift Pads specified.
3. Drilling for Tubular Pile Sockets
   During the Feasibility Study exercise, Arch Henderson has undertaken due diligence on rates used to build up budget costing of the schemes presented. In going to the market for competitive drilling rates it was found that drilling for tubular piles over 1800mm in diameter had an exponential cost increase. Tubular pile diameter at this time is 2032mm for the Exemplar scheme. This shall require further consideration and investigation at the next phase to value engineer the design solution.
4. Quality and/or Volume of Suitable Site-won Material
   Following the completion of the on-site land based trial pits Arch Henderson has made a 'best-estimate' of the unsuitable material likely to be encountered on the SDWQ site. However, this shall require to be further confirmed at ground investigation stage. Arch Henderson are also working on the assumption that all rock fill found below the organic

and clay strata shall be suitable for the reclamation works. Again this shall require to be confirmed. Should a greater volume of material be found to be unsuitable this may lead to increase in land take required and u/s bund prescribed on the Feasibility Study drawings. Quality of rock fill is also important for the design of the quay structures and reclamation. Reduction in quality can lead to a significant cost impact on project. Also See Section 10.4.

10.4 Site / Ground Investigation

The lack of marine site investigation and landside ground investigation is a risk to the overall project. As previously stated, these investigations will be required and are of great importance to the design development of the overall scheme and therefore directly linked to scheme confidence and the development of risk and cost certainty.

Two key risks sit with the marine and land ground investigation; 1. The exact level and quality of the rock present on the line of the proposed quay (piling) construction; and 2. The cut-and-fill balance principle for the land take and reclamation, and that the rock quality is of a suitable nature for reclamations in the water. Aligned with this risk is that more unsuitable material than anticipated exists. Both could lead to design and cost risks to the project.

10.5 Wave Study / Hydraulic Modelling

A short wave study to assess wave height has been completed by OICHA (and their Partners) however a detailed wave study and hydraulic modelling would be recommended for a project of this nature and value. The wave regime, heights and climate needs to be fully investigated and understood in relation to design to ensure a practical working harbour environment is procured and built.

Until the wave climate is modelled, analysed and understood this shall sit as a risk to the design.

10.6 Environmental Considerations

Environmental considerations to the best of our knowledge at this stage have been considered. At the time of this Feasibility Study, EnviroCentre Ltd is undertaking and completing a Scoping Opinion for submission to all Statutory Consultees. Until opinions are returned and understood further this shall be a risk to the project design.

10.7 Other Quarry(s) (Orkney or Mainland Quarries)

As previously highlighted the source of fill material required for the SDWQ development has been identified as being made on site to create the yard area as was the intention from the Masterplan Ph1 phase. Should the material be found to be unsuitable this would pose a significant challenge to the overall viability of the project, and remains a risk until the land ground investigation has been completed.

At this stage no approaches for fill material outwith the SDWQ site has been considered.

11.0 Procurement Route(s)

This section shall define and provide an outline commentary on the procurement requirements to progress from this Feasibility Study stage. The procurement route outlined has been prescribed to ensure OICHA maintains the key dates as set out in Table 2.

If approved, Arch Henderson would propose the Site Investigation (SI) (and desktop wave study / hydraulic modelling) for SDWQ is procured and completed on site in Orkney within 2021. The SI could run in conjunction with, or prior to the appointment of, Professional Services for the project. This is being recommended for a number of reasons, as set out below;

1. The overall project, and its success is at a 'high risk' until the SI undertaken and rock parameters for the site is known. See Section 10.3 and 10.4.
2. The project risk could be reduced and further cost certainty could be gained prior to OIC / OICHA committing further Capital Investment to the project. For example procuring Professional Services to an estimated tender value of between £2M and £4M (dependant on number of phases).
3. Procuring the SI at this time allows the Key Dates to be achieved; otherwise the dates shall be pushed for circa. 9 to 12 months.

Professional Services would require to be procured towards the end of 2021 and in early 2022 to oversee the design and management of the overall project from Scheme Design to Project Completion.

Once the appointment of Professional Services has been made by OIC(HA) one of two procurement routes would require to be chosen; Traditional route (Designed by Professional Service Consultant and constructed by a Contractor), or Design and Build (Lead by a Contractor partnering with a Consultant Designer). This decision would be taken by OICHA in conjunction with the appointed Professional Services provider.

The size and complexities in SDWQ and the potential for value engineering the Design and Build route may present significant advantages to this project, however if the overall project is to be split into packages a more traditional procurement route may be appropriate. For example the Access Road is proposed to be let as an Enabling Contract to the main SDWQ project and would be likely let as a traditional contract. Further discussion and understanding on Contract forms shall be required at the later phases.

12.0 Consents

As highlighted in the Client Brief document Statutory and Regulatory consenting shall be required to be undertaken for the SDWQ project. Many of the processes to close out consenting cannot be wholly completed and closed out at this stage.

To date, Envirocentre have been conducting the following prior and during the Feasibility Study and have confirmed;

- Screening under the Environmental Impact Assessment (EIA) Regulations has been undertaken and has confirmed that both developments are 'EIA Development'.
- Scoping requests have been submitted to Marine Scotland (MSLOT) and OIC to confirm the surveys and assessments that are required for each site to support planning and marine licence applications.
- Once scoping responses are received assessments will be undertaken to feed into the EIA Reports for each site.

13.0 Conclusion and Outcomes

The following conclusions and outcomes have been drawn from the Feasibility Study report;

1.0 The feasibility of the Scapa Deep Water Quay site has been researched, chosen and engineered at a location of existing deep water within Scapa Flow that is very close to accessible rising land, which in turn produces efficient cut and fill earthworks balance to maximise future development area.

2.0 The chosen site maximises access to suitable inert stone for developing significant laydown area directly adjacent to deep water berthing with only rock armour stone protection envisaged for import with all unsuitable material waste planned for storage on the site.

3.0 The deep quay positioning has been chosen and engineered to allow further depth increase using only "soft" dredging and not more cost prohibitive pre-treatment of hard strata.

4.0 A solid quay Exemplar Design has been chosen and engineered to provide suitable large deck load capacity of 25 tonnes/m^2 as required by current industry stakeholders.

5.0 The feasibility of the Scapa Deep Water Quay site has been broken down into enabling and phased work packages that help to inform future procurement programming options and funding revenue streams.

6.0 This Feasibility Study explains and highlights current project engineering and cost risks and discusses procurement methods to reduce current engineering and cost risks, including procuring full Site Investigation and Wave Studies to complement Exemplar Design before any further scheme and detailed Professional Services are committed.

7.0 In conclusion, from an engineering viewpoint, the proposed project is considered to be feasible, both in terms of construction and timing, providing the associated project risks are investigated and mitigated. The estimated cost of the project is around £179m including 10% contingency but excluding Optimism Bias and therefore, the ultimate feasibility of the project also relies on the economic benefits being realised, as set out in the Economic Assessment report produced by Fisher Associates.

Appendices

Appendix 1	OICHA Client Design Brief Document (Scapa Deep Water Quay)
Appendix 2	Scapa Deep Water Quay Development Programme(s)
Appendix 3	Scapa Deep Water Quay Development Cost Plan / Budget
Appendix 4	Arch Henderson Exemplar Design Drawings

Scapa Deep Water Port Development

Feasibility Study

Preliminary High Level Cost Estimates

Stewart Building
Esplanade, Lerwick
Shetland, ZE1 0SE
Tel: 01595 695512
www.arch-henderson.co.uk
lerwick@arch-henderson.co.uk

Orkney Islands Council
Marine Services, Scapa
Orkney, KW15 1SD
Tel: 01856 873636
www.orkneyharbours.com
harbours@orkney.gov.uk

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Client Representative	David Sawkins
Project Manager	Shane Jamieson
Project Partner	Andrew Sandison

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29-03-21	Rev 1		AS	SJ	
29-04-21	Rev 2		AS	SJ	

Salient Cost Estimate Summary

Works	Scapa WP01	Phasing	Scapa WP02	Phasing	Scapa WP03	Phasing
Dredging	21,500m2/41,500 m3		16,500m2/42,500m 3		13,800m2/17,510 m3	
SI & Consents	£10,640	**6 months 2021/22**	£10,800	**6 months 2021/22**	£6,801.60	**6 months 2021/22**
Fees	£45,000		£45,000		£45,000	
Dredging	£1,784,000	**10 months**	£1,855,000	**With Scapa WP01**	£1,180,460	**With Scapa WP01**
Contingency 10%	£178,400		£185,500		£118,046	
Total Dredging	£2,018,040		£2,096,300		£1,350,307.60	
Quay & Access Construction	15mCD deep berth / 300m Main solid face / 125m Tug Pilot Berth Return (cut and infill volume 925,000m3 / 10.3 Hectare Laydown / 1.625 Hectare Quay / Rock		15mCD deep berth / 275m Main solid face / 48m Return (cut and infill volume 765,000m3 / 8.51 Hectare Laydown(18.81 total phase 1 & 2 / 1.19 Hectares Quay Laydwon / Rock		20m CD deep berth /73.5m Main face / 61.5m return. Total suspended deck laydown 0.45 Hectares.	

	Armour 7,625m2		Armour 7,150m2			
SI & Consents	£1,400,000	**6 months 2021/22**	£30,000	**6 months 2021/22**	£30,000	**6 months 2021/22**
Fees	£2,150,000	**Over 3 years**	£1,550,000	**Over 3 years**	£1,052,801	**Over 3 years**
Quay Construction	£68,467,475	**10 months access** road followed by **26months** Site & **Quay Works**	£53,156,275	**24 months**	£21,360,625	**16 months**
Contingency 10%	£6,846,747.50		£5,315,627.50		£2,136,062.50	
Total Quay Construction	£78,864,222.50		£60,051,902.50		£23,496,687.50	
Grand Total	**£80,882,262.50**		**£62,148,202.50**		**£25,876,995.10**	

All costs are based on applicable submitted contractor rates over the last 7 years within Northern Isles with suitable inflation added to 2021.

Excludes Optimism Bias,HRO,EIA,Land Purchase,Legal,VAT cost etc.

Orkney Islands Council

Scapa Deep Water Scheme
High Level Cost Option - WORKS PHASE 01

15mCD deep berth / 300m Main face / 125m Tug Pilot Berth Return (cut and infill volume 925,000m3 / 10.3 Hectare Laydown / 1.625 Hectare Quay / Rock Armour 7,625m2

	Item Description	Unit	Quantity	Rate	Amount
DREDGING					
Back Hoe & split hopper barges	Mobilisation / Demob	Sum			£750,000.00
Dredging	Soft Dredge and Fill Structure	m3	35000.0	£21.00	£735,000.00
	Hard Dredge and Fill Structure	m3	6500.0	£46.00	£299,000.00
	Soft Dredge & Dump Offshore	m3	0.0	£19.00	£0.00
	Hard Dredge & Dump Offshore	m3	0.0	£26.00	£0.00
					£1,784,000.00
	Additional Contingency Allowance (10%)				£178,400.00
	Total Dredge Cost Estimate				**£1,962,400.00**
Statutory & Engineering Fees	Crown Estates Dredge Royalty Charge (Incl. overdredge and bulking factor)	m3	41500.0	£0.16	£6,640.00
	Marine Scotland Consent Charges (Estimate)	Sum			£4,000.00
	Site Investiagtion (included with main quay works)	Sum			£0.00
	Dredging Engineering Fees (Estimate depending on final procurement method)	Sum			£45,000.00
	Total Fees Cost Estimate				**£55,640.00**
	DREDGING GRAND TOTAL				**£2,018,040.00**
QUAY WORKS					
Contract Set Up	Mob/ Demob/ General Items / Preliminaries / Risk / Insurances etc	Sum			£7,000,000.00
material other tham other than hard strata rock	Incl. Cut off drains, Excavation overburden, stockpile, form perimeter bunds landscape, seed & fertilise	m3	125000.0	£11.00	£1,375,000.00
General excavation in hard strata & rock to stated levels	Incl. crushing, screening, selecting general, graded and Type 1 including filling to structures	m3	925000.0	£14.00	£12,950,000.00
Rock Armour	Supply and place primary 3 to 4 T Armour in 2 layers to Outer Bund	m2	7625.0	£225.00	£1,715,625.00
	Supply and place secondary 0.5 to 1.0 Armour 1m deep to Outer Bund	m2	7625.0	£130.00	£991,250.00
	Supply and place geotextile to Outer Bund	m2	7625.0	£10.00	£76,250.00
Compaction / Treatment Fill	Vibro compaction of all fill above MHWS to Quay Structures and Reclamations	Sum			£350,000.00
Class 6F1 fill	Supply,place and compact up to 2m deep to underside future slab 50% site won and include with site excavation above	m3	136000.0	£22.00	£2,992,000.00
Piling Temporary Works	Floating pontoon barge + crane mob / demob	Sum			£300,000.00
	Jack up barge + ringer crane hire £14500 / day (14 months piling / drilling)	Nr	420.0	£14,500.00	£6,090,000.00
	Fabricate, place and remove temporary works	Sum			£350,000.00
300m Quay Face to -15m CD & Pilot / Tug Boat return	Combi 2032 x 24mm tubes + AZ52-700 / grade X70				
	2032 x 24mm tubes @ 27m long (Concrete Infill provisional)	Nr	119.0	£65,000.00	£7,735,000.00
	Driven depth pre-drilled 2.3m dia.	m	595.0	£7,500.00	£4,462,500.00
	AZ52-700 driven area	m2	2500.0	£900.00	£2,250,000.00
	AZ26-700 area pile / linear metre wall less tubes - 20m length	m2	5350.0	£525.00	£2,808,750.00
	Supply and place ASDO 500 M160/150 Tie Rods, L=30m @ +4.5m CD	Nr	200.0	£8,000.00	£1,600,000.00
	Supply and place ASDO 500 M72/64 Tie Rods, L=30m @ +1.35m CD	Nr	0.0	£3,500.00	£0.00
	Supply and place 2 x305x305x198Kg/m waling assembly @ +1.35m CD tidal	m	810.0	£950.00	£769,500.00
	AZ18-700 anchor wall driven area	m2	2646.0	£150.00	£396,900.00
	AZ18-700 anchor wall area pile / linear metre wall - 3.85m length	m2	2646.0	£250.00	£661,500.00
	Concrete Cope Supply and Place (362 x 2.65 x 5)	m3	4800.0	£250.00	£1,200,000.00
	46m wide x 400mm thick RC Deck Supply and Place	m2	12680.0	£215.00	£2,726,200.00
	250mm Concrete Deck Supply and Place	m2	1700.0	£125.00	£212,500.00
	Concrete Cope Shuttering (362 x (2.65 + 5)	m2	2800.0	£90.00	£252,000.00
	Concrete Cope Ancillary	sum			£150,000.00
	Marine furniture(25 laddersx£2000/25 bollardsx£2000 /362m cope rail x £75))	sum			£175,000.00
	Lighting 40m Columns + heads on base (TBC)	Nr	10.0	£70,000.00	£700,000.00
	Service trenches (650m x £150) and pits (15 x £4000)	Sum			£160,000.00
	Proprietary Fender return face (OIC Truck Tyres main face)	m	125.0	£9,000.00	£1,125,000.00
	Tyre fender remaining faces	m	330.0	£1,000.00	£330,000.00
	4 water tanks+ pipe,power(await quote)+1.5MWsubstation/septic tank&outfalls	sum			£650,000.00
	Solid Drain(630m x £175)/Silt traps (20 x £900)/French Drains(1700m x£50)	sum			£215,000.00
	Cathodic Protection (3 levels)	m	1550.0	£1,000.00	£1,550,000.00
	Wave screen outer face (Provisional until wave study complete)	m	300.0	£7,000.00	£2,100,000.00
	Main Access Road, junction lighting, service trench, SUDS Swale, remote track and post and wire fencing	m	1050.0	£1,950.00	£2,047,500.00
	Site access roads and parking	m	350.0	£1,750.00	£612,500.00
	Site permeter agricultural post and wire fencing	m	1100.0	£15.00	£16,500.00
	On site Security Fencing	m	325.0	£300.00	£97,500.00
	Sub Total				£68,467,475.00
	Additional Contingency Allowance (10%)				£6,846,747.50
	Total Quay Cost Estimate				**£75,314,222.50**
	Total Dredging Cost Estimate				**£1,962,400.00**
	GRAND CAPITAL COST TOTAL				**£77,276,622.50**
Statutory & Engineering Fees	Marine Scotland Consent Charges (Estimate)	Sum			£150,000.00
	Site Investigation (land and sea) including wave study	Sum			£1,250,000.00
	Quay Works Engineering Fees (Est. depending on final procurement method)	Sum			£2,150,000.00
	Dredging fees, consents , crown estate royalties etc.	Sum			£55,640.00
	Total fees cost estimate				£3,605,640.00
	GRAND TOTAL QUAY WORKS, RECLAMATION FILL, ACCESS, SERVICES, FEES AND 10% CONTINGENCY SUMS				**£80,882,262.50**
	Excludes Optimism Bias (40%),HRO,EIA,Land Puchase,Legal,VAT cost etc.				
Current Programme & Anticipated Cashflow Forecast	TBC				

Orkney Islands Council

Scapa Deep Water Scheme

High Level Cost Option - WORKS PHASE 02

15mCD deep berth / 275m Main face / 48m Return (cut and infill volume 765,000m3 / 8.51 Hectare Laydown(18.81 total phase 1 & 2 / 1.19 Hectares Quay Laydwon / Rock Armour 7,150m2

	Item Description	Unit	Quantity	Rate	Amount
DREDGING					
Back Hoe & split hopper barges	Mobilisation / Demob (assumes not done as part of Works Phase 01)	Sum			£750,000.00
Dredging	Soft Dredge and Fill Structure	m3	34000.0	£21.00	£714,000.00
	Hard Dredge and Fill Structure	m3	8500.0	£46.00	£391,000.00
	Soft Dredge & Dump Offshore	m3	0.0	£19.00	£0.00
	Hard Dredge & Dump Offshore	m3	0.0	£26.00	£0.00
	Sub Total				£1,855,000.00
	Additional Contingency Allowance (10%)				£185,500.00
	Total Dredge Cost Estimate				**£2,040,500.00**
Statutory & Engineering Fees	Crown Estates Dredge Royalty Charge (Incl. overdredge and bulking factor)	m3	42500.0	£0.16	£6,800.00
	Marine Scotland Consent Charges (Estimate)	Sum			£4,000.00
	Site Investiagtion (included with main quay works)	Sum			£0.00
	Dredging Engineering Fees (Estimate depending on final procurement method)	Sum			£45,000.00
	Total Fees Cost Estimate				**£55,800.00**
	DREDGING GRAND TOTAL				**£2,096,300.00**
QUAY WORKS					
Contract Set Up	Mob/ Demob/ General Items / Preliminaries / Risk / Insurances etc	Sum			£3,500,000.00
material other tham other than hard strata rock	Incl. Cut off drains, Excavation overburden, stockpile, form perimeter bunds landscape, seed & fertilise	m3	60000.0	£11.00	£660,000.00
General excavation in hard strata & rock to stated levels	Incl. crushing, screening, selecting general, graded and Type 1 including filling to structures	m3	765000.0	£14.00	£10,710,000.00
Rock Armour	Uplift and place primary 3 to 4 T Armour in 2 layers to Outer Bund	m2	7150.0	£95.00	£679,250.00
	Uplift and place secondary 0.5 to 1.0 Armour 1m deep to Outer Bund	m2	7150.0	£40.00	£286,000.00
	Supply and place geotextile to Outer Bund	m2	7150.0	£10.00	£71,500.00
Compaction / Treatment Fill	Vibro compaction of all fill above MHWS to Quay Structures and Reclamations	Sum			£350,000.00
Class 6F1 fill	Supply,place and compact up to 2m deep to underside future slab 50% site won and include with site excavation above	m3	50000.0	£22.00	£1,100,000.00
Piling Temporary Works	Floating pontoon barge + crane mob / demob	Sum			£300,000.00
	Jack up barge + ringer crane hire £14500 / day (14 months piling / drilling)	Nr	420.0	£14,500.00	£6,090,000.00
	Fabricate, place and remove temporary works	Sum			£350,000.00
275m Quay Face to -15m CD & Return	Combi 2032 x 24mm tubes + AZ52-700 / grade X70				
	2032 x 24mm tubes @ 27m long (Concrete Infill provisional)	Nr	115.0	£65,000.00	£7,475,000.00
	Driven depth pre-drilled 2.3m dia.	m	570.0	£7,500.00	£4,275,000.00
	AZ52-700 driven area	m2	2350.0	£900.00	£2,115,000.00
	AZ26-700 area pile / linear metre wall less tubes - 20m length	m2	5100.0	£525.00	£2,677,500.00
	Supply and place ASDO 500 M160/150 Tie Rods, L=30m @ +4.5m CD	Nr	200.0	£8,000.00	£1,600,000.00
	Supply and place ASDO 500 M72/64 Tie Rods, L=30m @ +1.35m CD	Nr	0.0	£3,500.00	£0.00
	Supply and place 2 x305x305x198Kg/m waling assembly @ +1.35m CD tidal	m	780.0	£950.00	£741,000.00
	AZ18-700 anchor wall driven area	m2	2450.0	£150.00	£367,500.00
	AZ18-700 anchor wall area pile / linear metre wall - 3.85m length	m2	2450.0	£250.00	£612,500.00
	Concrete Cope Supply and Place (340 x 2.65 x 5)	m3	4505.0	£250.00	£1,126,250.00
	46m x 400mm thick RC Deck Supply and Place	m2	11885.0	£215.00	£2,555,275.00
	250mm Concrete Deck Supply and Place	m2	0.0	£125.00	£0.00
	Concrete Cope Shuttering (362 x (2.65 + 5)	m2	2800.0	£90.00	£252,000.00
	Concrete Cope Ancillary	sum			£125,000.00
	Marine furniture(25 laddersx£2000/25 bollardsx£2000 /362m cope rail x £75))	sum			£175,000.00
	Lighting 25m Columns on base (TBC)	Nr	20.0	£35,000.00	£700,000.00
	Service trenches (250m x £150) and pits (5 x £4000)	Sum			£57,500.00
	Proprietary Fender return face (OIC Truck Tyres main face)	m	0.0	£5,000.00	£0.00
	Tyre fender remaining faces	m	320.0	£750.00	£240,000.00
	Extend power, water + outfalls	sum			£110,000.00
	Solid Drain(630m x £175)/Silt traps (20 x £900)/French Drains(1475m x£50)	sum			£205,000.00
	Cathodic Protection (3 levels)	m	1550.0	£1,000.00	£1,550,000.00
	Wave screen outer face (Provisional until wave study complete)	m	300.0	£7,000.00	£2,100,000.00
	Site permeter agricultural post and wire fencing	m	270.0	£15.00	£4,050.00
	On site Security Fencing	m	0.0	£300.00	£0.00
	Sub Total				£53,156,275.00
	Additional Contingency Allowance (10%)				£5,315,627.50
	Total Quay Cost Estimate				**£58,471,902.50**
	Total Dredging Cost Estimate				**£2,040,500.00**
	GRAND CAPITAL COST TOTAL				**£60,512,402.50**
Statutory & Engineering Fees	Marine Scotland Consent Charges (Estimate)	Sum			£30,000.00
	Site Investigationincluding wave study (include in WorksPhase 01)	Sum			£0.00
	Quay Works Engineering Fees (Est. depending on final procurement method)	Sum			£1,550,000.00
	Dredging fees, consents , crown estate royalties etc.	Sum			£55,800.00
	Total fees cost estimate				**£1,635,800.00**
	GRAND TOTAL QUAY WORKS, RECLAMATION FILL, ACCESS, SERVICES, FEES AND 10% CONTINGENCY SUMS				**£62,148,202.50**

Orkney Islands Council
Scapa Deep Water Scheme
High Level Cost Option - WORKS PHASE 03

20mCD deep berth / 73.5m Main face / 61.5m Return / 0.45 Hectare Deck Laydown / 159No. Tubular piles, Dredging 17,510m3

	Item Description	Unit	Quantity	Rate	Amount
DREDGING					
Back Hoe & split hopper barges	Mobilisation / Demob (assumes not done as part of Works Phase 01)	Sum			£750,000.00
Dredging	Soft Dredge and Fill Structure	m3	15000.0	£21.00	£315,000.00
	Hard Dredge and Fill Structure	m3	2510.0	£46.00	£115,460.00
	Soft Dredge & Dump Offshore	m3	0.0	£19.00	£0.00
	Hard Dredge & Dump Offshore	m3	0.0	£26.00	£0.00
	Sub Total				£1,180,460.00
	Additional Contingency Allowance (10%)				£118,046.00
	Total Dredge Cost Estimate				**£1,298,506.00**
Statutory & Engineering Fees	Crown Estates Dredge Royalty Charge (Incl. overdredge and bulking factor)	m3	17510.0	£0.16	£2,801.60
	Marine Scotland Consent Charges (Estimate)	Sum			£4,000.00
	Site Investiagtion (included with main quay works)	Sum			£0.00
	Dredging Engineering Fees (Estimate depending on final procurement method)	Sum			£45,000.00
	Total Fees Cost Estimate				**£51,801.60**
	DREDGING GRAND TOTAL				**£1,350,307.60**
QUAY WORKS					
Contract Set Up	Mob/ Demob/ General Items / Preliminaries / Risk / Insurances etc	Sum			£1,850,000.00
material other tham other than hard strata rock	Incl. Cut off drains, Excavation overburden, stockpile, form perimeter bunds landscape, seed & fertilise	m3	0.0	£11.00	£0.00
General excavation in hard strata & rock to stated levels	Incl. crushing, screening, selecting general, graded and Type 1 including filling to structures	m3	0.0	£14.00	£0.00
Rock Armour	Uplift and place primary 3 to 4 T Armour in 2 layers to Outer Bund	m2	0.0	£95.00	£0.00
	Uplift and place secondary 0.5 to 1.0 Armour 1m deep to Outer Bund	m2	0.0	£40.00	£0.00
	Supply and place geotextile to Outer Bund	m2	0.0	£10.00	£0.00
Compaction / Treatment Fill	Vibro compaction of all fill above MHWS to Quay Structures and Reclamations	Sum			£0.00
Class 6F1 fill	Supply,place and compact up to 2m deep to underside future slab 50% site won and include with site excavation above	m3	0.0	£22.00	£0.00
Piling Temporary Works	Floating pontoon barge + crane mob / demob	Sum			£450,000.00
	Jack up barge + ringer crane hire £14500 / day (7 months piling)	Nr	0.0	£14,500.00	£0.00
	Fabricate, place and remove temporary works	Sum			£650,000.00
275m Quay Face to -15m CD & Return	Combi 2032 x 24mm tubes + AZ52-700 / grade X70				
	2032 x 24mm tubes @ 27m long (Concrete Infill provisional)	Nr	0.0	£65,000.00	£0.00
	Driven depth pre-drilled 2.3m dia.	m	0.0	£7,500.00	£0.00
	AZ52-700 driven area	m2	0.0	£900.00	£0.00
	AZ26-700 area pile / linear metre wall less tubes - 20m length	m2	0.0	£525.00	£0.00
	Supply and place ASDO 500 M160/150 Tie Rods, L=30m @ +4.5m CD	Nr	0.0	£8,000.00	£0.00
	Supply and place ASDO 500 M72/64 Tie Rods, L=30m @ +1.35m CD	Nr	0.0	£3,500.00	£0.00
	Supply and place 2 x305x305x198Kg/m waling assembly @ +1.35m CD tidal	m	75.0	£950.00	£71,250.00
	AZ18-700 anchor wall driven area	m2	0.0	£150.00	£0.00
	AZ18-700 anchor wall area pile / linear metre wall - 3.85m length	m2	0.0	£250.00	£0.00
	914mm dia x 22mm thick piles - 159No @ 21.5m ave. length	m	3420.0	£1,700.00	£5,814,000.00
	Reinforced steel pile toe cone and pin	Nr	159.0	£2,500.00	£397,500.00
	Pile cap bracing struts 40No x 400mm dia x 6m	m	240.0	£1,500.00	£360,000.00
	Pre Cast Pile Caps - 143No @ 2.75m3 / cap	t	985.0	£700.00	£689,500.00
	Pre Cast Transverse Beams - 262No @ 4.7m3 / beam	t	3100.0	£675.00	£2,092,500.00
	Pre Cast Deck Slab 240No. @3.125m3 / slab	t	1875.0	£475.00	£890,625.00
	Pile Infill (Supply and place)	m3	2200.0	£250.00	£550,000.00
	Deck Slab - Thickness Varies 1.25 to 1.65m (Supply and place)	m3	6600.0	£250.00	£1,650,000.00
	Pile Cap Infill (Supply and place)	m3	305.0	£250.00	£76,250.00
	Transverse Beam Infill (Supply and place)	m3	1850.0	£250.00	£462,500.00
	Concrete Cope Supply and Place (340 x 2.65 x 5)	m3	0.0	£250.00	£0.00
	400mm thick Concrete	m2	0.0	£215.00	£0.00
	250mm Thick Concrete Deck Supply and Place	m2	0.0	£125.00	£0.00
	Concrete Cope Shuttering (362 x (2.65 + 5)	m2	0.0	£90.00	£0.00
	Concrete Brush Finish	m2	4520.0	£5.00	£22,600.00
	Concrete Ancillary 1.5% insitu volume = 165m3 x 8050Kg/m3	t	1328.0	£2,000.00	£2,656,000.00
	Marine furn(13 laddersx£2500/17 200 T bollardsx£2900 /200m cope rail x £75))	sum			£97,000.00
	Lighting 25m Columns on base (TBC)	Nr	3.0	£35,000.00	£105,000.00
	Service trenches (250m x £150) and pits (5 x £4000)	Sum			£57,500.00
	Proprietary Fender Panel 4.1x5.5m Main and return north face/6 QCL rubbers	Nr	11.0	£55,000.00	£605,000.00
	Tyre fender remaining faces	m	65.0	£750.00	£48,750.00
	Extend power, water + outfalls	sum			£50,000.00
	Drainage	sum			£100,000.00
	Cathodic Protection (3 levels) - 159 x 3	Nr	477.0	£450.00	£214,650.00
	Wave screen outer face (Provisional until wave study complete)	m	200.0	£7,000.00	£1,400,000.00
	Site permeter agricultural post and wire fencing	m	0.0	£15.00	£0.00
	On site Security Fencing	m	0.0	£300.00	£0.00
	Sub Total				£21,360,625.00
	Additional Contingency Allowance (10%)				£2,136,062.50
	Total Quay Cost Estimate				**£23,496,687.50**
	Total Dredging Cost Estimate				**£1,298,506.00**

	GRAND CAPITAL COST TOTAL		**£24,795,193.50**
Statutory & Engineering Fees	Marine Scotland Consent Charges (Estimate)	Sum	£30,000.00
	Site Investigationincluding wave study (include in WorksPhase 01)	Sum	£0.00
	Quay Works Engineering Fees (Est. depending on final procurement method)	Sum	£1,000,000.00
	Dredging fees, consents , crown estate royalties etc.	Sum	£51,801.60
	Total fees cost estimate		**£1,081,801.60**
	GRAND TOTAL QUAY WORKS, RECLAMATION FILL, ACCESS, SERVICES, FEES AND 10% CONTINGENCY SUMS		**£25,876,995.10**

David Sawkins
Orkney Islands Council Harbour Authority
Harbour Authority Building
Scapa
Orkney
KW15 1SD

Our ref 673702/MC/014
Telephone 07584 391095
E-mail mcoleman@envirocentre.co.uk

29 April 2021

Dear David

OICHA Capital Projects
Wintering Bird Surveys – Interim Report

Please find attached a brief, interim report on the findings of the wintering bird surveys across four Capital Projects sites.

If there are any questions regarding the attached please do not hesitate to contact the undersigned.

Yours sincerely
for EnviroCentre Ltd

(issued electronically)

Emma Cormack
Principal Ornithologist

Matt Sullivan
Principal Consultant

Enc: 2020-21 Wintering Bird Survey - Interim Report
Appendix A - Bird Records

2020-21 WINTERING BIRD SURVEY – INTERIM REPORT

Introduction

Orkney Islands Council Harbour Authority (OICHA) proposes to construct a number of capital harbour projects on Mainland Orkney. There is potential for these projects to impact bird species during the construction period and effect bird species over the longer-term once the projects are operational, especially the qualifying species of the proposed Special Protection Areas (pSPAs) of North Orkney and Scapa Flow.

This document details the methods used, the results and a brief discussion on the findings so far along with an interim summary.

Survey Aims and Objectives

In summary, the main concerns raised by NatureScot (formerly Scottish National Heritage (SNH)) during early consultation on the proposed capital projects is in relation to the disturbance of qualifying species pertaining to the various European-designated sites (and proposed European-designated sites) around Orkney, especially within Scapa Flow. This disturbance may occur during the construction period and through the operational period of the proposed facilities, which may include displacement caused by increased vessel and vehicular movements.

These concerns are based on Eider, Long-tailed Duck, Goldeneye, Red-breasted Merganser, Black-throated Diver, Great Northern Diver, Slavonian Grebe and Shag which occur around the Orkney coastline during the winter months, and Red-throated Diver which breeds on the moorlands of Orkney and forages in the sea during the summer months.

Discussions were held with NatureScot to agree appropriate methods of surveying the development areas to ascertain the ornithological baseline conditions throughout the entire year. In accordance with best practice, two periods of surveys were agreed namely

- The Wintering Bird Survey covering the period between October and March; and
- The Summer Breeding Bird Survey covering the period between April and September.

The objective of these surveys was to count the numbers and species present, their favoured locations in relation to the proposed developments, and their behaviour.

The results of the ornithological surveys would then be used to address NatureScot's concerns through assessing if there is potential for protected bird species to be impacted by the proposed developments.

2020-21 Wintering Bird Survey Methodology

The aim of the wintering surveys was to monitor the overwintering species in the vicinity of the proposed capital harbour project sites and to carry out a range of surveys in areas where no previous data were available. The scope of the 2020-21 Wintering Bird Surveys is provided in Table 1 with the locations of each capital harbour development site shown in Drawing No 673702/001 Location Overview, Appendix B.

Table 1: Orkney Winter Bird Survey Methods (Period October 2020 to March 2021)

Survey	Method
Upland Winter Bird Survey	• A winter walkover survey closely following the adapted B&S moorland breeding bird survey method, with fieldwork being undertaken three times during the period October to March; and • This survey will be undertaken at the Scapa Deep Water Quay (SDWQ) site and around its proposed access track.
Vantage Points	• Vantage Point (VP) surveys to record the bird activity around the SDWQ site where the most construction activity will occur, and where the highest number of pSPA bird species are most likely to be observed; • The VP surveys will be conducted in the centre of the proposed works area which offers an excellent panorama of the vicinity and water of Scapa Flow to both the north and south (Ordnance Survey Grid Reference (OSGR) HY 45283 04122); • The VP surveys should provide a spread over the full daylight period available (from official local sunrise to sunset times) which will vary depending on the time of year, and watches should also be conducted through a range of tide heights and sea states. VPs should be spread across all calendar months when the species is present or likely to be so. The watches should be stratified according to the ecology of the target species present and should give a representative sample of site use; • From the VP, the visible sea area within a 180º arc is divided into 12 sectors. This area is scanned for target species over a (maximum) 3 hour period, with all bird activity recorded. This includes birds on the water of Scapa Flow (with an indication of their general behaviour – foraging, resting, etc), and any flights across the survey area (noting approximate height and direction of flight); • A hierarchy of importance for the VP data has been drawn up to obtain the most useful results: i. A quantified measure of occurrence (i.e. average numbers & density) for each of the pSPA species in, and close to, the offshore development area, using repeated counts within the 12 sectors; ii. A quantified or descriptive measure of the use of the area by a particular species – e.g. by focussed watching of a group of birds, mapping their position and detailing their behaviour every five minutes. Given that Black-throated Diver is the most important offshore species, any groups or individuals of this should always be selected; if all Black-throated Diver were followed, it would give quantified information of their time spent in the different sectors as well as what they were doing there. This method would also be used for Slavonian Grebe. Red-breasted Merganser are an inshore species, and will also be recorded using this method when present. Goldeneye numbers have declined in Scapa Flow, but if present, they will be recorded using this method. For the more abundant pSPA species, which can occur in several groups at once (Great Northern Diver, Long-tailed Duck, Eider and Shag), the larger groups present can be selected for following – this will not be comprehensive for any of these species and would therefore give only descriptive information of site usage; iii. A descriptive measure of flight activity – Flights of diver, grebe, merganser, and the larger groups/flocks of Eider, Long-tailed Duck and Shag should be noted briefly – with a note of the time observed, height and a mapped flight path, but with no need to attempt to time their duration; and iv. A count of the waders and other species along the shoreline. • A minimum of three sector counts should be undertaken during 20 VP surveys throughout the 2020-21 winter bird survey period.
Low Tide Counts	• Low tide counts to be undertaken in line with the national Wetland Bird Survey (WeBS) programme. WeBS Core Counts are made using so-called 'look-see' methodology, whereby the observer, familiar with the species involved, surveys the whole of a predefined area. Counts are made at all wetland habitats, including lakes, lochs/loughs, ponds, reservoirs, gravel pits, rivers, freshwater marshes, canals, sections of open coast and estuaries. Numbers

Survey	Method
	of waterbird species, including divers, grebes, cormorants, herons, spoonbill, swans, geese, ducks, rails, cranes, waders and kingfisher are counted. Counts of gulls and terns are optional; • For the Hatston, Kirkwall and Scapa Pier Capital Project sites, counts will be made once per month throughout the year, ideally eight days after the predetermined 'priority dates' defined in the WeBS guidance to cover the optimal low-tide period, rather than the high-tide that WeBS desires. The WeBS priority dates are pre-selected with a view to optimising tidal conditions for counters covering coastal sites at high tide on a Sunday, whereas all the Orkney sites will be conducted on the same day per month to coincide with a suitable low-tide time to ensure all foraging waders will be included in the counts. All areas will include potential intertidal areas to be lost during the proposed construction of the sites; and • Any terrestrial species present (Rock Pipit, Pied Wagtail, corvids, etc) within the survey area should also be recorded to ensure all bird activity is included within the data.

Field Surveyor

Firth Ecology was commissioned by EnviroCentre (on behalf of OICHA) to undertake the Wintering Bird Survey field work during the months of October 2020 and March 2021 in line with Table 1. Andrew Upton of Firth Ecology is a highly experienced field surveyor, and has undertaken a wide scope of ornithological survey work and analysis on Orkney for renewable energy schemes and for NatureScot in order to determine the baseline levels of wildfowl ahead of the pSPA designations.

A QA/QS audit carried out by EnviroCentre in February 2021 considered the fieldwork to be excellent, with both highly impressive survey design and recording accuracy allowing the best possible data to be obtained from the surveys.

2020-21 Wintering Bird Survey Results

The 2020-21 wintering bird surveys have recorded a total of 56 species. All 56 species constituted birds resident on Orkney throughout the year or those which regularly overwinter on Orkney.

Species observed during each of the surveys are listed in alphabetical order in Appendix A.

A summary of the results for each of the specific survey methods are provided below.

Upland Bird Survey (Site of Scapa Deep Water Quay)

The upland bird survey in the area of the proposed Scapa Deep Water Quay included both the standard survey method listed in Table 1 and *ad hoc* sightings during the journey to and from the Vantage Point location overlooking the Bay of Deepdale through the agricultural land.

Twenty-four species were observed, which included waders, raptors, passerines and wildfowl.

There was one female Hen Harrier present in the area throughout the winter period, one female Merlin on 8 January, and the occasional Peregrine hunting along the cliffs of Scapa Flow. There were no large aggregations of passerines (24 Skylark on 24th November 2020 being the largest). The largest flock of wildfowl present was a flock of 110 Greylag on 20th February 2021 (there was also a group of 90 in November 2020). Curlew numbers peaked on 20th February 2021 with a flock of 120 foraging birds in the fields adjacent to the proposed access road.

Vantage Points (Site of Scapa Deep Water Quay)

The 2020-21 Wintering Bird Vantage Point (VP) survey was undertaken from a location overlooking the Bay of Deepdale. The watch point is located at a raised headland approximately halfway along the proposed quayside of the Deep Water Quay, and has a viewshed which stretches along the coastline and into the eastern section of Scapa Flow, enabling excellent viewing of at least 1 km in all directions.

As required by the VP methodology, the visible sea area within a 180º arc was divided into 12 sectors as shown in Figure 1, Appendix B. All birds observed were recorded by the surveyor, with birds observed in sectors 1-8 being the most likely to be disturbed by the proposed development.

Twenty-seven species were recorded within the 12 sectors throughout the survey period (i.e. within 1 km of the viewpoint), with Shag and Eider the most numerous of the pSPA species. Great Northern Diver numbers began to drop off after a period of high numbers in November, and Slavonian Grebe was not observed until December, after which a small group was present in a small area of the Flow. Black-throated Diver is arguably the most vulnerable species and commands most attention during the surveys, and there was a small group present sporadically throughout the winter.

Groups of qualifying species of the Scapa Flow pSPA (Black-throated Diver, Great Northern Diver, Slavonian Grebe, Eider, Long-tailed Duck, Goldeneye, Red-breasted Merganser, Shag) or other target species if none of the above are present, regularly have their behaviour recorded to ascertain behavioural traits and from this it is hoped to extrapolate the birds' preferred locations of foraging, lounging, swimming, roosting, moulting, etc.

Eider, Slavonian Grebe, Great Northern Diver, Black-throated Diver, Shag and Long-tailed Duck have all been recorded occasionally in the four sectors closest to the shoreline on both rising and falling tides and during various sea states, both foraging and swimming. This is the area most likely to be disturbed during the construction and operation of the proposed development.

For an unknown reason, but possibly due to depth of water or availability of prey items, the sectors to have had most bird activity recorded within them were scattered across the 180º view shed. Cliff-nesting birds are likely to increase from the early spring to the north of the Burn of Deepdale, it is probable most of these birds will be in the northern sectors over the summer months.

Low Tide Counts (Hatston, Scapa Pier and Kirkwall)

At all sites, birds roost or forage in their preferred locations, and counts have been organised into small, manageable geographical areas to simplify analysis of the results. A total of 37 species was recorded across all four Low Tide Count Sites to the end of March 2021. Twenty-eight were recorded at Hatston, 22 at Scapa Pier, and 20 in Kirkwall.

Numbers of species were highest during October at Scapa Pier and Hatston. Accumulations of certain species were noted to have peaked at Hatston with 226 Golden Plover present in October 2020 and 275 Curlew in December 2020. The gull roost at Hatston increased as the winter period progressed, and included two Iceland Gulls in February 2021 (uncommon, but regular winter visitors from Greenland). Oystercatcher numbers also increased as winter progressed at Scapa Pier. Numbers of birds on the water (auks, grebes and ducks) peaked in January at Scapa Pier and Hatston.

Due to its more urban environment, Kirkwall has had a more limited diversity during the counts, although disturbance through human activity is highest at Scapa Pier, where the beach is a popular destination for family gatherings and dog walking.

Discussion

Consistent data was obtained throughout the winter survey period. Bird activity occurred throughout the survey areas at each site, and some species were recorded in locations that may be impacted by the proposed developments.

The Upland Survey on the terrestrial sections of the proposed Scapa Deep Water Quay site showed the presence of species typical of moorland and agricultural land on Orkney over the winter months. Although some species recorded are afforded additional levels of legal protection, or are included on the national Amber or Red Lists of conservation concern, there is no species or location which will require specific additional surveys to be undertaken, or specific mitigation measures or design changes to the proposed development.

The data gathered from the Vantage Point watches have shown several interesting behavioural traits of species being mobile within the eastern section of Scapa Flow during each survey. It is unknown whether this is normal behaviour that will occur annually, or whether external factors (sea state, weather, temperature, food sources, etc) at the time of the surveys were partly, or wholly, responsible for such movements, but it does complicate assessing the potential for species to be impacted whilst present on the water.

The Low Tide Counts showed a diverse number of species being present through the winter, including some large accumulations of some species at Hatston Pier. At this stage, there appears to be no certain trend within the data at any site as many of the wintering birds had arrived prior to the start of the winter survey period, and shall remain into the spring. With the continuation of monthly visits to all sites, a broader picture of when bird numbers fluctuate and species' diversity deviate throughout the year can be obtained, and there will be data on the presence and numbers of pre-breeding and post-breeding roosts of breeding birds and summer visitors which have yet to be recorded during the surveys (e.g. terns).

The majority of qualifying species for both the Scapa Flow pSPA and the North Orkney pSPA are winter visitors to Orkney and are present from late-summer through to the following spring. Numbers and densities of some qualifying species are likely to be inflated in post-arrival (September) and pre-departure (April) accumulations around the coasts of Orkney. In order to record these potential build-ups of numbers and their locations, and thereby assess their importance to the area and any potential disturbance to their behavioural patterns, it is important to conduct surveys during these times as well so as to analyse the full winter season.

Red-throated Diver is a qualifying species of the pSPA due to its presence as a breeding bird on the moorlands of Orkney, and its presence through the summer months foraging in the waters around Mainland Orkney. This will also need to be addressed in order to discount the proposed developments being considered within their main foraging zones.

Similarly, little is known about moulting grounds of several pSPA qualifying species, and in order to show that the proposed developments are not being considered within areas where moulting wildfowl gather between mid-summer and autumn, it is important that these times are also surveyed.

In conclusion, the results of the winter surveys show the species, numbers and locations of birds within the vicinity of each capital project harbour site. These datasets will answer the majority of concerns of NatureScot regarding bird activity and the potential for the developments to impact on them.

One concern NatureScot has at Scapa Deep Water Quay (and potentially at all sites) appears to be disturbance to birds on the water in the vicinity of the shipping lanes through the increase in vessel movements associated with the development(s). It is unlikely that data from any bird surveys will address this concern as a result of the disparate locations of the birds in the vast expanse of Scapa Flow and there being very few vessel movements noted within the survey areas during the wintering bird survey season.

Wintering Bird Summary

The current suite of surveys and data obtained so far has produced some interesting results regarding bird activity within eastern Scapa Flow. It has highlighted the importance of obtaining field data to better understand both bird activity in the area and thereby shape any forthcoming mitigation or management measures to enable the proposed developments to proceed.

The data so far will cover many of the questions raised by NatureScot and an additional breeding season of data will only improve the knowledge of the proposed sites, and lead to a better understanding of the behaviour of birds present. This, in turn, will allow an even more robust assessment of any effects on the birds in the vicinity of each development site, and a more appropriate level of mitigation or management measures to be implemented where required. However, it should be noted that concerns about bird disturbance within shipping lanes will need to be addressed through future dialogue with the relevant stakeholders.

APPENDIX A: BIRD RECORDS

Table 2: Summary of 2020/21 Wintering Bird Species Present

SPECIES	Upland Bird Survey	Vantage Point	Low Tide Counts			
			Scapa Deep Water Quay	Scapa Pier	Hatston Pier	Kirkwall Pier
Bar-tailed Godwit						
Black Guillemot						
Black-headed Gull						
Black-throated Diver						
Collared Dove						
Common Gull						
Common Scoter						
Cormorant						
Curlew						
Eider						
Gannet						
Golden Plover						
Goldeneye						
Great Black-backed Gull						
Great Northern Diver						
Grey Heron						
Greylag Goose						
Guillemot						
Hen Harrier						
Herring Gull						
Hooded Crow						
House Sparrow						
Iceland Gull						

Jackdaw						
Kittiwake						
Lapwing						
Little Auk						
Long-tailed Duck						
Mallard						
Merlin						
Mute Swan						
Oystercatcher						
Peregrine						
Pheasant						
Pied Wagtail						
Pink-footed Goose						
Puffin						
Raven						
Razorbill						
Red-breasted Merganser						
Redshank						
Red-throated Diver						
Ringed Plover						
Rock Dove / Feral Pigeon						
Rock Pipit						
Rook						
Shag						
Shelduck						
Skylark						
Slavonian Grebe						

Snipe							
Starling							
Turnstone							
Twite							
Wigeon							
Wren							
TOTAL	**56**	**24**	**27**	**10**	**22**	**28**	**20**

APPENDIX B: DRAWINGS AND FIGURES

Legend

★ Approximate Capital Project Location

Do not scale this map

Client
Orkney Islands Council Harbour Authority

Project
OICHA Capital Projects Screening Exercise

Title
Capital Project Locations

Status
FINAL

Drawing No.	Revision	Date
673702-001	-	28 May 2020
Drawn	**Checked**	**Approved**
JP	CF	CF

Scale
1:50,000 @A3
0 255 510 1,020 1,530 Metres

Rev	Date	Amendment	Initials
-	-	-	-

envirocentre
Craighall Business Park, Eagle Street, Glasgow, G4 9XA
T: 0141 341 5040 E: info@envirocentre.co.uk W: www.envirocentre.co.uk

Figure 1: Vantage Point Survey Sectors at the site of the proposed Scapa Deep Water Quay Development

ORKNEY ISLANDS COUNCIL:
ORKNEY HARBOUR AUTHORITY

FINANCIAL AND ECONOMIC ASSESSMENT FOR ORKNEY PORT DEVELOPMENT PROJECTS

FINAL REPORT: APRIL 2021

Fisher Associates
Fisher Advisory Ltd, September House, Boughmore Road, Sidmouth, EX10 8SH, UK
Tel: 07786 806 535
www.fisheradvisory.com
Company Number: UK 10411446

FISHER

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TABLES

EXECUTIVE SUMMARY

This Report – 'Financial and Economic Assessment for Orkney Port Development Projects' – has been commissioned by Orkney Islands Council Harbour Authority to consider the financial and economic considerations and benefits associated with specific harbour development projects in Orkney.

This work follows on from the Orkney Harbours Masterplan Phase 1 and will feed into a more detailed Outline Business Case (OBC).

The infrastructure and facilities in question comprise:

- The construction of new deep water quayside facilities in Scapa Flow – the Scapa Deep Water Quay (SDWQ)
- Development of land and quay space at Hatston
- Improvements at Stromness and Lyness

These projects are underpinned by the following key drivers:

1. Climate change initiatives, in particular the commitment to **Net Zero** greenhouse gas (GHG) emissions.
2. The need to **develop new business activity** and **support current growth sectors** to secure the future economic wellbeing of Orkney and the Harbour Authority in the light of transition away from traditional oil and gas operations.
3. Enabling Orkney to capitalise on the **remaining opportunities** in the oil and gas sector.

Offshore wind opportunity

Orkney is well-located for several offshore wind sites and agreements have been drawn up with several developers wanting to base the assembly/installation of wind turbines and their operations and maintenance (O&M) activities in Orkney.

Scapa Deep Water Quay will provide the necessary quay space, depth of water and laydown area to meet the developer's needs for the installation phase. Hatston is the preferred location for an O&M base and crew transfers. There is also a supporting role for Stromness and Lyness as a rapid response base and storage area respectively.

Other opportunities

Remaining opportunities in oil and gas

Orkney is ideally located to service oil and gas vessels supporting activities West of Shetland; there are opportunities for Orkney to become a successful **oil and gas supply base**. The harbour infrastructure to support this would be provided at Hatston.

Operators are also looking for alternative sites to carry out **large scale maintenance and modification programmes** for semi-submersible platforms and rigs. They need very deep water/ quay space and the new facility at SDWQ would allow them to come alongside.

Boatyard

The development at Hatston will enable a boatyard and lift to be accommodated. This will enable Orkney to attract the larger vessels (e.g. windfarm, aquaculture) that would otherwise have to go overseas to be serviced, as well as serving the local community.

Cruise and marine leisure

The proposed developments at Stromness will support the offshore wind sector, but also safeguard the cruise calls into Stromness by providing a pontoon for landing passengers. It will also remove conflicts with the marina users and enable additional marina berths to accommodate the growing demand for marine leisure facilities.

Results

Total cost of investment is substantial at **£248.2m**	Projects are expected to generate **£528m** of monetised benefits to Orkney (to 2051)
Projects have a strong justification with a **positive** ENPV (excluding lease payments from windfarm developer anchor tenant)	**ENPV (to 2051)** Base case: +£57.8m
The number of jobs created or safeguarded in Orkney and gross value added (GVA) will **benefit the local community**	Base Case (2030): **150 jobs** **£16.2m GVA**

1 INTRODUCTION

1.1 Aim of this Report

This Report – 'Financial and Economic Assessment for Orkney Port Development Projects' – has been commissioned by Orkney Islands Council Harbour Authority to consider the financial and economic considerations and benefits associated with specific harbour development projects in Orkney.

This work follows on from the Orkney Harbours Masterplan Phase 1 (see 1.3) and will feed into a more detailed Outline Business Case (OBC) which will be developed according to HM Treasury "Green Book" and "Guide to Developing the Project Business Case" Five Case Model which is summarised below.

This financial and economic assessment is closely linked to the Economic and Financial Cases as per the Five Case Model.

Although this is an economic assessment, it is important to demonstrate that the project fits in with the delivery of strategic goals at a national, regional and local level.

Stage 1: Scoping: Strategic Outline Case (SOC)

- Orkney Harbours Masterplan Phase 1.

Stage 2: Planning: Outline Business Case (OBC)

- **Strategic case**: revisits earlier strategic assumptions and analyses. Makes the case for change at strategic level. Sets out background to proposal and explains the objectives to be achieved. Strategic policy context and the fit with wider public policy objectives, and any dependencies on other programmes.
- **Economic case**: identifies a preferred option which demonstrably optimises value for money. Assesses the economic costs and benefits of the proposal to society as a whole. Includes a cost-benefit analysis and takes account of uncertainty and risk, optimism bias, distributional impacts, and wider socio-economic impacts.
- **Commercial case**: prepares the potential deal and asks "can the proposed solution be effectively delivered through a workable commercial deal or deals?" Sets out procurement strategy, ownership of assets, key contractual issues.
- **Financial case**: affordability and funding requirements/ sources of the likely deal. Identifies and fills any funding gaps, contains provision for cost overruns, explains and estimates contingent liabilities.
- **Management case**: management arrangements and clear milestones for successful delivery.

Stage 3: Procurement: Final Business Case (FBC)

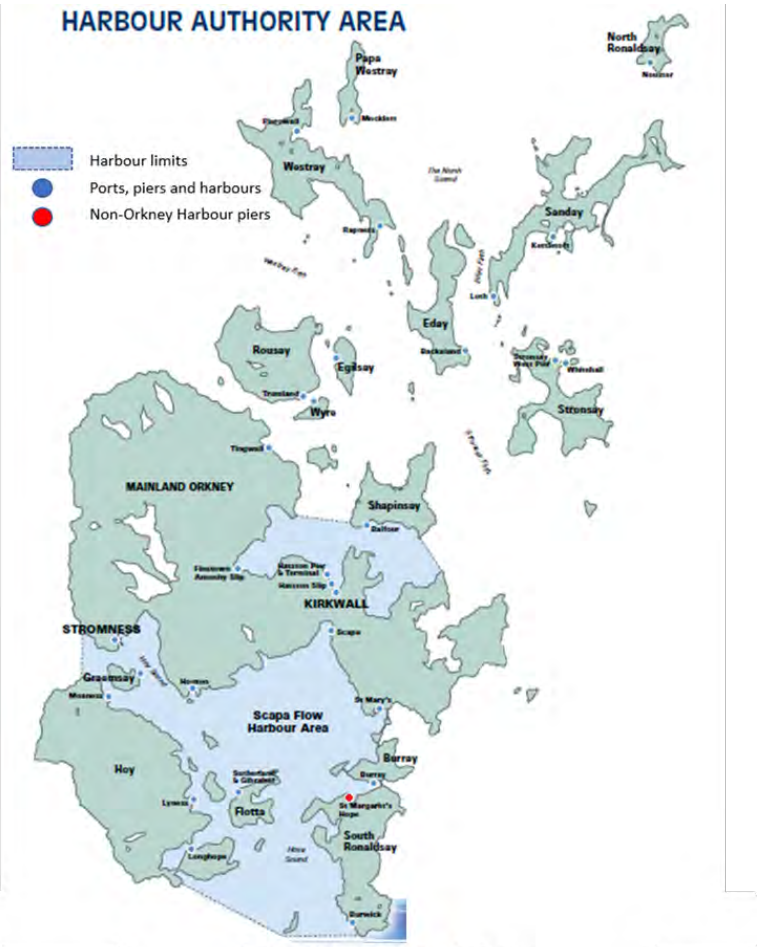
- Finalise commercial arrangements prior to project commenement

1.2 Orkney Harbours – a diverse and forward looking base

Orkney Islands Council (OIC) is the Statutory Harbour Authority responsible for the safe and efficient operation of the 29 piers and harbours located throughout the Orkney Islands.

The range of ports and harbours is diverse, in terms of structure, size and nature of operational activity.

The major port facilities of Hatston, Kirkwall and Stromness accommodate a range of operational activity across many sectors – aquaculture, cargo, cruise, ferries, fishing, marine leisure and renewables, in particular offshore wind.



Source: Orkney Harbour Authority.

The strategically located Oil Port of Scapa Flow, with its unique deep water sheltered anchorage, hosts multiple ship to ship (STS) transfer operations of crude oil, liquefied natural gas (LNG) and liquefied petroleum gas (LPG) as well as serving the Flotta Oil Terminal. It now also accommodates semi-submersible rigs and accommodation platforms at anchor for maintenance and stand-down.

There are many smaller piers and harbours throughout the North and South Isles as well as across the Orkney Mainland: many of these accommodate lifeline island ferry services, aquaculture, fishing and marine leisure activities. Many of these piers are critical in ensuring the future viability of island or remote communities.

ORKNEY HARBOURS HAS A DIVERSE BUSINESS BASE AND PLAYS A FUNDAMENTAL ROLE IN SUPPORTING MANY KEY SECTORS IN THE ORKNEY ECONOMY AND ACROSS ISLAND COMMUNITIES. IT HAS AN AMBITIOUS INFRASTRUCTURE VISION THAT WOULD "PLACE ORKNEY AT THE FOREFRONT OF THE DRIVE FOR A CLEANER, GREENER FUTURE".

1.3 Developing Orkney's harbour infrastructure

1.3.1 Orkney Harbours Masterplan Phase 1 – a summary

The Orkney Harbours Masterplan Phase 1 was published in November 2019, a culmination of almost two years' analyses and consultation.

Following an iterative and detailed process of optioneering and assessment, the masterplan presented several projects that would enable the Harbour Authority to address challenges within existing markets, develop new business and safeguard its crucial role in supporting the economy of Orkney.

The objectives underpinning the Orkney Harbours Masterplan Phase 1 are shown opposite.

Commercial

- Establish a strategic framework and vision that will guide future infrastructure investment decisions towards a coordinated and sustainable future.

Financial

- To safeguard and enhance the financial sustainability of the harbour business within the context of a competitive business environment.

Socio-economic

- To support and enhance the socio-economic prosperity and social well-being of local communities.

Environment

- To safeguard and support the long-term productivity of the coastal and marine environment through best practice and strong environmental stewardship.

The masterplan proposals were defined as follows:

Kirkwall Pier • Multi-purpose quayside infrastructure • Waterfront development • Marina expansion • Improvements to traffic management and facilities on the quayside	**Stromness & Copland's Dock** • Improvements to Copland's Dock • Reclamation of land for development • Marina expansion • Cruise tender pontoon • Improvements to traffic management and facilities on the quayside
Scapa Pier • Pier extension and dredging • Increase in laydown and operational area and marine leisure facilities	**Lyness** • Creation of new hardstanding area behind pier
Scapa Deep Water Quay • Creation of a new Deep Water Port Facility in Orkney • 300m quayside with water depth of -20m CD • 5+ hectares laydown area	**Hatston Terminal & Pier** • New deep water quayside infrastructure • Reclamation of land for development • Ex-pipe and fuel storage • Reconfiguration of freight marshalling, parking and public access • New passenger terminal

1.3.2 Project development – an update

Since the publication of the Orkney Harbours Masterplan Phase 1 there has been a considerable amount of work undertaken to guide the prioritisation and timing of masterplan proposal development.

Over the last two years the offshore wind sector has been galvanised and advanced considerably with the ScotWind proposals brought to market in Scotland. The Orkney Harbours Masterplan Phase 1 is a strategic framework that has provided the basis for Orkney to respond to these market opportunities. There has been continuous and increasing interest from offshore wind developers seeking a base in Orkney for construction / assembly and O&M.

In practical terms, this has resulted in the reimagining of the proposals for Scapa Deep Water Quay into a more substantial facility that is better focused on serving this market, whilst also accommodating the previously foreseen uses.

Potential roles for other harbours in Orkney have also been identified through dialogue with the offshore wind market, particularly Hatston, Stromness and Lyness although there is no requirement for significant physical changes at the latter two.

The expanded Scapa Deep Water Quay project, and the complementary ability to service offshore wind at other harbour locations, now form the basis for modified proposals and use of facilities, which have now been analysed in this assessment.

Scapa Deep Water Quay and **Hatston** proposals should be prioritised to enable Orkney to attract and benefit from offshore wind opportunities, which will provide a long-term stream of economic activity for Orkney.

There may be funding available in the short term to support marina development and a cruise pontoon in **Stromness** along with the placing of additional fenders at **Copland's Dock**. Stromness has been identified as an ideal location for crew transfer vessels (CTVs) for servicing offshore wind farm sites during operational phases. To this end, the economic assessment considers Stromness.

Whilst creating hardcore standing at **Lyness** was not deemed a major priority within the masterplan, it is now the case that the offshore wind sector are keen to use Lyness as a storage site for larger items. Again, Lyness is included in the economic assessment in this regard.

The **Scapa Pier** proposals may not be required – as and when the fuel tanks at Scapa reach the end of their life there is an option to build a new fuel tank farm at Hatston – thus avoiding the need for Scapa Pier to accommodate larger fuel carriers. It is proposed that tugs and pilot boats be relocated to Scapa Deep Water Quay. This will free up space on the existing Scapa Pier and the original intention of using it for more marine-related activities can still be achieved but without spending £12m.

Kirkwall Pier proposals will come later, but within ten years.

1.4 Structure of this Report

This Report is structured as shown opposite.

Section 2 (Strategic Context) describes the rationale for projects; presents a summary of key market sectors; and demonstrates how the projects fit with national, regional and local policies.

Section 3 presents a detailed overview of the projects, namely Scapa Deep Water Quay and proposals to develop Hatston Pier and Terminal.

Sections 4 comprises an overview of project costs and analysis of economic benefits and impacts.

Section 5 summarises the Harbour costs and revenues.

Section 6 presents our conclusions.

Appendix A describes the strategic policies in more detail.

2 STRATEGIC CONTEXT

2.1 Why is this project needed?

The masterplan proposals were developed against a set of outline requirements derived from identified issues, constraints and opportunities at the time.

The Scapa Deep Water Quay and Hatston projects are underpinned by the following key drivers:

4. Climate change initiatives, in particular the commitment to **Net Zero** greenhouse gas (GHG) emissions.
5. The need to **develop new business activity** and **support current growth sectors** to secure the future economic wellbeing of Orkney and the Harbour Authority in the light of transition away from traditional oil and gas operations.
6. Enabling Orkney to capitalise on the **remaining opportunities** in the oil and gas sector.

The Harbour Authority must look to the future and invest in facilities and infrastructure that will both safeguard and enable growth in existing markets and enable diversification into new markets and revenue streams.

Orkney has an opportunity to develop new and grow existing markets in the oil and gas sector, but it is dependent on the right infrastructure, which it currently lacks.

Investing in new infrastructure will enable Orkney to become a hub for offshore wind and other activities through transition to decarbonisation.

2.1.1 Net Zero greenhouse gas emissions – harnessing offshore wind

The Scottish Government has set itself the ambitious and legally binding target to reach Net Zero by 2045[1]. The UK Government has, within the wider Climate Change initiatives, also committed to reach this target by 2050. To achieve these targets, zero carbon technologies and fuels need to be developed as soon as possible and these projects play a pivotal role in delivering these policies.

Scotland has extensive offshore wind resources with potential to increase its contribution to the UK energy needs, and it has the commitment to be a global leader in offshore wind. The current leasing round, ScotWind, includes several deep water sites in proximity to Orkney and site operators will require access from and to suitable ports.

[1] Climate Change (Emissions Reduction Targets) (Scotland) Act 2019

Crown Estate Scotland[2] highlighted that it is essential that Scotland's ports are "ideally equipped and ready to support the rapid expansion of offshore wind" and there is "a significant risk that existing port capacity will be insufficient". Orkney is well-located and will have the physical attributes to meet this need: the interest from offshore wind developers is unprecedented. Scapa Deep Water Quay has been identified as the optimal construction / assembly point, with Hatston the Operations & Maintenance base and Lyness and Stromness identified as suitable for laydown and additional O&M support.

Investing in new infrastructure will enable Orkney to harness the opportunity for offshore wind and create long term economic and social benefit for the region.

2.1.2 Net Zero greenhouse gas emissions – hub for future marine fuels

There is a potential opportunity to develop a storage and distribution hub for low and zero carbon fuels: this could be developed at Scapa Deep Water Quay where there is scope for up to 18 hectares of laydown area. The hub would initially provide storage and bunkering facilities for vessels in the region and regional terrestrial users. In the longer term the facility would extend service to the shipping sector in Scotland and the UK. This component of the project would only be taken forward if there was sufficient interest and investment from the private sector.

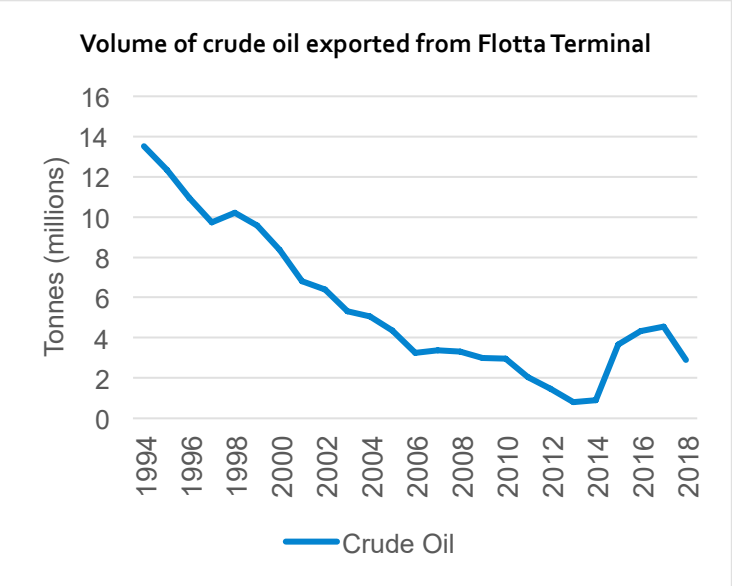
There is an opportunity for Orkney to play a key role not only in harnessing opportunities from decarbonisation but in enabling and even expediting the transition process, through the provision of appropriate infrastructure and facilities – coupled with Orkney's unparalleled expertise, research and commercialisation of renewable energy and zero carbon fuel technologies.

[2] Ports for offshore wind, Crown Estate Scotland, Arup, Sept 2020

2.1.3 Facilitate new harbour business and growth in existing markets

2.1.3.1 Flotta Terminal

The Flotta Terminal operation is at the centre of the Scapa Oil Port and has been a key source of revenue for the Harbour Authority for the last 40 years. There has, however, been a long-standing decline in the volume of crude oil exported from the Flotta Terminal. Although volumes of oil exported have picked up since 2013, growth is not expected in the future, as operations at the Flotta Terminal are envisaged to wind down and cease at some point during the next 20 years.



2.1.3.2 New and growth activities

The opportunity to support the forthcoming **offshore wind sector** developments has been mentioned above and is described in more detail in section 3.1. This is a major new activity stretching into the long term if Orkney has the infrastructure to support it.

In addition, there are potential opportunities in the following areas:

- **Boat repair and maintenance**: there is an opportunity to grow activity in this sector within Orkney, through providing the necessary infrastructure and equipment (e.g. at Hatston). Through the development of the masterplan it became clear that there could be potential demand for such a facility; a substantial number of aquaculture vessels currently travel to the North East of Scotland for repairs and maintenance, as do larger fishing boats, smaller ferries, tugs, pilot boats and work boats. The ability to handle them within Orkney would cut costs and increase efficiencies across a number of sectors.
- **Aquaculture**: strong growth is expected in salmon farming and Orkney is well-placed to support this and its supply chain, but it requires space and better facilities.
- **Marina**: Orkney is an attractive and strategic destination for visiting boats, in a market that is growing in popularity. The resident berths are full, however, and they cannot meet the demand from larger visiting boats.
- **Cruise**: cruise is already a key component of the Harbours' business base; but can constrain other activities at Hatston in busy periods.

The Harbour Authority must look to the future and invest in facilities and infrastructure that will both safeguard and enable growth in existing markets and enable diversification into new markets and revenue streams.

2.1.4 Remaining opportunities in the oil and gas sector

Orkney is ideally located to service oil and gas vessels supporting activities West of Shetland. According to recent analysis undertaken by EY[3], there are opportunities for Orkney to become a successful **oil and gas supply base**; however, there is not adequate harbour infrastructure in terms of water depth, available berthing space all year round and other essential services and supplies.

Operators are also looking for alternative sites to carry out **large scale maintenance and modification programmes** for semi-submersible platforms and rigs. They can only be accommodated with the right infrastructure in place – e.g. very deep water to attract rigs and platforms alongside. There is an opportunity for Orkney to target this market through creating a new deep-water facility in Scapa Flow.

2.1.5 Policy fit

The project proposals contribute to a range of policies and plans at national, regional and local level. The level of fit with policy aims and objectives is pertinent in that this can influence the availability of funding and deliverability.

Many of the policies are focussed on economic growth and competitiveness: Programme for Government, Scotland's Economic Strategy and HIE's Strategy; the National Planning Framework 4 aims to identify major developments and planning priorities at the national level.

The Climate Change Plan is focussed on decarbonisation.

The National Islands Plan focuses on Scotland's island communities across a range of sectors;

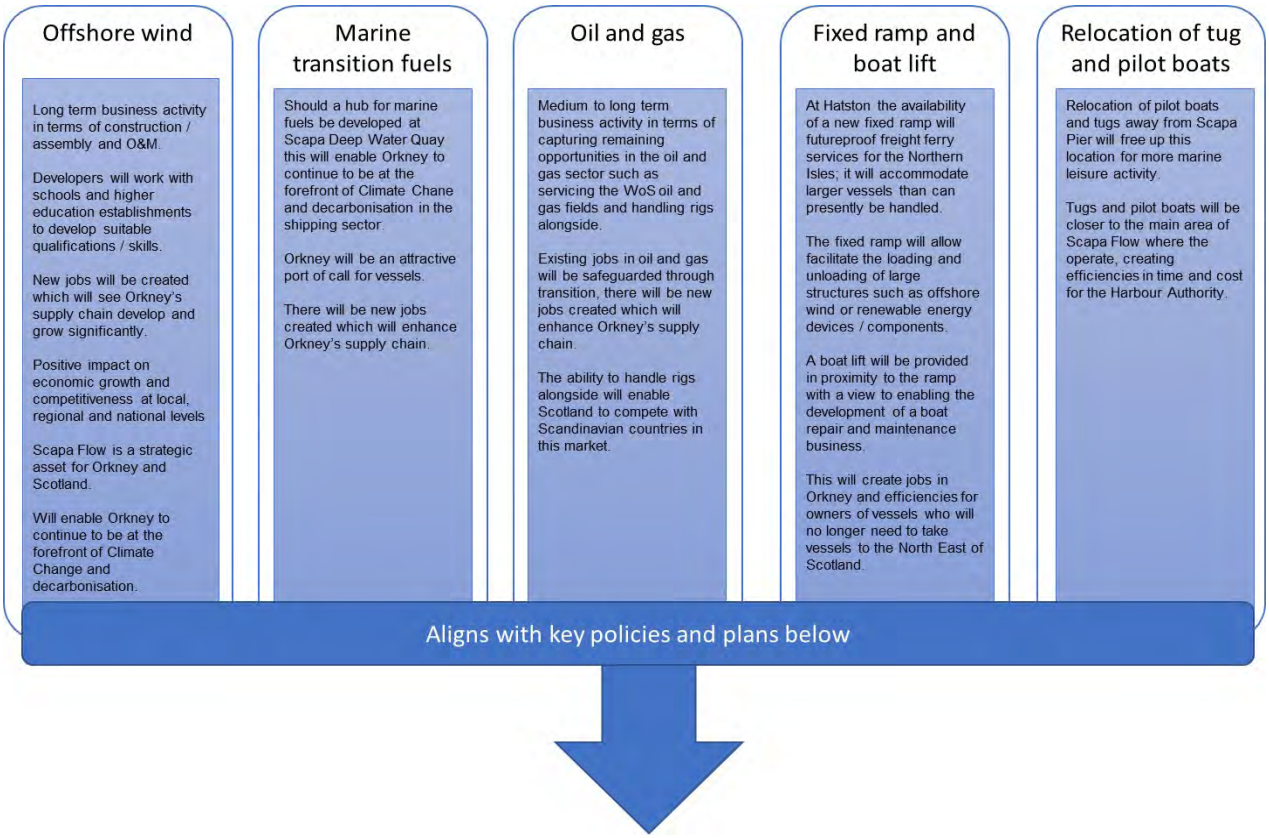
There are several policies relating to marine-related aspects (Giant Strides, Crown Estate policy and planning around island and ferry transport (Ferries Plan / Island Connectivity Plan).

Locally Orkney has several plans in place that focus on improving the economy, society and generally making Orkney a good place to live, work and visit.

[3] *Assessment of Potential Oil & Gas Revenues through Orkney Islands Harbour Infrastructure, EY, 2019*

A summary of these policies is presented at Appendix A.

In terms of fit with these policies, the projects at Scapa Deep Water Quay and Hatston go some way to delivering policy objectives at local, regional and national levels. The figure below presents a summary of project components and rationale and which policies these fit most with.



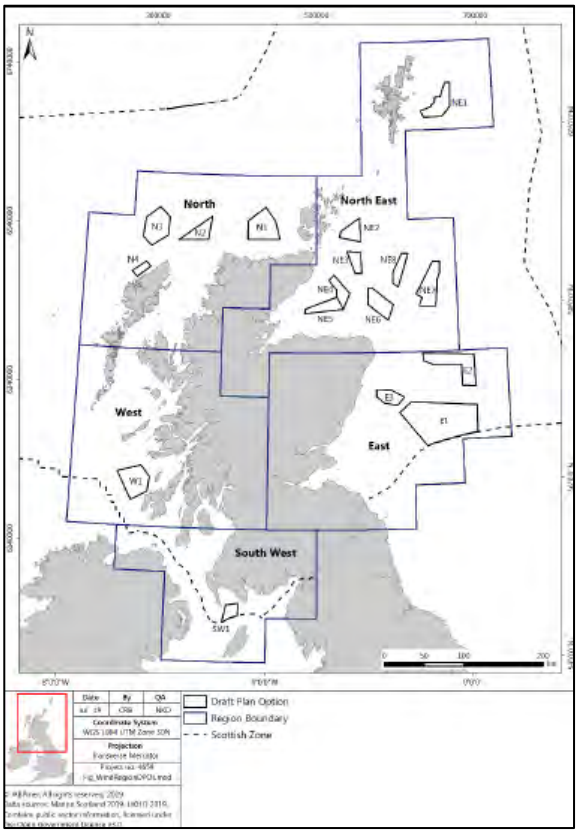
Policies and plans	Offshore wind	Marine fuels	Oil and gas	Fixed ramp and boat lift	Relocation of tugs / pilot boats
Programme for Govt	✓✓✓	✓	✓✓✓	✓✓	✓
Scotland's Economic Strategy	✓✓✓	✓	✓✓✓	✓✓	✓
Climate Change Plan	✓✓✓	✓✓✓		✓	✓
CES	✓✓✓	✓	✓	✓	✓
NPF4	✓✓✓	✓✓	✓✓		
National Islands Plan	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓
Giant Strides					✓
Ferries Plan		✓		✓✓✓	
HIE's Economic Strategy	✓✓✓	✓	✓✓✓	✓✓	✓
Local Development Plan	✓✓✓	✓	✓✓	✓✓	✓
Council Plan	✓✓✓	✓	✓✓	✓✓	✓
Community Plan	✓✓✓	✓	✓✓	✓✓	✓

3 MARKET OVERVIEW

In this section, we provide an overview of the markets that this project will address; the reasons why the investment is needed to meet the market needs; and the beneficiaries of the investment.

3.1 Offshore wind

There is already a substantial volume of offshore wind energy activity off the coastline of Scotland, with six sites in operation and eight having received consent (2019). Crown Estate Scotland is in the process of running a further leasing round for commercial scale offshore wind energy projects in Scottish Waters, known as the Scotwind Leasing. A revised Draft Sectoral Marine Plan for Offshore Wind was published in 2019, which identified 17 sites or Draft Plan Options across five regions. These sites could deliver between 8 and 10 GW of power and, if delivered, these developments could assist in delivering the Scottish Offshore Wind Energy Council's goal to produce at least 8 GW of offshore wind in Scottish Waters by 2030.



There are several proposed sites in close proximity to Orkney (particularly N1, N2 and NE3 but also several others), making this the optimal location for the construction, operation and maintenance activities associated with offshore windfarm development: having a base in Orkney would significantly reduce time at sea, with shorter journey distances between harbour and offshore windfarm locations; there is safe anchorage within Scapa Flow; and Orkney has a track record in building resilient and capable supply chains and workforces to meet the demands of transitioning economies, from oil and gas to renewables and zero carbon fuels.

Orkney Harbour Authority is in discussion with upwards of 12 developers and has signed Non-Disclosure Agreements with ten of those who are looking to acquire one of the leases. Preferred developers will be announced in Autumn 2021; it is envisaged that consent for development could be given by 2025 and that construction could, for some sites, commence in 2028.

It should be noted that whilst the sites look relatively small on paper, they are fairly sizeable in terms of how many turbines could be installed – at least 100 turbines within each site initially.

As part of the Orkney Harbours Masterplan Phase 1, offshore wind was identified as a key opportunity for Orkney; there has been significant interest from potential windfarm developers, with some seeking exclusivity agreements already.

There needs to be specific investment in harbour infrastructure and facilities in order to accommodate construction, operation and maintenance activities. This would also need to be implemented fairly quickly in order that potential offshore windfarm developers could incorporate Orkney as a key port within their plans.

3.2 Oil and gas

Oil and gas operations in Orkney are in decline, which means there is a clear need to develop new business activity as well as capitalising on the remaining opportunities arising in the sector to secure the future economic wellbeing of Orkney and the Harbour Authority.

The West of Shetland oil and gas basin (WoS) is regarded as one of the UK's final opportunities with regard to oil and gas production. Whilst the area is relatively under-explored and under-developed compared with the rest of the UK Continental Shelf (UKCS) there are forecasts which suggest that it will yield a large proportion of UKCS output. There is a real opportunity for Orkney to become a supply base for vessels and crew servicing WoS oil and gas operations, given Orkney's proximity to the site – Hatston is significantly closer than Aberdeen or Peterhead (where vessels are currently operating from); as well as Lerwick and Scrabster which could be seen as competing ports. With unrestricted access to berths, sufficient depth of water, laydown area and fuel provision Hatston will be an optimal location for this activity.

Semi-submersible rigs and platforms require ongoing maintenance; there is limited capacity within Scottish ports to do this as there are very few facilities with sufficient water depth – it is the case that many structures travel to Scandinavia. Scapa Deep Water Quay will have -20m of water depth below Chart Datum and will be able to accommodate such structures, as well as other deep drafted structures and vessels.

At Flotta Oil Terminal there is a scheduled decrease in the flow of oil, with the facility currently due to close around 2035. This will result in the loss of around 200 jobs, a reduction in income to the Council as the Harbour Authority and the loss of an

otherwise world class energy facility. This constitutes a significantly negative outcome for Orkney's residents and businesses: Flotta Oil Terminal played a pivotal role in the UK oil and gas industry with around 10% of the UK's oil output handled through this terminal; the Terminal has been a prominent employer in Orkney over the last few decades – it is one of only several companies employing more than 50 people and its workforce makes up around 3% of all jobs in Orkney.[4]

Thus, there is a real and credible opportunity for Orkney to harness remaining opportunities in the oil and gas sector.

3.3 Boat repair and maintenance

The main facilities for boat repair and maintenance are based in the North East of Scotland. Macduff Shipyards is the largest company operating in the sector, with facilities at Macduff, Fraserburgh and Buckie. There are other boat repair companies operating out of Peterhead, Fraserburgh and Arbroath, plus there are boatyard facilities in Shetland and on the west coast of Scotland.

For major maintenance or refits many vessel owners in Orkney use facilities in the North East of Scotland: aquaculture workboats, the inter-isle ferry fleet, tugs, pilot boats and larger fishing boats, for example.

For basic maintenance, painting and out-of-water inspections, many vessels use the boatshed at St Margaret's Hope, which is undercover – this is the only such facility in Orkney at present and vessel owners also carry out maintenance and painting on the quay at various locations throughout Orkney, though this is weather dependent. The facility is restricted in terms of the weight and length of vessel it can accommodate.

There is a boatyard at Burray, which the owner intends to develop into a commercial business.

There is a real opportunity for Orkney to attract a new business sector to the region through commercial tendering of the boatlift and its operation. With the right operator in place, it would be possible to accommodate a wide range of vessels for repair and maintenance activities. The vessel owners would benefit from a substantial increase in efficiency.

- There are around 130 registered fishing vessels in Orkney (2018 Scottish Sea Fisheries Statistics), as well as a large number of residential sailing boats and dive boats based in Orkney (e.g. likely to be in excess of 150).
- Orkney Harbour Authority operates three pilot boats, three tugs and the inter-isle ferry fleet.
- There are at least 30 aquaculture boats servicing various fish farm sites around Orkney, plus other supporting workboats and barges.

[4] In 2018 total number of jobs in Orkney was estimated at 11,000, of which 5,000 were part-time (Orkney Islands Economic Review 2020, Fraser of Allender Institute).

3.4 Cruise

- Orkney's cruise market has grown very strongly since 2010. This reflects strength of visitor product, marketing to cruise lines and extension of Hatston berth in 2014.
- Passenger numbers in 2017 (115,000) were more than four times those in 2010, with the number of calls (135) almost doubling in that period.
- The average size of vessel has increased – passengers per vessel and GRT have both doubled since 2010.
- The number of calls in Orkney has grown at a slightly lower rate than in Scotland as a whole. However, Orkney passenger numbers have grown much faster than the national trend.

Despite the impact of Covid it is envisaged that Orkney's cruise business will return over the next several years and underlying growth in demand will continue.

Improvements in infrastructure will support Orkney's attractiveness to cruise companies.

Increasing the number of smaller cruise liner visits to the Isles would take some pressure off Kirkwall Pier, and fit with growing demand for more specialist/exclusive experiences as part of expedition cruises. This would need buy-in from Isles' communities to ensure they can meet the needs of the vessels and their passengers.

3.5 Marine leisure

In 2018 there were 653 visitor boats, with the majority of these between June and August. These boats spent just over 5,800 nights in Orkney, with an average of six nights per boat during the peak period. The total number of crew was 1,565.

Kirkwall and Stromness have similar volumes with regard to visitor boat nights, whilst there are more visitor boats and crew calling at Kirkwall.

Overall there has been a gradual increase in the number of visiting boats over the last few years despite some volatility in 2012/2013 – and the more recent impact of Covid-19. Nonetheless it should be noted that visitor boats to Orkney have grown at a faster rate than in Scotland as a whole. This is attributable to increased digital marketing by Orkney Marinas, growing general visitor awareness of Orkney as a destination and an increasing number of repeat visits.

There is the opportunity to attract more visitor boats to Orkney as underlying demand for leisure sailing grows – assuming that markets will return to normal a year after Covid-19. This would be strengthened by investment in onshore facilities and continued marketing efforts. The latter could possibly encompass Orkney being part of a marketed itinerary – akin to the *Cool Route* that has been developed for Ireland-Northern Ireland-western Scotland-Faroe-western Norway sailing.

The provision of more and larger berths would help meet demand from the growing numbers of boats of more than 20m LOA – including superyachts.

Provision of additional berths would also help meet growing demand from Orkney residents.

There is growth potential in the small day boat tour market, including provision of bookable/walk up tours as well as private charters. This will require raising awareness of the business opportunities by bodies like OIC and HIE. There is likely be strong visitor interest in boat tours of Scapa Flow. However, potential conflicts with other harbour users would need to be addressed.

4 MASTERPLAN PROJECTS

4.1 Introduction

This section provides a detailed overview of the two projects that are the primary subject matter of this Economic and Financial Assessment – Scapa Deep Water Quay and proposals to develop Hatston Pier and Terminal.

4.2 Scapa Deep Water Quay

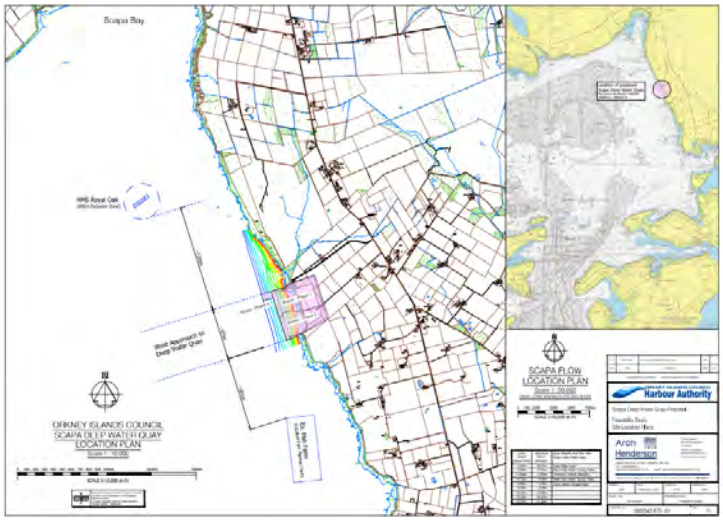
During the last 18 months the nature and scope of Scapa Deep Water Quay has transformed in some respects, as a result of various factors, such as site investigation, engineering feasibility and market requirements, particularly relating to the offshore wind sector which has seen significant development over the last year.

- Dialogue with more than 10 offshore wind developers to discuss requirements (e.g. water depth, quayside, laydown area, etc.).
- Preliminary site investigations (land and sea)
- Preliminary environmental surveys and analysis (wintering birds, otters, landscape, archaeological, etc.)
- Ongoing dialogue with key stakeholders (landowners, SEPA, Scottish Water, SSEN, SNH, HES)
- Further engineering feasibility to reach Exemplary Design stage

For Scapa Deep Water Quay, the site location proposed in the masterplan (to the north of the North of Deepdale) was discounted after assessment of access constraints and poor suitability of existing topography relative to minimum laydown extent now required.

As the ScotWind leasing round for offshore wind farm sites got underway, there was much greater clarity in terms of what potential developers will require in order to construct, operate and maintain offshore wind farms in proximity to Orkney. A key factor now known is that the laydown area required is much greater than 5 hectares; rather a minimum of 12 hectares is required; and that at least 15 metres of water depth would be required – more in the case of some specific developers and their proposed methods. It was concluded that an area in close proximity to the original site could be utilised as it was possible to create a much larger laydown area.

There is no deep water pier infrastructure in Scapa Flow located on the Orkney mainland coast. During the masterplanning process, a number of locations were identified and appraised; the preferred site is located south of the Burn of Deepdale, which is located within a rural area comprising mainly pastureland between Kirkwall and Holm, approximately four kilometres south of the existing Scapa Pier.



The Scapa Deep Water Quay proposals comprise the design and construction of a new harbour facility which has 575m of quayside with water depth of -15 CD; a 110m x 75m extension with water depth of -20m CD; and 18 hectares of laydown area (excluding quay areas). There will also be an access road from the A961 to the site.

The development is designed to be built in three phases although the ordering of Phases 2 and 3 will be dependent on the economic need for these facilities. It is most likely that Phases 1 and 2 or Phases 1, 2 and 3 would be built simultaneously.

Phase 1	• New quay: 300m x 46m (450m berthing) • -15m CD water depth (via dredging) • 12 hectares laydown area • Access road
Phase 2	• Quay extension: 275m x 46m to south • -15 CD water depth (via dredging) • Six hectares laydown area
Phase 3	• Quay extension: 110m x 75m to north • -20m CD water depth (via dredging)

The main purpose of this facility would be to undertake any/multiple industry activity that requires both deep-water berthing and large laydown area. There are specific market opportunities in the offshore wind and oil and gas sectors. This is also a potential location for the development of a future fuel storage and supply hub. The location has also been identified as a hub for harbour pilot boats and tugs.

With regard to offshore wind, there are several lease areas earmarked for development around Orkney, with Orkney the preferred location as a hub for

construction assembly and O&M – Scapa Deep Water Quay is the optimal site for the delivery and assembly of components as part of the construction phase.

'It is essential that purpose-built staging port facilities, such as the Scapa Deep Water Quay, are available to maximise the weather window for offshore construction. A new, purpose-built deep-water quay in the natural shelter of Scapa Flow would service the growing offshore wind market in the North of Scotland and, in doing so, become a great asset to Orkney's economy.'

Source: offshore windfarm developer

4.3 Hatston Pier

Hatston Pier and Terminal is located on the coast to the northwest of Kirkwall. It is Orkney's primary commercial terminal and link south to Aberdeen and north to Shetland. The longest berth is 385m in length, offering 10.5 metre draft. The original pier was built in 2002 and a 160m extension was completed in 2013.

This multi-purpose infrastructure has been hugely successful in accommodating a range of operational activities including the largest cruise ships, renewable energy, ferries, oil and gas and cargo/ livestock.

The proposal for enhancing Hatston Pier has not changed dramatically since the publication of the Orkney Harbours Masterplan Phase 1, rather it has been developed into a more detailed plan, again through various activities over the last 18 months or so.

Dialogue with offshore wind developers has led to Hatston being identified as a key location for offshore wind Operations & Maintenance (O&M)

Preliminary environmental surveys and analysis

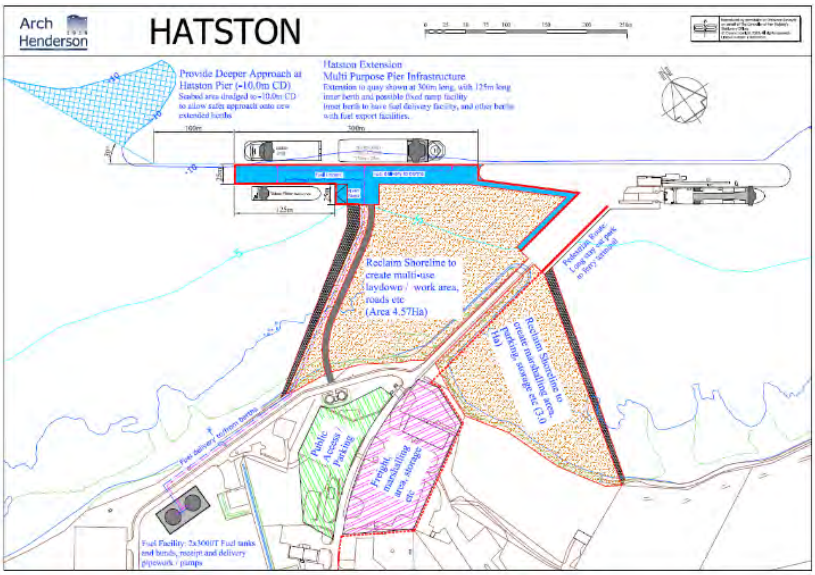
Ongoing dialogue with key stakeholders (existing harbour users, SEPA, Scottish Water, SSEN, SNH, HES)

Further engineering feasibility to reach Exemplary Design stage

The plan for Hatston is focussed on:

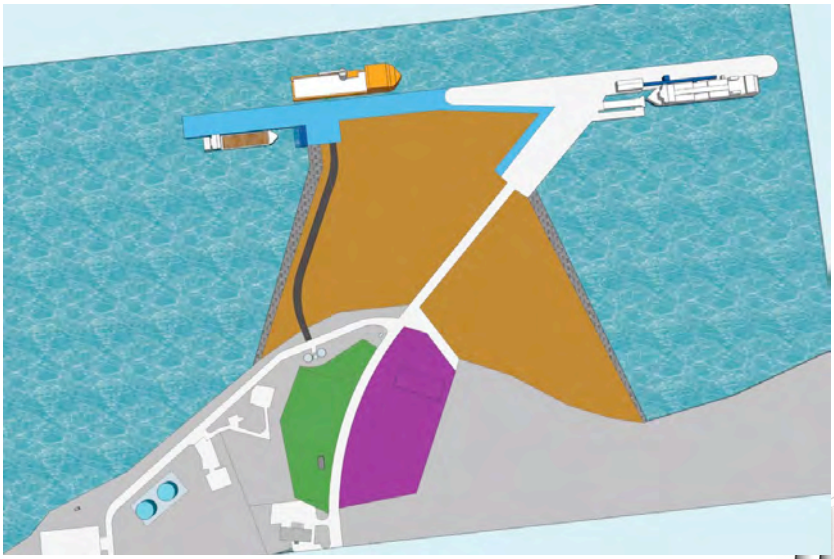
- Reducing conflicts between users and operational activity.
- Resolving the seasonal lack of availability of berths due to cruise, which imposes year-round constraints on other vessels using the quay.
- Providing capacity for offshore wind O&M and crew transfers.
- It will be possible to handle freight and traffic more efficiently and effectively and thereby enable growth across a range of economic sectors.

Hatston has been identified as an optimal base for Service Operation Vessels (SOVs), such as the Esvagt Froude, which would handle O&M, supplies and crew. A typical SOV has length over 80m and draft of 6.5m. Crew may also be transported on Crew Transfer Vessels (CTVs) which are generally smaller vessels with an LOA of between 20m and 40m and a relatively shallow draft. For any one offshore farm site, there could be several SOVs based at port. Different developers would also be likely to want their own facilities.



Core proposals comprise a significant extension to the existing pier and expansion of landside area through reclamation. This will futureproof harbour operations.

The existing outer quay will be extended by 300m (with water depth of -10m CD) and there will be a 125m inner berth. There will be substantially more quayside available both for the existing pier and the extension.



A fixed ramp will be located on the inner berth as well as a specialist boat lift which will have a maximum safe working load of 800 tonnes

able to lift vessels of 40m LOA and 15m beam.

Circa 7.5 hectares of additional land would be made available for harbour-related operations through reclamation.

There will also be an ex-pipe fuel supply and fuel storage facility close to the pier. The design of new infrastructure here will be futureproofed so as to accommodate future provision and storage of alternative (less polluting/carbon-free) fuels and provision of shore power where viable. The development is designed to be built in three phases if required.

Phase 1	• Reclaim shoreline to create 2.96 hectares of laydown / area for marshalling, parking and storage.
Phase 2	• Extend current quay by circa 300m. • Create 1.73 hectares of additional concrete deck area. • Dredging to -10m CD to allow safer approach on to new extended quay.
Phase 3	• Reclaim shoreline to create additional 1.47 hectares of laydown area. • Create inner berth with ramp and boat lift.

There is also potential for the reconfigured pedestrian access within the harbour area to connect to the proposed coastal path identified within the Kirkwall Urban Design Framework (KUDF).

Options to promote sustainable transport will be explored at the feasibility stage, such as the provision of electric vehicle charging points, electric bicycles, electric vehicles as part of car-pooling schemes and linkages with existing and future walking and cycling networks.

In the future there may also be a need to refurbish and/or extend the existing passenger reception facility that caters for both ferry and cruise passengers on the quayside.

4.4 Stromness and Lyness

The opportunity relating to offshore wind activity has extended to Stromness and Lyness; discussions with several offshore wind developers have led to consideration of these locations for specific uses.

Stromness has been identified as an optimal base for rapid response vessels used for quick site visits to westerly offshore wind farm sites when required. Typically they would use a catamaran such as a Seacat with LOA of 24m. At this stage, it is not clear

if an alternative location would be better suited for easterly windfarm sites.

Lyness has been identified as a preferential location for storing equipment such as cables, chains, anchors, etc.

5 ECONOMIC ANALYSIS

5.1 Introduction

In this section we examine whether the preferred option, which has been selected from a shortlist of technical proposals, demonstrably optimises value for money and meets the project objectives. It assesses the economic costs and benefits to society as a whole and takes into consideration risk and uncertainty, optimism bias, distributional impacts and wider socio-economic impacts.

In carrying out this analysis, we have followed the guidance in HM Treasury Green Book[5] which sets out good practice in project development to ensure that a project delivers value for money. All assumptions and data underlying the cost estimates, revenue projections, market outlook and wider economic impacts are documented.

The economic assessment looks at the impact of the project (the 'With project' case) against what would have happened without the project (the 'Reference case' or 'Do nothing'). The results are presented using the metrics:

- **Economic Net Present Value (ENPV)** - a measure of the value of an investment, taking account of all the costs associated with it, the revenue streams it generates and the benefits to the economy over time. A positive (or zero) ENPV indicates that the project is 'worthwhile'.
- **Economic Rate of Return (ERR)** – the discount rate at which the costs and benefits of the project, discounted over its life, are equal.

In the 'With project' case, for each project, we have set out the results for the Base case, which is based on realistic assumptions about what could happen in each of the markets. In future analysis we will also look at Low and High cases to reflect the upper and lower bounds of the expected returns.

We also carry out sensitivity tests to see how sensitive the outcomes are to changes in the assumptions, particularly allowing for optimism bias.

5.2 Contents of this section

The remainder of this section covers the following elements:

- General assumptions
- Capital expenditure
- Operating costs
- Assumptions, summary market outlook and results for each case

An overview of the markets is provided in Section 3 and in this section we summarise the assumptions pertaining to the economic analysis.

[5] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

We also look at the impact on employment and Gross Value Added (GVA) created or safeguarded, and fiscal receipts.

The benefits for each of the proposals has been identified and we have quantified those that have a monetary value in the economic evaluation. Not all benefits could be quantified, but they are still important to the justification of the proposals and should not be overlooked.

Although the results have been presented under each of the locations, it should be noted that, for the offshore wind in particular, a holistic approach needs to be taken: the different locations can offer different elements of the overall offering to developers, and there are dependencies and spin-offs to other activities.

5.3 General assumptions

Time horizon	The analysis is annual from 2021 to 2051 (this can be extended to 50 years in line with Green Book guidance on very long-lived assets, if the scenarios can be well-defined that far into the future).
Prices	Costs and revenues are in 2021 real prices (i.e. no inflation).
Discount rate	3.5%
Taxation	VAT is 11% (based on total UK VAT receipts divided by total UK annual household consumption to capture the fact that not all expenditure is on VAT-rated goods and services). Average income tax, National Insurance contributions and Council Tax is 18.5%. It is assumed that, through fiscal devolution, the Scottish Government receives taxation revenue either directly, or passed on by HM Treasury.
Dues and charges	Orkney Harbour Authority and OIC revenues are based on the 2021-21 Schedule of Charges, supplemented by Aberdeen 2021 charges for oil and gas cargoes.

Average wages and employment

Average wages have been taken from the Scottish Government Financial Scrutiny Unit publication for 2019, inflated to 2021. Where an activity spans more than one sector classification for wages, an average of the wages in relevant sectors has been used.
Employment for cruise and marina activities has been estimated from visitor spend per job (from Highland Council, 'Sustainable Tourism Profile').

Average wages (£/FTE/pa)	
Tourism	£21,612
Fish processing	£29,678
Wholesale/retail trade	£21,672
Offshore	£51,483

Gross value added

Depending on data available, GVA has either been determined from:

- Scotland's Marine Economic Statistics 2018
- The ratio of turnover to GVA (from Scottish Annual Business Survey and from Cebr "The Economic Contribution of the UK Ports Industry" figures for Scotland, 2017).
- GVA per worker from 'Scotland's Marine Economic Statistics, Sept 2018' inflated to 2021 prices.
- Inputs from other research

Ratio of turnover to GVA	
Cruise pax/crew spend	39.8%
Marine leisure	62.7%
Aquaculture	24.4%
Harbour	34.9%
Oil and gas / offshore wind	44.9%
Boat repair	23.3%

GVA	Per worker	Ratio FTE:worker	Per FTE
Offshore wind construction			£73,069
Offshore wind operations			£106,417
Oil and gas	£104,064	85.2%	£122,141
Boat repair			£40,676

Economic multipliers

Indirect and induced impacts have been derived using employment multipliers and GVA multipliers from the Scottish Government 2015 Input-Output tables.
Where an activity spans more than one sector, an average of the multipliers in relevant sectors has been used.

These multipliers have been adjusted downwards to make them more applicable to Orkney.

Composite adjusted multipliers are shown below:

Activity	Employment	GVA	Output
Renewables / Boatyard	1.302	1.315	1.273
Oil and gas	1.367	1.379	1.262
Rig maintenance	1.308	1.330	1.276
Marina/cruise	1.150	1.261	1.265
Harbour operations	1.419	1.243	1.234
Construction	1.377	1.430	1.338

5.4 Implementation timescale and activities

The tables below summarise key project milestones for the Scapa Deep Water Quay and Hatston projects.

Table 1 Project milestones - Scapa Deep Water Quay

Scapa Deep Water Quay Project Milestone:	Time to Complete (months)	Planned Completion Date
Completion of Exemplar Design	5	Q2 2021
Management & Completion of Site Investigation	9	Q1 2022
Appointment of Lead Consultant	7	Q2 2022
Detailed Design	12	Q2 2023 (Enabling works design captured in this date)
Tender for Enabling Works Tender of Main Construction Works	4 4	Start of Q4 2022 End of Q3 2023
Award of Contract: Enabling Works Contract Main Contract	 3 3	 Award – Start Q1 2023 Site - End of Q1 2023 Award – Start Q1 2024 Site – End of Q1 2024
Enabling Works Access Road and Construction Jetty	12	Q1 2024
Quay Construction Works	24 Months + (6 months float)	End Stop Date: Q1 2026 (Float until Q3 2026) *For Phases 1 & 2*
Environmental Assessments	18	Q3 2022
Marine Licence	12	Q4 2022

Table 2 Project milestones - Hatston

Hatston Project Milestone:	Time to Complete (months)	Planned Completion Date
Completion of Exemplar Design	5	Q2 2021
Site Investigation	9	Q1 2022
Appointment of Consultant	7	Q2 2022
Detailed Design	12	Q2 2023
Tender of Construction Works	4	Q3 2023
Award of Contract	3	Award – Start Q1 2024 Site – End Q1 2024
Construction Works	30 + (12 months float)	Q3 2026 (Float to Q3 2027) *All Works Packages*
Environmental Assessments	18	Q3 2022
Marine Licence	12	Q4 2022

5.5 Capital expenditure: summary

Table 3 presents a summary of capital expenditure. The subsequent tables present a detailed breakdown of capital costs for each proposal /location.

- High level capital costs include consultant fees associated with design, feasibility and construction.
- Costs exclude those relating to Harbour Revision Orders (HRO), legal aspects, Environmental Impact Assessment (EIA) and Value Added Tax (VAT).
- A contingency of 10% has been applied to all the costs except the engineering fees and the site investigations and consents. This is construction risk to reflect typical variations in prices and does not include Optimism Bias, which is modelled separately.
- Costs assume that the construction element of each project phase is standalone. Should phases be carried out at the same time, it is expected that savings could be made through shared mobilisation, better access to site and general item costs. The dredging costs, however, are based on all the dredging being carried out at the same time. If it is not, there would be additional costs of getting the dredgers over.
- Phasing includes the additional float period to allow for delays.

Table 3 Capital expenditure summary

Location (£'000)	2021	2022	2023	2024	2025	2026	2027	Total
Scapa DWQ	2,371	12,015	39,633	46,928	46,928	31,285	0	**179,160**
Hatston	922	670	288	20,402	20,221	20,221	3,370	**66,095**
Stromness	750	0	0	0	0	0	0	**750**
Lyness	1,667	533	0	0	0	0	0	**2,200**
Total	**5,710**	**13,218**	**39,921**	**67,330**	**67,150**	**51,507**	**3,370**	**248,206**

Table 4 Capital expenditure - Scapa Deep Water Quay

Project component (£'000)	2021	2022	2023	2024	2025	2026	2027	Total
Main road	0	2,200	0	0	0	0	0	2,200
Land purchase	0	8,000	0	0	0	0	0	8,000
Phase 1								
Investigations, design, consents	1,584	1,038	414	214	214	142	0	3,606
Dredging	0	0	425	510	510	340	0	1,784
Quay	0	0	16,302	19,562	19,562	13,041	0	68,467
Contingency	0	0	1,673	2,007	2,007	1,338	0	7,025
Total	**1,584**	**1,038**	**18,813**	**22,293**	**22,293**	**14,862**	**0**	**80,882**
Phase 2								
Investigations, design, consents	462	459	301	155	155	103	0	1,636
Dredging	0	0	442	530	530	353	0	1,855
Quay	0	0	12,656	15,188	15,188	10,125	0	53,156
Contingency	0	0	1,310	1,572	1,572	1,048	0	5,501
Total	**462**	**459**	**14,709**	**17,444**	**17,444**	**11,630**	**0**	**62,148**
Phase 3								
Investigations, design, consents	324	318	207	107	107	71	0	1,135
Dredging	0	0	281	337	337	225	0	1,180
Quay	0	0	5,086	6,103	6,103	4,069	0	21,361
Contingency	0	0	537	644	644	429	0	2,254
Total	**324**	**318**	**6,111**	**7,191**	**7,191**	**4,794**	**0**	**25,930**
Total	**2,371**	**12,015**	**39,633**	**46,928**	**46,928**	**31,285**	**0**	**179,160**

Table 5 Capital expenditure - Hatston

Project component (£'000)	2021	2022	2023	2024	2025	2026	2027	Total
Phase 1								
Investigations, design, consents	41	33	16	10	0	0	0	100
Reclamation and road access	0	0	0	2,167	2,167	2,167	361	6,862
Contingency	0	0	0	217	217	217	36	686
Total	**41**	**33**	**16**	**2,394**	**2,384**	**2,384**	**397**	**7,648**
Phase 2								
Investigations, design, consents	729	528	227	142	0	0	0	1,626
Dredging	0	0	0	257	257	257	43	815
Quay	0	0	0	12,337	12,337	12,337	2,056	39,067
Contingency	0	0	0	1,259	1,259	1,259	210	3,988
Total	**729**	**528**	**227**	**13,996**	**13,854**	**13,854**	**2,309**	**45,495**
Phase 3								
Investigations, design, consents	153	109	45	28	0	0	0	335
Quay	0	0	0	3,622	3,622	3,622	604	11,470
Contingency	0	0	0	362	362	362	60	1,147
Total	**153**	**109**	**45**	**4,013**	**3,984**	**3,984**	**664**	**12,952**
Total	**922**	**670**	**288**	**20,402**	**20,221**	**20,221**	**3,370**	**66,095**

Table 6 Capital expenditure – Stromness and Copland's Dock

Project component (£'000)	2021	2022	2023	2024	2025	Total
Fenders						
Investigations, design, consents	10	0	0	0	0	10
Fenders	200	0	0	0	0	200
Contingency	20	0	0	0	0	20
Total	**230**	**0**	**0**	**0**	**0**	**230**
Marina expansion						
Investigations, design, consents	30	0	0	0	0	30
Marina	250	0	0	0	0	250
Contingency	25	0	0	0	0	25
Total	**305**	**0**	**0**	**0**	**0**	**305**
Cruise pontoon						
Investigations, design, consents	5	0	0	0	0	5
Cruise pontoon	195	0	0	0	0	195
Contingency	15	0	0	0	0	15
Total	**215**	**0**	**0**	**0**	**0**	**215**
Total	**750**	**0**	**0**	**0**	**0**	**750**

Table 7 Capital expenditure – Lyness

Project component (£'000)	2021	2022	2023	2024	2025	Total
Surfacing						
Investigations, design, consents	0	0	0	0	0	0
Surfacing	1,667	333	0	0	0	2,000
Contingency/ optimism bias	0	200	0	0	0	200
Total	**1,667**	**533**	**0**	**0**	**0**	**2,200**

5.5.1 Optimism bias

Optimism bias (OB) takes into account our demonstrated, systematic tendency to underestimate costs and overestimate benefits. The Green Book recommends that an explicit adjustment be made to the costs, benefits and phasing preferably based on outcomes of comparable projects against budget or using its generic OB percentages if there is no other evidence.

We start with an upper bound of OB and, as more information becomes available, for example from site investigations, and risks are mitigated, the level of OB will reduce towards a lower bound (or the initial contingency).

For this analysis we have used applied OB of 70% for Scapa Deep Water Quay and 30% for the other projects. The generic recommended adjustment ranges from the Green Book Supplementary Guidance are from 66% (upper) to 6% (lower) for non-standard civil engineering projects.

Table 8 Capital expenditure with optimism bias

Project location (£'000)	2021	2022	2023	2024	2025	2026	Total
Scapa DWQ	2,371	12,215	64,267	76,489	76,489	50,993	**282,823**
Hatston	922	670	288	25,917	25,736	25,736	**83,559**
Stromness	750	0	0	0	0	0	**750**
Lyness	1,667	533	0	0	0	0	**2,200**
Total	**5,710**	**13,418**	**64,555**	**102,406**	**102,225**	**76,729**	**369,332**

5.6 Operating costs

It is assumed that the operating and maintenance costs in the reference case are already covered in the Harbour Authority's current budget and are not expected to increase as a result of not implementing these projects.

The costs below are additional costs resulting from the investment. The figures result from discussions with the Harbour Authority and the engineers, and can be refined in the future as the projects progress. They are in 2021 prices.

Staff numbers	• Scapa Deep Water Quay: 1 full-time, 1 part-time pier worker • Hatston: 1 full-time, 2 part-time pier workers. • Stromness: no additional employment • Lyness: no additional employment As the level of activity increases, the requirements for additional manpower may increase.
Average employment costs	Wages = £30,028 (for a pier worker) On-costs = 27.89%. (Source: Orkney Harbour Authority, inflated to 2021 prices)
Maintenance costs	• Hatston = £158k per annum based on 50% of the current maintenance cost for Hatston. • Scapa Deep Water Quay = assumed annual maintenance cost of 0.5% of the base case capital cost. Major refurbishment of the quay will fall outside the timeframe of this evaluation. • Cruise pontoon = £5,000 per annum. • Stromness marina expansion = maintenance cost will be borne by Orkney Marinas Ltd (OML). • Lyness = 0.5% of the base case capital cost
Crown Estate	• Hatston = £9,875 pa based on 50% of the current cost. • Scapa Deep Water Quay = £13,750 per annum based on the current cost for Hatston. • Stromness marina = £5,940 (assumed to be same cost as Kirkwall: Orkney Harbour Authority). • Lyness = no cost
Insurance	• Insurance costs are not expected to change as they are not based on area.

In the following sections we set out the assumptions for each location and market sector.

5.7 Scapa Deep Water Quay

5.7.1 Reference case

There is no facility in the reference case, and hence no suitable harbour infrastructure for supporting the offshore wind sector installation phase, nor handling offshore structures (e.g. rigs and platforms) alongside, or maintaining oil tankers and vessels associated with the offshore sector.

5.7.2 With project

The new Deep Water Quay will enable the following specific activities, but there are expected to be additional market opportunities that have not been identified or quantified at this stage. Notably the windfarms will require decommissioning/ replacing in around 25-30 years' time, but we have not included this at this stage.

Offshore wind

- The project would provide berth and laydown area for the assembly and installation phase of offshore wind farms.

Offshore structures maintenance

- The facilities in Phase 3 would enable structures (e.g. platforms and rigs - in particular, the 6th generation oil rigs which cannot be accommodated elsewhere because they need very deep water) to be serviced alongside.

Passing vessels

- 8,000 vessels a year currently sail past Orkney without stopping. It is very likely that some will call at Scapa Deep Water Quay for emergency repairs or chandlery, for example. They can be accommodated in Phase 3.

Harbour craft

- Harbour tugs and other vessels can be relocated here from Scapa Pier. This will save costs and time, and mean that craft do not have to be moved when the fuel tanker is on Scapa Pier, or when the weather is bad.

MTF hub (separate project)

- There is an opportunity for Scapa Deep Water Quay to be the optimal location for the development of a hub for Marine Transitional Fuels. This has not been included in this assessment.

5.7.2.1 Offshore wind

Orkney lies close to several offshore windfarm sites, giving it an advantage over mainland Scotland ports for the assembly/installation phase as well as ongoing operations and maintenance (O&M). It is expected that construction of the windfarms could commence in 2028. Two of these sites, N1 and N2, are expected to have around 170 turbines each (1GW is planned per site).

Discussions have been held with one developer and the profile of installation and vessel movements has been based on their plans and on the assumption that the two nearest sites, N1 and N2, are developed and served from Orkney. It is possible that additional sites could also be served from Orkney, particularly once it has established a track record, although it will face increasing competition from other ports the further out the sites are.

We have assumed that the windfarms could go ahead with Phases 1 and 2 or just Phase 1 of the investment. We understand that the developers have indicated that they would like both phases. If there is more than one developer, then there could be issues with them both fitting in with Phase 1 only, hence we have modelled them sequentially.

There would be some involvement by local services, but not as much as in the O&M phase as the components are largely being brought in and then shipped out to site.

Key assumptions:

Turbine	• Nacelle: 560 tonnes • Tower sections: 750 tonnes • Blades: 55 tonnes x 3 per turbine • Monopoles: 1,000 tonnes • Jackets: 625 tonnes
Vessels	Examples of delivery vessels to bring the components into port: • mv FAIRPARTNER:15,022GT / capacity for 10 piles • mv OSPREY: 38,722GT / capacity for 10 jackets • mv BOLDWIND: 8,604GT / capacity for 6 turbines A jack-up vessel would be used to take the component out to the windfarm site: • mv VOLTAIRE: 23,641GT / capacity for 30 piles or 10 jackets or 5 turbines per call
Laydown area	• Phase 1: 10.3 hectares, phase 2: 8.3 hectares (assumed to be taken for 12 months of the year even though activity may not be throughout the year) • Charge: £54,000 per hectare per annum
Schedule	Components will be delivered and installed following a proposed schedule from the developer between: • Site 1 – from 2028 to 2032 • Site 2 – from 2031 to 2035 (assumed a 2nd site will follow on from the first).
Local services	Assumed spend per turbine of £50,374 based on the findings from 'Socio-economic impact study of offshore wind' July 2020, QBIS, Denmark.

5.7.2.2 Maintenance of offshore structures and passing vessels

Deepwater oil and gas structures have to return to shore for repair and refurbishment, but the number of ports that have enough depth of water to accommodate these very large structures is limited – most of those in northern waters have to go to Norway.

Platforms and rigs come to Scapa Flow during down times of if they require servicing/maintenance, though not all maintenance can be done at anchor. The local supply chain needs strengthening, but it is developing.

The key risk is competition from other harbours with deep water (e.g. Kishorn, Lerwick, Cromarty), so Orkney would have to ensure its rates are competitive.

These structures could only be accommodated at Scapa Deep Water Quay if Phase 3 of the project including the dredging is carried out. One offshore structure could be serviced alongside at any one time, and still leave space for other users. On average a structure would be alongside for 50 days.

In addition, Phase 3 will allow tankers and other smaller passing vessels to call in for maintenance.

Key assumptions:

Offshore structures	• Six structures per year come for maintenance alongside (berth occupied for about 300 days). • Direct spending on goods and services such as engineering, scaffolding, diving, welding, food and hotels = £300k per month.
Passing vessels	• 10 tankers (55,000 GT) per annum call in. • 1 vessel (10,000 GT) per week calls in. • Average length of stay: eight days for tankers; four days for passing vessels.

5.7.2.3 Harbour craft cost savings

There is a lack of berthing space at Scapa Pier which results in harbour vessels (e.g. tugs) having to move out to Stromness on when the fuel tankers are in port, or in bad weather, which costs money and time. Relocating them to Scapa Deep Water Quay will improve efficiency and save costs.

Key assumptions:

Cost savings	• 250 harbour craft movements per year benefit • Average cost saving of £1,000 per movement

5.7.3 Results

The economic results for Scapa Deep Water Quay are shown in Table 9 below. These reflect the outcome if the Harbour only charges the offshore wind developer ship dues, cargo dues and lease of laydown area. It does not include any concession payment for being an anchor tenant.

We have, however, looked at four different cases of financial arrangement with the windfarm developer and compare the results in section 7. These are:

- Case A: The windfarm anchor tenant pays an annual lease only, no dues and charges, over 25 years. The Harbour receives no income from other users of SDWQ - clearly this is unlikely but reflects the outcome if OH can transfer all the risk to the windfarm developer.
- Case B: the anchor tenant pays a reduced annual lease as well as the normal dues and charges. The Harbour also receives income from other users.
- Case C: as per case B, but with lower lease payments.
- Case D: Only Harbour income, no anchor tenant concession agreement.

The results show that even without a concession payment from the anchor tenant, the ENPV is very positive at +£77.6m, which indicates that the project is worthwhile on economic grounds.

Table 9 Scapa Deep Water Quay: Economic impact - Base case

SDWQ (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051	Total
Costs														
Capital expenditure	2,371	12,015	39,633	46,928	46,928	31,285	0	0	0	0	0	0	0	**179,160**
Operating costs	0	0	11	11	11	82	927	927	927	927	927	927	927	**23,294**
Total costs	**2,371**	**12,015**	**39,644**	**46,939**	**46,939**	**31,368**	**927**	**927**	**927**	**927**	**927**	**927**	**927**	**202,454**
Benefits														
Offshore wind														
Harbour revenue Case D	0	0	0	0	0	0	0	12,573	12,883	12,679	13,449	0	0	**203,815**
Local direct spend	0	0	0	0	0	0	0	1,511	1,511	2,519	4,534	0	0	**17,127**
Total	0	0	0	0	0	0	0	14,084	14,394	15,198	17,983	0	0	**220,942**
Structure/vessel service														
Harbour revenue	0	0	0	0	0	406	1,281	1,281	1,281	1,281	1,281	1,281	1,281	**32,428**
Local direct spend	0	0	0	0	0	1,217	3,650	3,650	3,650	3,650	3,650	3,650	3,650	**92,454**
Total	0	0	0	0	0	1,622	4,930	4,930	4,930	4,930	4,930	4,930	4,930	**124,882**
Passsing ship traffic														
Harbour revenue	0	0	0	0	0	0	298	298	298	298	298	298	298	**7,462**
Total	0	0	0	0	0	0	298	298	298	298	298	298	298	**7,462**
Harbour craft cost savings														
Harbour cost saving	0	0	0	0	0	83	250	250	250	250	250	250	250	**6,333**
Total direct benefit	**0**	**0**	**0**	**0**	**0**	**1,705**	**5,479**	**19,563**	**19,873**	**20,676**	**23,462**	**5,479**	**5,479**	**359,619**
Indirect and induced benefits														
Offshore wind	0	0	0	0	0	0	0	3,357	3,429	3,657	4,387	0	0	**52,404**
Rig service	0	0	0	0	0	431	1,309	1,309	1,309	1,309	1,309	1,309	1,309	**33,151**
Passing traffic	0	0	0	0	0	0	70	70	70	70	70	70	70	**1,747**
Harbour craft cost savings	0	0	0	0	0	19	59	59	59	59	59	59	59	**1,483**
Total indirect and induced	**0**	**0**	**0**	**0**	**0**	**451**	**1,437**	**4,794**	**4,867**	**5,094**	**5,824**	**1,437**	**1,437**	**88,785**
Total benefits	**0**	**0**	**0**	**0**	**0**	**2,156**	**6,916**	**24,357**	**24,740**	**25,770**	**29,286**	**6,916**	**6,916**	**448,404**
Net benefits	**-2,371**	**-12,015**	**-39,644**	**-46,939**	**-46,939**	**-29,212**	**5,989**	**23,430**	**23,813**	**24,843**	**28,359**	**5,989**	**5,989**	**245,950**
NPV at 3.5% (£m)	**£77.6m**													
Financial														
Costs	2,371	12,015	39,644	46,939	46,939	31,368	927	927	927	927	927	927	927	**202,454**
Harbour income	0	0	0	0	0	489	1,829	14,402	14,712	14,508	15,278	1,829	1,829	**250,038**
Net revenue	**-2,371**	**-12,015**	**-39,644**	**-46,939**	**-46,939**	**-30,879**	**902**	**13,475**	**13,785**	**13,581**	**14,351**	**902**	**902**	**47,584**
Financial IRR	**2%**													

Table 10 Scapa Deep Water Quay: Gross Value Added - Base case

Scapa DWQ (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Direct GVA													
Offshore wind													
Harbour	£0	£0	£0	£0	£0	£0	£0	£4,388	£4,496	£4,425	£4,694	£0	£0
Local businesses	£0	£0	£0	£0	£0	£0	£0	£256	£256	£256	£256	£0	£0
Total	£0	£0	£0	£0	£0	£0	£0	£4,644	£4,752	£4,681	£4,949	£0	£0
Structure/vessel service													
Harbour	£0	£0	£0	£0	£0	£142	£447	£447	£447	£447	£447	£447	£447
Local businesses	£0	£0	£0	£0	£0	£449	£1,347	£1,347	£1,347	£1,347	£1,347	£1,347	£1,347
Total	£0	£0	£0	£0	£0	£591	£1,794	£1,794	£1,794	£1,794	£1,794	£1,794	£1,794
Passsing ship traffic													
Harbour revenue	£0	£0	£0	£0	£0	£0	£104	£104	£104	£104	£104	£104	£104
Harbour craft													
Cost saving	£0	£0	£0	£0	£0	£29	£87	£87	£87	£87	£87	£87	£87
Total direct GVA	**£0**	**£0**	**£0**	**£0**	**£0**	**£620**	**£1,985**	**£6,629**	**£6,737**	**£6,666**	**£6,935**	**£1,985**	**£1,985**
Indirect and induced GVA													
Offshore wind	£0	£0	£0	£0	£0	£0	£0	£1,146	£1,172	£1,155	£1,220	£0	£0
Structure/vessel service	£0	£0	£0	£0	£0	£182	£552	£552	£552	£552	£552	£552	£552
Passing ship traffic	£0	£0	£0	£0	£0	£0	£25	£25	£25	£25	£25	£25	£25
Harbour craft	£0	£0	£0	£0	£0	£7	£21	£21	£21	£21	£21	£21	£21
Total indirect and induce	**£0**	**£0**	**£0**	**£0**	**£0**	**£189**	**£599**	**£1,744**	**£1,771**	**£1,753**	**£1,819**	**£599**	**£599**
Total GVA	**£0**	**£0**	**£0**	**£0**	**£0**	**£809**	**£2,584**	**£8,373**	**£8,508**	**£8,419**	**£8,753**	**£2,584**	**£2,584**

Table 11 Scapa Deep Water Quay: Employment - Base case

Scapa DWQ (FTE)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Direct employment													
Harbour Authority	0	0	0	0	0	2	2	2	2	2	2	2	2
Local businesses:													
Offshore wind	0	0	0	0	0	0	0	4	4	4	4	0	0
Structure/vessel service	0	0	0	0	0	4	13	13	13	13	13	13	13
Total	**0**	**0**	**0**	**0**	**0**	**6**	**14**	**18**	**18**	**18**	**18**	**14**	**14**
Indirect and induced employment													
Harbour Authority	0	0	0	0	0	1	1	1	1	1	1	1	1
Local businesses:													
Offshore wind	0	0	0	0	0	0	0	1	1	1	1	0	0
Structure/vessel service	0	0	0	0	0	1	4	4	4	4	4	4	4
Total	**0**	**0**	**0**	**0**	**0**	**2**	**5**	**6**	**6**	**6**	**6**	**5**	**5**
Total	**0**	**0**	**0**	**0**	**0**	**8**	**19**	**23**	**23**	**23**	**23**	**19**	**19**

Table 12 Scapa Deep Water Quay: Fiscal contribution - Base case

Scapa DWQ (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Direct	0	0	0	0	0	49	130	164	164	164	164	130	130
Indirect	0	0	0	0	0	16	41	51	51	51	51	41	41
Total	**0**	**0**	**0**	**0**	**0**	**65**	**171**	**215**	**215**	**215**	**215**	**171**	**171**

5.8 Hatston

5.8.1 Reference case

Without the masterplan proposals, there would be no change in current activity at Hatston.

5.8.2 With project

There are three main activities that are enabled by the investment in Hatston.

Offshore wind

- The project would provide quay access and landside development /laydown area for the operations and maintenance (O&M) phase of offshore wind farms.

Oil and gas

- New infrastructure and ex-pipe fuelling at Hatston would enable Orkney to better service the oil and gas market in the form of an operations/supply base for the sector, served by platform supply vessels (PSVs) and Safety Stand-by Vessels (SSVs) and other offshore vessels.
- Cargo is also imported into Orkney and transferred to oil and gas fields and vice versa, The Harbour Authority could charge cargo dues each time, as happens in Aberdeen; the analysis assumes this is the case.

Boat repair

- It will enable a boat repair business to locate at Hatston with a slipway and boat lift.

5.8.2.1 Offshore wind

The developers of offshore wind sites have already shown interest in setting up an O&M base in Hatston.

Key assumptions:

Vessels	Typical vessel for O&M, supply and crew changes: • ESVAGT SOV: 5,230GT
Laydown area	• Phase 1: 3 hectares would be available. We have assumed that the developer takes all 3 hectares. If this is not the case, then the area could be let to other users. • Charge: £74,132 per hectare per annum (£30,000 per acre)
Schedule	• 12 supply calls per annum and 24 O&M calls per windfarm (x2) (ramped up over initial years of operation)
Local services	• Assumed local turnover of £940k based on 'Socio-economic impact study of offshore wind' July 2020, QBIS, Denmark.

5.8.2.2 Oil and gas

Orkney is in close proximity to the West of Shetland oil assets, and Hatston is the closest deep water port to key developments which should be coming on-stream in the next decade. We have assumed that further exploration begins and there is some development after 2027, which means there is the opportunity to grow the existing customer base and for Hatston to become a hub for oil and gas supply operations.

It is very difficult to estimate the potential traffic given that this is a new area of development. We have, therefore, taken the operations using Aberdeen (3,353 PSVs and 939 SSVs/other vessels in 2017) as a starting point and assumed traffic in Orkney is a small percentage of that activity (2% rising to 5% over 10 years).

There will also be benefits to local services. The supply chain for oil and gas is well-established and initially a large proportion of supplies will be imported from elsewhere in Scotland or from rest of UK/world, but we have, in the absence of information, put in a nominal amount to reflect the strengthening of the local capabilities.

Vessels	Typical cargo vessel for delivery to Orkney: • Avonburgh = 2,100GT • Carrying capacity of 10,000 tonnes (we assume ferries are not used for this cargo) • PSV = 3,104GT • SSV and other vessels = 1,343GT
Carrying capacity	• Avonburgh: 10,000 tonnes (we assume ferries are not used for this cargo) • PSV per trip: Water: 100 tonnes; fuel: 95 tonnes; drilling muds/slurry: 55 tonnes; equipment including pipe: 45 tonnes; other including food: 165 tonnes; and scrap: 40 tonnes.
Schedule	• 12 supply calls per annum and 24 O&M calls per windfarm (x2) (ramped up over initial years of operation)
Local services	• £100,000 turnover pa

5.8.2.3 Boatyard

The overall market outlook for boat repair looks good. Offshore wind will create new demand for maintenance of vessels, and there is also demand locally from aquaculture vessels, harbour craft and others. Some of these vessels will currently be going to other boatyards in Scotland, so we would need to take account of

displacement of activity, but larger ones in particular may have to go overseas which imposes additional costs and time on operators.

Key assumptions:

Revenue to Harbour	• £45,000 per year lease
Wider benefits	• Boatyard turnover building up to £1m per year

5.8.3 Results

The economic results for Hatston are shown in Table 13 below. As with SDWQ, these reflect the outcome if the Harbour only charges the offshore wind developer ship dues and lease of land. Hatston would remain a common user facility, so would not have an anchor tenant, but it would not be unreasonable to expect the windfarm operator to contribute towards the cost of providing the infrastructure.

We have, therefore also looked at four different cases of financial arrangement with the windfarm developer and compare the results in section 7. These are:

- Case A: The windfarm operator pays an annual lease only, paid annually once O&M commences, and this covers the costs of developing Hatston.
- Case B: the windfarm operator pays a reduced annual lease as well as the normal dues and charges. The Harbour also receives income from other business enabled by the development.
- Case C: as per case B, but with lower lease payments.
- Case D: Only Harbour income.

Without a contribution from the windfarm operator, the ENPV of Hatston is -£21.1m.

Table 13 Hatston: Economic impact - Base case

Hatston (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051	Total
Costs														
Capital expenditure	922	670	288	20,402	20,221	20,221	3,370	0	0	0	0	0	0	**66,095**
Operating costs	0	0	0	0	0	0	87	245	245	245	245	245	245	**5,959**
Total costs	**922**	**670**	**288**	**20,402**	**20,221**	**20,221**	**3,457**	**245**	**245**	**245**	**245**	**245**	**245**	**72,054**
Benefits														
Offshore wind														
Harbour revenue Case D	0	0	0	0	0	0	0	332	346	346	456	470	470	**10,878**
Local services	0	0	0	0	0	0	0	940	940	940	940	940	940	**22,560**
Total	0	0	0	0	0	0	0	1,272	1,286	1,286	1,396	1,410	1,410	**33,438**
Boatyard														
Harbour revenue	0	0	0	0	0	0	38	45	45	45	45	45	45	**1,118**
Boatyard benefit	0	0	0	0	0	0	135	189	216	243	270	270	270	**6,453**
Total	0	0	0	0	0	0	173	234	261	288	315	315	315	**7,571**
Oil and gas supply vessels														
Harbour revenue	0	0	0	0	0	0	222	265	265	400	400	665	665	**14,189**
Local services	0	0	0	0	0	0	83	100	100	100	100	100	100	**2,483**
Total	0	0	0	0	0	0	305	365	365	500	500	765	765	**16,672**
Total direct benefit	**0**	**0**	**0**	**0**	**0**	**0**	**478**	**1,872**	**1,913**	**2,074**	**2,211**	**2,490**	**2,490**	**57,681**
Indirect and induced benefits														
Offshore wind	0	0	0	0	0	0	0	334	338	338	363	367	367	**8,705**
Boatyard	0	0	0	0	0	0	46	62	69	77	84	84	84	**2,023**
Oil and gas supply vessels	0	0	0	0	0	0	74	88	88	120	120	182	182	**3,974**
Total indirect and induced	**0**	**0**	**0**	**0**	**0**	**0**	**119**	**485**	**496**	**534**	**567**	**633**	**633**	**14,702**
Total benefits	**0**	**0**	**0**	**0**	**0**	**0**	**597**	**2,357**	**2,408**	**2,608**	**2,778**	**3,123**	**3,123**	**72,382**
Net benefits	**-922**	**-670**	**-288**	**-20,402**	**-20,221**	**-20,221**	**-2,860**	**2,112**	**2,163**	**2,363**	**2,534**	**2,878**	**2,878**	**328**
NPV at 3.5% (£m)	**-£21.2m**													
Financial														
Costs	922	670	288	20,402	20,221	20,221	3,457	245	245	245	245	245	245	
Harbour income	0	0	0	0	0	0	222	265	265	400	400	665	665	**14,189**
Net revenue	**-922**	**-670**	**-288**	**-20,402**	**-20,221**	**-20,221**	**-3,235**	**21**	**21**	**155**	**155**	**421**	**421**	**-57,865**
Financial IRR	**-11%**													

Table 14 Hatston: Gross Value Added - Base case

Hatston (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Direct GVA													
Offshore wind													
Harbour	£0	£0	£0	£0	£0	£0	£0	£116	£121	£121	£159	£164	£164
Local businesses	£0	£0	£0	£0	£0	£0	£0	£5,321	£5,321	£5,321	£5,321	£5,321	£5,321
Total	£0	£0	£0	£0	£0	£0	£0	£5,437	£5,442	£5,442	£5,480	£5,485	£5,485
Boatyard													
Harbour	£0	£0	£0	£0	£0	£0	£13	£16	£16	£16	£16	£16	£16
Local businesses	£0	£0	£0	£0	£0	£0	£117	£163	£186	£210	£233	£233	£233
Total	£0	£0	£0	£0	£0	£0	£130	£179	£202	£225	£249	£249	£249
Oil and gas supply vessels													
Harbour	£0	£0	£0	£0	£0	£0	£77	£93	£93	£140	£140	£232	£232
Local services	£0	£0	£0	£0	£0	£0	£37	£45	£45	£45	£45	£45	£45
Total	£0	£0	£0	£0	£0	£0	£115	£138	£138	£184	£184	£277	£277
Aquaculture													
Harbour	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Local businesses	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Total	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Total direct GVA	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£244**	**£5,753**	**£5,781**	**£5,851**	**£5,913**	**£6,011**	**£6,011**
Indirect and induced GVA													
Offshore wind	£0	£0	£0	£0	£0	£0	£0	£1,707	£1,708	1,708	1,717	1,718	£1,718
Boatyard	£0	£0	£0	£0	£0	£0	£31	£37	£37	48	48	71	£71
Oil and gas supply vessel	£0	£0	£0	£0	£0	£0	£33	£40	£40	£51	£51	£73	£73
Aquaculture	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Total indirect and induce	£0	£0	£0	£0	£0	£0	£64	£1,783	£1,784	£1,807	£1,816	£1,862	£1,862
Total GVA	**£0**	**£0**	**£0**	**£0**	**£0**	**£0**	**£308**	**£7,536**	**£7,565**	**£7,658**	**£7,729**	**£7,873**	**£7,873**

Table 15 Hatston: Employment – Base case

Hatston (FTE)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Direct employment													
Harbour Authority	0	0	0	0	0	0	2	2	2	2	2	2	2
Local businesses:													
Offshore wind	0	0	0	0	0	0	0	50	50	50	50	50	50
Boatyard	0	0	0	0	0	0	3	4	5	5	6	6	6
Oil and gas supply vessels	0	0	0	0	0	0	0	0	0	0	0	0	0
Aquaculture (safeguarded	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**56**	**57**	**58**	**58**	**58**	**58**
Indirect and induced employment													
Harbour Authority	0	0	0	0	0	0	1	1	1	1	1	1	1
Local businesses:													
Offshore wind	0	0	0	0	0	0	0	15	15	15	15	15	15
Boatyard	0	0	0	0	0	0	1	1	1	2	2	2	2
Oil and gas supply vessels	0	0	0	0	0	0	0	0	0	0	0	0	0
Aquaculture (safeguarded	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**17**	**17**	**18**	**18**	**18**	**18**
Total	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**74**	**74**	**75**	**76**	**76**	**76**

Table 16 Hatston: Fiscal contribution - Base case

Hatston (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Direct	0	0	0	0	0	0	14	15	15	15	15	15	15
Indirect	0	0	0	0	0	0	5	5	5	5	5	5	5
Total	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**20**	**20**	**20**	**20**	**20**	**20**

5.9 Stromness

Stromness has been identified by windfarm developers as a suitable location for rapid response vessels, at least for the westerly windfarm site.

There is an existing marina in Stromness which is operating near or at capacity. There are also conflicts and security issues between the marina and cruise liners; the latter come alongside in Stromness and several tender their passengers ashore through the marina facility. This setup does not encourage the cruise liners.

5.9.1 Reference case

There would be no change in current activities and, without the pontoon, it would not be acceptable to have offshore wind catamarans also using the marina facilities.

5.9.2 With project

Benefits of developing Stromness will be delivered for the following activities:

•Offshore wind

- Stromness is closer to the west windfarm site than Hatston, which will reduce access time and therefore be preferable for rapid response.

•Marina expansion

- The marina will be expanded with 12 new berths and there will be increased activity arising from this.

Cruise

- With a cruise pontoon located in Stromness, tendering will be safer and easier, thus safeguarding the current number of visiting cruise liners and encouraging more.

Marine leisure tours

- The presence of a cruise pontoon may be attractive to providers of marine tours and dive boats, providing safe access and egress for boat passengers.

5.9.2.1 Offshore wind

Key assumptions:

Vessel	• Seacat type catamaran 78GT
Frequency	• 24 trips per annum

5.9.2.2 Marine leisure

Sailing tourism is a growth area; a recent report estimates that sailing tourism in Scotland could grow by up to 28% by 2023 (EKOS 'Sailing Tourism in Scotland', 2016). The Scottish Government also envisages Scotland being a marine tourism destination of first choice. Orkney has good potential for growing its marine tourism:

- It provides much needed shelter for boats crossing the Pentland Firth.
- Larger boats are currently being turned away because they cannot be accommodated.
- There is a waiting list for resident berths (although this underestimates demand as people know the marina is full).

Key assumptions:

Berths	• 12 additional berths for visitors
Vessel	• Leisure boat average length = 11.4m (source OHA)
Usage	• Visitor boat-nights per visitor berth are assumed to start at 40 in year 1, gradually increasing to 72 by year 5, then remaining constant.
Spending	• Average visitor boat spend (including berth fees): £153 (source: EKOS, in 2021 prices)
Charge	• Visitor rate for boats over 10m: £21.00 fixed charge plus £1.75 per metre over 10m. Average charge per visiting yacht call is therefore £24.50 including VAT (source: OML).

5.9.2.3 Cruise

There were 52 cruise calls to Stromness in 2018 and 2019. Of these 49 came alongside and three tendered their passengers into the town, using the marina as a landing area. The ships that tendered in were the smaller expedition cruises.

Given the safety and security concerns of this arrangement, the presence of a cruise pontoon will safeguard existing tendered calls and potentially attract several more each year.

Key assumptions:

Vessel	Small to medium cruise ship (based on analysis of OH data): • 12,000GT • 207 passengers (max) • 125 crew (max) • Average occupancy = 89%
Visits	• 4 additional cruise calls • 97% of passengers and crew coming ashore

Spending	• Average spend per passenger: £57.09 (2021 prices), including mark-up on tours by cruise company (assumed 15%); local spend: £48.52. • Average spend per crew: £9.91

5.9.3 Results

The outcomes for Stromness are shown in Table 17. The ENPV is positive at £2.5m indicating that this is worthwhile.

Table 17 Stromness: Economic impact - base case

Stromness (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Costs													
Capital expenditure	750	0	0	0	0	0	0	0	0	0	0	0	0
Operating costs	6	10	10	10	10	10	10	10	10	10	10	10	10
Total costs	**756**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Benefits													
Offshore wind													
Harbour revenue	0	0	0	0	0	0	0	0	0	0	6	12	12
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**12**	**12**
Marina (excl VAT)													
OML revenue less OHA %	0	0	9	9	11	13	16	16	16	16	16	16	16
OHA revenue	0	0	3	3	3	4	4	5	5	5	5	5	5
Local direct spend	0	0	55	55	68	82	96	99	99	99	99	99	99
Total	**0**	**0**	**57**	**57**	**72**	**86**	**100**	**103**	**103**	**103**	**103**	**103**	**103**
Cruise													
Harbour revenue	0	18	18	18	18	18	18	18	18	18	18	18	18
Local direct spend	0	35	35	35	35	35	35	35	35	35	35	35	35
Total	**0**	**53**	**53**	**53**	**53**	**53**	**53**	**53**	**53**	**53**	**53**	**53**	**53**
Total direct benefit	**0**	**53**	**110**	**110**	**125**	**139**	**153**	**156**	**156**	**156**	**162**	**168**	**168**
Indirect and induced benefits													
Offshore wind	0	0	0	0	0	0	0	0	0	0	1	3	3
Marina	0	0	17	17	21	26	30	31	31	31	31	31	31
Cruise	0	13	13	13	13	13	13	13	13	13	13	13	13
Total indirect and induced	**0**	**13**	**31**	**31**	**35**	**39**	**44**	**44**	**44**	**44**	**46**	**47**	**47**
Total benefits	**0**	**66**	**141**	**141**	**160**	**178**	**197**	**200**	**200**	**200**	**208**	**215**	**215**
Net benefits	**-756**	**57**	**131**	**131**	**150**	**168**	**187**	**191**	**191**	**191**	**198**	**205**	**205**
NPV at 3.5% (£m)	**£2.5m**												
Financial													
Costs	756	10	10	10	10	10	10	10	10	10	10	10	10
Harbour income	0	18	20	20	21	22	22	22	22	22	22	22	22
Net revenue	**-756**	**8**	**11**	**11**	**11**	**12**	**13**	**13**	**13**	**13**	**13**	**13**	**13**
Financial IRR	**-4%**												

Table 18 Stromness: Gross Value Added – Base case

Stromness (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Direct GVA													
Offshore wind													
Harbour	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Marina													
Harbour	£0	£0	£3	£3	£3	£4	£4	£5	£5	£5	£5	£5	£5
Local businesses	£0	£0	£34	£34	£43	£51	£60	£62	£62	£62	£62	£62	£62
Total	£0	£0	£37	£37	£46	£55	£64	£66	£66	£66	£66	£66	£66
Cruise													
Harbour	£0	£6	£6	£6	£6	£6	£6	£6	£6	£6	£6	£6	£6
Local businesses	£0	£14	£14	£14	£14	£14	£14	£14	£14	£14	£14	£14	£14
Total	£0	£20	£20	£20	£20	£20	£20	£20	£20	£20	£20	£20	£20
Total direct GVA	**£0**	**£20**	**£57**	**£57**	**£66**	**£75**	**£85**	**£87**	**£87**	**£87**	**£87**	**£87**	**£87**
Indirect and induced GVA													
Offshore wind	£0	£0	£0	£0	£0	£0	£0	£0	£0	0	0	0	£0
Marina	£0	£0	£10	£10	£12	£14	£17	£17	£17	£17	£17	£17	£17
Cruise	£0	£5	£5	£5	£5	£5	£5	£5	£5	£5	£5	£5	£5
Total indirect and induce	**£0**	**£5**	**£15**	**£15**	**£17**	**£20**	**£22**	**£22**	**£22**	**£22**	**£22**	**£22**	**£22**
Total GVA	**£0**	**£25**	**£72**	**£72**	**£83**	**£95**	**£107**	**£109**	**£109**	**£109**	**£109**	**£109**	**£109**

Table 19 Stromness: Employment – Base case

Stromness (£'000)	2,021	2,022	2,023	2,024	2,025	2,026	2,027	2,028	2,029	2,030	2,031	2,041	2,051
Direct employment													
Harbour Authority	0	1	1	1	1	1	1	1	1	1	1	1	1
Local businesses:													
Offshore wind	O&M under Hatston												
Marina	0	0	2	2	2	3	3	4	4	4	4	4	4
Cruise	0	1	1	1	1	1	1	1	1	1	1	1	1
Total	**0**	**2**	**4**	**4**	**5**	**5**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Indirect and induced employment													
Harbour Authority	0	0	0	0	0	0	0	0	0	0	0	0	0
Local businesses:													
Offshore wind	O&M under Hatston												
Marina	0	0	0	0	0	0	1	1	1	1	1	1	1
Cruise	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Total	**0**	**2**	**5**	**5**	**5**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**

Table 20 Stromness: Fiscal contribution - Base case

Stromness (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Direct	0	11	19	19	21	23	25	25	25	25	25	25	25
Indirect	0	1	2	2	2	2	3	3	3	3	3	3	3
Total	**0**	**11**	**21**	**21**	**23**	**25**	**27**	**28**	**28**	**28**	**28**	**28**	**28**

5.10 Lyness

Lyness has been identified as a suitable location for the storage of anchors and chains etc for the offshore wind farms. The original masterplan project was principally the remediation of the southern section of Harbour land towards the ferry linkspan. This will take some time and would not be required for offshore wind. We have therefore only included resurfacing the already surfaced northerly section in the compound.

Key assumptions:

Land available	• 2 hectares
Charge	• £54,000 per hectare pa for the duration of the delivery and installation activities

5.10.1 Results

The results for Lyness are shown in Table 21. The project shows a small negative ENPV, but this is not surprising given that the Harbour is only receiving income for 8 years. It would be expected that other uses would be found for the site in the future.

There is no additional employment and hence fiscal contribution associated with Lyness.

Table 21 Lyness: Economic impact - base case

Lyness ('000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051	Total
Costs														
Capital expenditure	1,667	533	0	0	0	0	0	0	0	0	0	0	0	**2,200**
Operating costs	0	0	11	11	11	11	11	11	11	11	11	11	11	**319**
Total costs	**1,667**	**533**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**2,519**
Benefits														
Offshore wind														
Harbour revenue	0	0	0	0	0	0	0	108	108	108	108	0	0	**1,728**
Total direct benefits	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**108**	**108**	**108**	**108**	**0**	**0**	**1,728**
Indirect and induced benefits														
Offshore wind	0	0	0	0	0	0	0	25	25	25	25	0	0	**405**
Total indirect & induced	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**25**	**25**	**25**	**25**	**0**	**0**	**405**
Total benefits	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**133**	**133**	**133**	**133**	**0**	**0**	**2,133**
Net benefits	**-1,667**	**-533**	**-11**	**-11**	**-11**	**-11**	**-11**	**122**	**122**	**122**	**122**	**-11**	**-11**	**-386**
NPV at 3.5% (£m)	**-£1.1m**													
Financial														
Harbour costs	1,667	533	11	11	11	11	11	11	11	11	11	11	11	**2,519**
Harbour benefits	0	0	0	0	0	0	0	108	108	108	108	0	0	**1,728**
Net revenue	**-1,667**	**-533**	**-11**	**-11**	**-11**	**-11**	**-11**	**97**	**97**	**97**	**97**	**-11**	**-11**	**-791**
Financial IRR	**-2%**													

5.10.2 Combined results

The projects collectively return an ENPV of £57.8m in the base case if the windfarm developer does not make a contribution over and above the usual charges.

If SDWQ phase 2 is not constructed, the ENPV rises slightly to £58.3m.

5.10.3 Sensitivity tests and optimism bias

There are considerable uncertainties regarding the capital costs, particularly for Scapa Deep Water Quay. As the projects progress and more information from surveys and design work becomes available, these risks will be reduced as costs are refined. In the table below, we show the impact on the ENPVs of including high level optimism bias.

Table 22 Sensitivity of results to optimism bias

Project	Capital cost ('000) Base case	OB	Capital cost ('000) (with OB)	ENPV Base case	ENPV (with OB)
SDWQ	179,160	70%	282,823	£77.6m	-£18.4m
Hatston	66,095	30%	83,559	-£21.2m	-£35.8m
Stromness	750	30%	938	£2.5m	£2.3m
Lyness	2,200	30%	2,800	-£1.1m	-£1.8m
All projects	**248,206**		**370,120**	**£57.8m**	**-£53.7m**

5.10.4 Construction phase impacts

The construction of these infrastructure projects will create/support jobs and GVA in the construction sector. The advice of Scottish Enterprise Economic Impact Guidance is to report the impact on the construction sector, but to keep it separate from the overall impact of the projects themselves.

The reasons for this are that the construction impacts are essentially a by-product of the intervention, they are temporary, and it would be misleading to include them. In addition, deadweight may be high as there may be leakages out of the Scottish economy. This is considered to be particularly relevant to works at Scapa Deep Water Quay because they are likely to require specialist contractors from overseas, and may have limited domestic impact.

This will be examined in more detail in the business case.

6 FINANCIAL ASSESSMENT

The Financial analysis is closely related to the Economic analysis but focuses on the affordability of the scheme and excludes the wider economic impacts.

This section summarises forecast financial costs (capital expenditure and operating costs) and revenues to Orkney Harbour Authority. Detailed funding options will be developed in the business case when we have a better idea of the funding gap depending on whether the windfarm developer is expected to contribute to the project or not.

Table 23 Summary of Orkney Harbours costs – Base case

(£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2041	2051
Capital expenditure													
Scapa Deep Water Quay	2,371	12,015	39,633	46,928	46,928	31,285	0	0	0	0	0	0	0
Hatston	922	670	288	20,402	20,221	20,221	3,370	0	0	0	0	0	0
Stromness	744	0	0	0	0	0	0	0	0	0	0	0	0
Lyness	1,667	533	0	0	0	0	0	0	0	0	0	0	0
Total	**5,704**	**13,218**	**39,921**	**67,330**	**67,150**	**51,507**	**3,370**	**0**	**0**	**0**	**0**	**0**	**0**
Operating costs													
Scapa Deep Water Quay	0	0	11	11	11	82	927	927	927	927	927	927	927
Hatston	0	0	0	0	0	0	87	245	245	245	245	245	245
Stromness	6	10	10	10	10	10	10	10	10	10	10	10	10
Lyness	0	0	11	11	11	11	11	11	11	11	11	11	11
Total	**6**	**10**	**32**	**32**	**32**	**103**	**1,034**	**1,192**	**1,192**	**1,192**	**1,192**	**1,192**	**1,192**
Total costs													
Scapa Deep Water Quay	2,371	12,015	39,644	46,939	46,939	31,368	927	927	17,863	39	39	39	927
Hatston	922	670	288	20,402	20,221	20,221	3,457	245	232	232	232	232	245
Stromness	750	10	10	10	10	10	10	10	53	53	53	53	10
Lyness	1,667	533	11	11	11	11	11	11	10	10	10	10	11
Total	**5,710**	**13,228**	**39,953**	**67,362**	**67,181**	**51,610**	**4,405**	**1,192**	**18,158**	**334**	**334**	**334**	**1,192**

Table 24 Summary of Orkney Harbour Authority revenues – base case

Project location (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2031	2041	2051
Scapa Deep Water Quay												
Harbour revenue Case D	0	0	0	0	0	0	0	12,573	12,883	13,449	0	0
Structure/vessel service	0	0	0	0	0	406	1,281	1,281	1,281	1,281	1,281	1,281
Passing vessels	0	0	0	0	0	0	298	298	298	298	298	298
Harbour craft cost savings	0	0	0	0	0	83	250	250	250	250	250	250
Total	**0**	**0**	**0**	**0**	**0**	**489**	**1,829**	**14,402**	**14,712**	**15,278**	**1,829**	**1,829**
Hatston												
Offshore windfarms Case D	0	0	0	0	0	0	0	332	346	456	470	470
Boatyard	0	0	0	0	0	0	38	45	45	45	45	45
Oil and gas support	0	0	0	0	0	0	222	265	265	400	665	665
Aquaculture	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**259**	**643**	**657**	**901**	**1,180**	**1,180**
Stromness												
Offshore wind response	0	0	0	0	0	0	0	0	0	6	12	12
Marina	0	0	3	3	3	4	4	5	5	5	5	5
Cruise	0	18	18	18	18	18	18	18	18	18	18	18
Total	**0**	**18**	**20**	**20**	**21**	**22**	**22**	**22**	**22**	**28**	**34**	**34**
Lyness												
Offshore wind storage	0	0	0	0	0	0	0	108	108	108	0	0
Total	**0**	**18**	**20**	**20**	**21**	**511**	**2,111**	**15,175**	**15,499**	**16,315**	**3,043**	**3,043**

Table 25 Summary of costs and revenues

Base case (£'000)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2031	2041	2051
Total cost	5,710	13,228	39,953	67,362	67,181	51,610	4,405	1,192	1,192	1,192	1,192	1,192
Total revenue	0	18	20	20	21	511	2,111	15,067	15,391	16,207	3,043	3,043
Revenue – Cost	**-5,710**	**-13,210**	**-39,932**	**-67,342**	**-67,160**	**-51,099**	**-2,294**	**13,875**	**14,199**	**15,015**	**1,851**	**1,851**
Cumulative	-5,710	-18,920	-58,852	-126,193	-193,354	-244,453	-246,747	-232,872	-218,673	-189,529	-120,247	-949

The above comparison of costs and revenues for all proposals shows that the additional operating costs will be significant in relation to the additional revenue, but that the Harbour Authority will be able to meet them.

7 SUMMARY AND CONCLUSIONS

7.1 Summary

This analysis is based upon the discounted cash flow technique. This permits valuations, or assessment of outcomes, based upon calculating the Net Present Value of a project. If the NPV of a project is zero or above, it is viable, at the cost of capital ("discount rate") which is used (in our analysis 3.5%). Where the NPV is above zero, and there are alternatives, then the highest NPV may indicate a preferred project.

Project viability is considered at two levels:

- **Financially viable** means that the investment yields income to Orkney Harbours sufficient for a project to make an acceptable financial return on investment.
- **Economically viable** means that the investment yields income to Orkney Harbours plus economic benefits to Orkney and further afield, sufficient for a project to make an acceptable economic return on investment.

Results are presented in a continuum based upon the level of risk transferred from OIC to a wind farm developer/operator:

- **Case A – Financially viable project (min risk to Orkney Harbours):** All the revenue risk is transferred. This is arguably the goal for negotiations.
- **Case B – Financially viable project (higher risk to Orkney Harbours):** OIC retains risk from variable income (dues). This is perhaps the fallback position.
- **Case C – Economically viable project** (*if relevant*[6]): OIC retains risk from variable income, but the lease payments are too low for financial viability. This is the worst acceptable case.
- **Case D – The outcome** of the project with no lease payments.

Thus the first three cases (A, B, C) essentially use the analysis to generate valuations to achieve an objective, whereas the last case (D) is an outcome.

The results are presented in the table overleaf for two options for both SDWQ and Hatston:

- SDWQ: All phases (1, 2, 3) constructed.
- SDWQ: Only phases 1 and 3 constructed.
- Hatston: All phases (1, 2, 3) constructed.
- Hatston: Only phases 1 and 2 constructed.

[6] This is only relevant if the project would not be economically viable under Case D.

The table shows the Financial Net Present Value (FNPV), and the Economic Net Present Value (ENPV).

For SDWQ, the results show the valuation based on lease payment made over 25 years.

SDWQ	Fin NPV	ENPV	Annual lease (25 years)	Total contribution
All 3 phases				
Case A (lease only)	**£0.0m**	**£119.5m**	**£12.3m**	**£308.7m**
Case B	**£0.0m**	**£115.2m**	**£2.3m**	**£56.8m**
Case C	Not Applicable			
Case D	**-£30.5m**	**£77.6m**	**£0.0m**	**£0.0m**
Phases 1 and 3				
Case A (lease only)	**£0.0m**	**£105.9m**	**£8.0m**	**£201.1m**
Case B	**£0.0m**	**£101.7m**	**£1.4m**	**£35.7m**
Case C	Not applicable			
Case D	**-£19.2m**	**£78.1m**	**£0.0m**	**£0.0m**

For Hatston, the results show the valuation based on lease payments made annually from the start of O&M over the whole remaining period for analysis (23 years).

Hatston	Fin NPV	ENPV	Annual lease (O&M ops)
All 3 phases			
Case A (lease only)	**£0.0m**	**£34.9m**	**£4.7m**
Case B	**£0.0m**	**£34.9m**	**£3.6m**
Case C	**-£28.3m**	**£0.0m**	**£1.4m**
Case D	**-£45.4m**	**-£21.2m**	**£0.0m**
Phases 1 and 2			
Case A (lease only)	**£0.0m**	**£27.9m**	**£3.8m**
Case B	**£0.0m**	**£27.9m**	**£2.7m**
Case C	**-£22.6m**	**£0.0m**	**£0.9m**
Case D	**-£34.6m**	**-£14.8m**	**£0.0m**

7.2 Conclusions

7.2.1 SDWQ (All phases)

Case A: Taking the view that this project is primarily driven by ORE, and the Developer should pay for it, the lease payment required is £12.3m pa over 25 years. This rolls up all dues (from the Developer) and variable income into this payment. (In practice any non-developer users will still be paying dues.)

Case B: If Orkney Harbours was to still rely on income from variable dues from the Developer (and therefore take the risk on what level of income it actually receives), then the lease payment would be £23m pa over 25 years.[7]

Case C: not relevant.

Case D: Even if the Developer were to pay no lease fees, the project yields a positive ENPV of £77.6m. This is a viable project, all things being equal, however one looks at it.

7.2.2 SDWQ (Phases 1 and 3 only)

Under this option, the lease payments the Developer would have to make are obviously lower in Cases A and B, because the capital cost is lower.

Under Case D, it is important to note there is a higher ENPV for only Phases 1 and 3 (£78.1m), in comparison to all phases (£77.6m). This means that, from Orkney Harbours' perspective, it may have a preference for only Phases 1 and 3.

However, the analysis assumes that a Developer can achieve the same outcomes without Phase 2. There isn't enough knowledge at this stage to understand exactly what infrastructure is required to accomplish what. This will depend on the Developer's methods, and their timescales. It is important to retain the discipline of only planning what is needed, and so Developers will need to be challenged on their requirements.

7.2.3 Hatston (All phases)

Case A: The lease payment required is £4.7m pa over the period of the analysis. This includes all variable payments from the Developer, and in practice dues from other users would be received in addition.

Case B: The reduced lease payment is £3.6m pa.

[7] In practice Orkney Harbours would also attempt to negotiate an "minimum take" agreement on dues, such that its income from these would have a floor in the event that the Developer failed to bring business through Orkney.

Case C: If for whatever reason, the developer cannot or will not pay the lease fee in Case B, then the minimum lease fee that would still result in an economically viable project from Orkney Harbours' perspective is £1.4m.

Case D: in this event, the project yields a negative ENPV of -£21.2m.

7.2.4 Hatston (Phases 1 and 2)

Phase 3 of the Hatston development is primarily aimed at having a boatyard, so it is reasonable to determine any lease payments from a windfarm operator based on Phases 1 and 2 only.

Case A: The lease payment required is £3.8m pa over the period of the analysis. This includes all variable payments from the Developer, and in practice dues from other users would be received in addition.

Case B: The reduced lease payment is £2.7m pa.

Case C: If for whatever reason, the developer cannot or will not pay the lease fee in Case B, then the minimum lease fee that would still result in an economically viable project from Orkney Harbours' perspective is £0.9m.

Case D: in this event, the project yields a negative ENPV of -£14.8m.

7.2.5 Stromness

The Stromness project is economically viable without any lease contribution from the windfarm developer; with a relatively low level of traffic and Harbour income from the windfarm rapid response vessels, the main benefits come from marine leisure and cruise.

It makes a slightly negative financial NPV of -£0.4m, but given that the facilities are used by cruise and marine leisure as well as windfarm operations, it could be argued that the latter should not be made to make up the shortfall alone.

7.2.6 Lyness

The negative ENPV and NPV for Lyness reflects the relatively short period over which the windfarm developer is likely to use it for storing anchors and chains etc during the initial construction period (8 years). It is expected that alternative uses could be found in the future if the windfarm operators/developers no longer require it.

APPENDIX A – STRATEGIC POLICIES

The project proposals have been developed in cognisance of key national, regional and local policies and plans. The table below provides a summary of each policy or plan.

Scottish Programme for Government	The clear priority for this period through to the end of this Parliament in May is dealing with the economic, health, and social crisis that the coronavirus has brought. Central to that recovery is a new national mission to help create new jobs, good jobs and green jobs.
Scottish Economic Strategy	A strong, vibrant and diverse economy is essential to our national prosperity and in creating the wealth to support high quality public services. In order that everyone in Scotland can enjoy the opportunities that economic growth provides, it is vital to boost the competitiveness of the Scottish economy. Over the long term, increased levels of productivity are essential to support the economic growth needed to ensure rising living standards.
National Planning Framework (NPF) 3 (4)	Reword:
Climate Change Plan	The Scottish Government published a Climate Change Plan in December 2020 with the following actions: • reducing greenhouse gas emissions through a Just Transition to a net-zero economy and society • driving Scotland's adaptation to climate change • supporting decarbonisation in the public sector • engaging with business and industry on decarbonisation • engaging the public and encouraging individuals to move towards low carbon living • leading international action on climate change • supporting communities to tackle climate change through the Climate Challenge Fund • supporting developing countries to tackle climate change through the Climate Justice Fund • preparing to participate in a UK Emissions Trading Scheme (UK ETS) after leaving the EU ETS at the end of the EU Exit Transition Period • establishing a national Nitrogen Balance Sheet to keep track of how efficiently nitrogen is being used. This project is primarily aimed at ensuring there is suitable and sufficient port infrastructure to support the offshore wind sector; there may be a distribution and storage hub for low or zero carbon fuels developed at Scapa Deep Water Quay in the future also. Hence the project is fully aligned with the Scottish Government's strategy to reach Net Zero by 2045.
Scottish Ferries Plan and Island Connectivity Plan	The Ferries Plan is currently being updated and provides the foundation for developing ferry services in Scotland. A new Island Connectivity Plan is also being developed.

Crown Estate Corporate Plan	The Corporate Strategy presents the overall objectives and proposes how these will be delivered. Crown Estate Scotland manages assets – seabed, coastline, rural estates and more – that stretch the length and breadth of Scotland. The strategic purpose is investing in property, natural resources and people to generate lasting value for Scotland. Five strategic objectives align with the National Performance Framework (NPF) and the UN's Sustainable Development Goals (SDGs), namely: • Support the sustainable expansion of Scotland's blue economy, focussing on marine and coastal development • Develop built environment that strengthens communities and benefits businesses • Invest in innovation and work with tenants to enable sustainable natural resource use • Build partnerships for people and the planet • Develop and deploy our people's expertise to deliver value and success
Giant Strides A Marine Tourism Strategy supporting communities, the environment and economic growth around Scotland's coasts, lochs and waterways	Vision for Scotland to be a World leader in 21st century sustainable marine tourism Marine tourism underpins rural and island economies, supports remote and fragile communities, invests in nature and provides a host of health and wellbeing benefits. Why support and invest in marine tourism: • Manage risk and drive returns. Marine tourism is one of many sectors that are all competing for support and investment. The strategy provides a clear framework to de-risk any potential investment, to assure alignment to national priorities and outcomes and to improve the return on investment by unlocking second and third order impacts and driving greater levels of community buy in. • Multiple impacts in hard to reach communities. Marine tourism is also one of the very few sectors that reaches the most remote and fragile communities in Scotland. It drives the economy but can also drive health, community and environmental impacts of equal consequence and impact.
National Islands Plan	The Plan encompasses 13 strategic objectives that are focussed on making the islands better places to work, live and visit. The project will realise new jobs; opportunities for the local supply chain to develop new skills and social and economic benefits for Orkney. The project supports many of the Plan's objectives, namely: *population retention/growth (1), sustainable economic development (2), housing (4), fuel poverty (5), health and well-being (7), empowering communities (10), climate change (11) and education (12*).
HIE Strategy 2019 – 2022	HIE's Strategy encompasses three priorities: • Successful, productive and resilient businesses • Conditions for growth • Strong, capable and resourceful communities. The project supports these priorities, as well as HIE's commitment to

	'build on the region's international reputation for excellence in energy and low carbon, and to forging collaborative partnerships to further strengthen the industry and HIE's position in it'.
Orkney Council Plan 2018 – 2023	The Council Plan sets out the key priorities of Orkney Islands Council and details the projects and activities through which these priorities are to be implemented, within agreed budget. The Plan's mission is focused on 'working together for a better Orkney'. There are five strategic priorities and a number of key priorities and aspirations which the masterplan proposals could potentially deliver against: Connected Communities: invest in marine infrastructure and business development. Caring Communities: address workforce development to make sure we have the right people in the right place at the right time. Thriving Communities: the Orkney Community is able to access work, learning and leisure through a modern, robust infrastructure which supports all our communities and meets the requirements of 21st century life. Enterprising Communities: continue to develop strategic projects, particularly to capitalize on the renewables sector. • Progress the Islands Deal to deliver innovative, enterprising and transformational projects. Continue to encourage and support economic opportunities which maximise islands' opportunity and influence. Quality of Life: Orkney has a flourishing population with people of all ages choosing to stay, return or relocate here for a better quality of life.
Orkney Local Development Plan	OIC adopted a new Local Development Plan (LDP) for Orkney in April 2017. It sets out a vision and spatial strategy for the development of land in Orkney over the next 10 to 20 years. The plan sets out 15 policies for each type of development. All of the policies in the Plan are afforded equal weight in the determination of planning applications; if a proposal is contrary to any single policy then it does not accord with the Plan. There are several supplementary guidance documents for specific planning issues and sectors. The Plan's vision incorporates the following: • To ensure that effective planning policies are in place to strengthen and support Orkney's communities by enabling those developments which will have a positive and sustainable socio-economic impact, and utilise locally-available resources, whilst striving to preserve and enhance the rich natural and cultural heritage assets upon which Orkney's economy and society depends. • Orkney's settlements will act as a focus for growth in order to support existing facilities and services such as shops, schools and public transport links. Facilitating active travel will be an integral part of development planning across the county with a commitment to include well-integrated footpaths and cycleways within new developments and to connect any fragmented sections of the existing network to encourage active and healthy living. • The Plan supports Orkney's strong maritime links and guides relevant developments to key land around ports and

	harbours.
Orkney Community Plan	The Orkney Community Plan incorporates Orkney's Local Outcomes Improvement Plan (LOIP) and describes what the Orkney Partnership (this is a partnership between OIC and other stakeholder organisations) aims to achieve, setting out its strategic priorities for action. There are three strategic priorities: • Positive ageing – independent living; positive and valued participation in the community; long-term health and wellbeing. • A vibrant economic environment – opportunities for young people; Orkney innovation zone; community-based enterprise and employment. • Healthy and sustainable communities – healthy lifestyles; inclusiveness and equality; access; a sustainable health and care workforce.

Appendix 6: CPA1 Requirements, Completed Tasks & Future Milestones for Proposed Scapa Deep Water Quay

Where We Are Now:
Scapa Deep Water Quay and Hatston

Tasks completed
Orkney Harbours Masterplan Phase 1
Exemplar Design
Feasibility Study
Economic Assessment
Environmental Scoping Opinion
Environmental Surveys
Discussions with Statutory Authorities
Discussion with Land-Owners

Scapa Deep Water Quay: Milestones

Key milestones going forward	Completed by:
Outline Appraisal Harbour Authority Sub Committee (CPA1)	May 2021
Site Investigation	Feb 2022
Wave Study	Aug 2021
Outline Business Case	Nov 2021
Project Approval (CPA2)	Nov 2021
Appointment of Consultants	May 2022
Detailed Design	May 2023
Environmental Impact Assessment	Aug 2022
Consents (e.g. Marine License, Planning Permission)	Dec 2022
Tender of Enabling Works	Oct 2022
Tender of Construction Works	Sep 2023
Award of Enabling Works Contract	Mar 2023
Award of Construction Contract (subject to contents)	Mar 2024
Construction completion	2026/2027

(Note: in “milestone” order not chronological order)

Appendix 7: Orkney Harbours Masterplan Phase 1 - CPA1 to CPA2 costs

		Scapa Deep Water Quay - Estimated Costs	Hatston - Estimated Costs
1: Feasibility - Completed			
2a: Tender/Appointment of Consulting Engineer	Outline Scheme Design	£250,000	£139,000
	Site Investigation organisation & management	£75,000	£50,000
	Detailed Design & Consent Management	£300,000	£150,000
	Tender Doc Preparation and Report on Tenders (0.5 for CPA2)	£250,000	£139,000
	Construction Production Information	£55,000	£75,000
	Construction Management	£375,000	£208,500
	Subtotal	**£1,305,000**	**£761,500**
2b: Site Investigation (third party)	Site Investigation (land/seabed boreholes)	£1,325,000	£750,000
	Subtotal	**£1,325,000**	**£750,000**
3: Environmental Impact, Consents & Planning	Environmental Impact Assessment	£130,000	£90,000
	Marine Scotland consents/Crown Estate Charges	£140,000	£74,000
	Other Planning Costs	£25,000	£25,000
	Sub Total	**£295,000**	**£189,000**
4: Tender/Appointment of Contractor - Design & Build	Detailed Design & Consent Management	£575,000	£336,500
	Construction Production Information	£320,000	£133,500
	Construction	TBC	TBC
	Sub Total	**£895,000**	**£470,000**
5: OIC Costs	Procurement Officer - 1FTE for 3 years (see below)	£97,350	£48,675
	Finance Officer - 1FTE for 3 years (see below)	£97,350	£48,675
	OIC Engineering - main road (A961) diversion, detail design	£60,000	
	Other Apportioned Costs - Legal etc	£65,000	£30,000
	Sub Total	**£319,700**	**£127,350**
6: Project Management	General back up for project management and the generation of an outline business case	£30,000	£30,000
	Sub Total	**£30,000**	**£30,000**
	Total For Whole Proposed Project - post May 2021	**£4,139,700**	**£2,297,850**
	CPA1 - CPA2 Costs - Sections 2a, 3 & one quarter of Section 5 for procurement and finance, all other OIC costs as stated in full	£1,303,675	£803,838
	CPA1 - CPA2 Costs - Site Investigation Costs - section	£1,325,000	£750,000
	Total for CPA1 - CPA2 per project	£2,628,675	£1,553,838
	Total for Both Projects: CPA1 - CPA2	**£4,182,513**	

Note:
1: Parts not shaded are not CPA1-CPA2 costs, shown for indication of possible future costs and to be confirmed at CPA2.

Appendix 8:

Stage 1 CPA

Capital Programme: Non-General Fund – Harbour Authority
Client Service: Development and Infrastructure – Marine Services
Project Name: Proposed Scapa Deep Water Quay.

1. Background

To construct a pier and land side facility on the east side of Scapa Flow at Deepdale. This would be 575m long with a water depth of between 15m and 20m below chart datum. It will have a quay and land area in the region of 20 Ha. The agreed client specification is in included as Appendix 1 of this report. Delivery models being considered vary from an early engagement of main contractor contract format (similar to that used by the British Antarctic Survey over the last five years), a contract where the client carries out all of the design works with the contractor building through to a design and build contract based on very good base information being supplied by the client. All options will be considered with a preferred method / contract arrangement being specified in the CPA2 report / documentation.

2. Financial Implications

	Total	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**
	£000k	**£000k**	**£000k**	**£000k**	**£000k**	**£000k**
Capital Expenditure (est)	180,000			60,000	60,000	60,000
Less: Anticipated Grants or Other Contributions	30,000			10,000	10,000	10,000
Net Capital Expenditure	150,000	0	0	50,000	50,000	50,000
Revenue Implications	0	0	0	0	0	0
Financing/Loan Charges	17,149	0	0	2,367	5,939	8,843
Post CPA2	1,512			504	504	504
Estimated cost of detailed Stage 2 CPA	2,629	1,977	652			

The cost of preparing documents, reports etc for CPA2 to be funded from Miscellaneous Piers and Harbours Reserves.

Estimated Stage 2 Costs from appendix 7 to this report.

Capital estimated within Appendices within this report and will be confirmed at CPA2, along with loan charges. This is due to a variety of finance packages that may be used to fund this project, which are known at this time but without a firm discession on exactly which one would be best suited.

3. Policy Aspects

With reference to The Council Plan 2018-23, Part 1 Strategic Priority – Enterprising Communities, which in turn leads to The Council Delivery Plan 2018-23 Priority 4.4 which references development of Scapa Flow and other Harbours, especially to capitalise on the renewable sector – this project fits perfectly into these plans and aspects.

4. Statutory Responsibility

The Council, as the Statutory Harbour Authority, has the responsibility of operating and providing the relevant / necessary facilities in order to operate the Harbour in a safe and efficient manner – all as per Orkney County Council Act 1974, Harbours Act 1964 and Harbours, Docks and Pier Clauses Act 1847.

The Statutory Harbour Authority will be required to engage with all relevant Statutory bodies which in this case will be Crown Estate Scotland, Marine Scotland, OIC Planning Authority, NatureScot, Scottish Environment Protection Agency and Historic Environment Scotland as a minimum.

5. Land Purchase Requirement

The total land requirements are in the region of 15 Ha in the Deepdale area in Holm. As indicated in Appendix 2 of this report, initial consultation has started with all the landowners with positive reactions thus far. This process will continue throughout this project. Via the Council's Estates Management Team a land valuation process is underway and should be completed during the summer of 2021. This will provide an initial land valuation which will / can be amended as this proposed project moves forward.

Sea-bed leases with Crown Estate Scotland will be required, as is normal with the majority of pier extension / reclamation projects in Scotland

6. Impact on Local Business, Employment and the Economy

As indicated in the Economic Review, Appendix 5 of this report the impact on the Orkney economy and community is estimated £109m for direct income and £102m as indirect income and induced income, generating 23 jobs and having an overall Gross Value Added of £342m.

7. Risk Assessment

The main risk associated with this proposed project is that baseline conditions are not known sufficiently early to be included in the overall design and project plan. It is very important that as much base information (Engineering, Environment & Economic) information is gathered at an early stage, and work together, in order that final designs, construction methods etc are based on real data and information. With this main risk being reduced to a minimum many, if not all, other risks will be reduced to an absolute minimum.

8. Accountable Officer

Jim Buck, Head of Marine Services, Transportation and Harbour Master.