

REPORT

Leith Outer Berth Approach Channel Deepening

Supplementary Best Practicable Environmental Option Report

Client: Forth Ports Limited

Reference: PC4514-RHD-YY-XX-RP-EV-0031

Status: Final/01

Date: 15 December 2023



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1 Introduction

1.1 Purpose of this Document

Under the Marine (Scotland) Act 2010, Section 21(1), a Marine Licence issued by Marine Scotland is required for the dredging and the deposit of substances or objects within waters adjacent to Scotland. Under Part 4, Section 27(2), Marine Scotland has an obligation to consider the availability of practical alternatives when considering applications involving disposal of material at sea. Applications for a Marine Licence to dispose of dredged spoil at sea require a Best Practicable Environmental Option (BPEO) assessment, demonstrating that alternatives to sea disposal have been investigated and that sea disposal does not pose an unacceptable risk to the marine environment and other legitimate users. Marine Licences for capital works are valid for the duration of the activities, to be specified in the Marine Licence application and agreed with Marine Scotland.

This report has been produced in support of a Marine Licence application for the disposal of capital dredge material at sea related to the proposed deepening of the Leith approach channel. It compares various options for the disposal of dredge material and identifies the BPEO.

This report is supplementary to the accompanying Outer Berth BPEO Report (the 'Outer Berth BPEO Report'), produced in support of the Outer Berth development's Marine Licence application for the disposal of capital dredge material at sea (ERM, 2022a¹).

1.1 Background and Need for the Dredging and Disposal

Forth Ports Limited ("Forth Ports") is improving the Outer Berth at the Port of Leith ("the Port") to support the offshore renewable energy industry. In December 2022, Marine Licences were granted by Marine Scotland's Licensing Operations Team (MS-LOT) (now known as the Marine Directorate Licensing Operations Team (MD-LOT)) for improvement works to the Outer Berth (MS-00009818) as well as the disposal of associated dredged material (MS-00009819). The Marine Licence applications were supported by an Environmental Impact Assessment (EIA) Report (the 'Outer Berth EIA Report') (Royal HaskoningDHV, 2022a²), a Habitats Regulations Appraisal (HRA) (the 'Outer Berth HRA') (Royal HaskoningDHV, 2022b³) and the Outer Berth BPEO Report.

The current water depth of the Leith approach channel (between -6.5m Chart Datum (CD) and -7.0m CD) significantly limits the tidal window during which deep-drafted vessels can transit in or out of the Port and, on some neap tides, access is not possible at all. Given this, the increased water depth required by the evolving offshore renewables industry, limited vessel availability, the increasing draft of construction vessels associated with this industry and the under-keel requirements for navigational safety, Forth Ports is proposing to deepen the Leith approach channel.

The proposed deepening would increase the depth of the approach channel to -9.0m CD and extend the offshore extent, from the current maintenance dredge limit, to the -9.0m CD contour within the Firth of Forth. The Outer Berth berth pocket, most of which will have been deepened to -9.0m CD as part of the

¹ ERM, 2022a. Port of Leith: Marine Licence Application for Disposal of Capital Dredge Material Best Practicable Environmental Option Report 8 April 2022 Project No: 0391463.09

² Royal HaskoningDHV, 2022a. Port of Leith – Outer Berth Environmental Impact Assessment Report Client: Forth Ports Limited Reference: PC2045-RHD-ZZ-XX-RP-EV-0007 Status: Final/03 Date: 11 April 2022

³ Royal HaskoningDHV, 2022b. Port of Leith – Outer Berth Habitats Regulations Appraisal - Screening for LSE and Provision of Information to Inform Appropriate Assessment Client: Forth Ports Limited Reference: PC2045-RHD-ZZ-XX-RP-EV-0009 Status: Final/P01.05 Date: 11 April 2022

consented Outer Berth development, would be repositioned northwards, increased in size, and deepened to -13.0m CD. The footprint of the proposed deepening can be seen in **Figure 1.1**.

It is anticipated that the dredge and disposal activities would be completed within approximately four months, with approximately 1,300,000m³ of material removed, approximately 1,410,000m³ including a 0.25m over-dredge allowance. It is proposed that the dredged material resulting from the capital dredging will be disposed of at sea at the licenced marine spoil disposal ground at Narrow Deep B. **Figure 1.1** shows the planned dredging area and the spoil disposal ground at Narrow Deep B.

The need for the proposed channel deepening is described in detail in the accompanying supplementary EIA (sEIA) Report (Ref: PC4514-RHD-YY-XX-RP-EV-0017), with relevant information summarised in this report to provide context. The “Do Nothing” option, the Outer Berth development would have a reduced capacity or be unable to receive the larger drafted vessels on which the offshore energy sector is becoming increasingly reliant. This would likely make the Port unviable to support the offshore renewables industry, thereby hindering:

- Scotland achieving its 2045 net zero targets;
- Scotland’s green energy transition; and
- Scotland’s Covid-19 recovery plan.

In addition, the significant economic and employment benefits associated with the Outer Berth development would not be realised.

1.2 Dredging and Disposal Activities

1.2.1 Dredging Activities

To deepen the approach channel to -9.0m CD and the Outer Berth berth pocket to -13.0m CD would require the removal of approximately 1,300,000m³ of sediment (approximately 1,410,000m³ of sediment including a 0.25m over-dredge allowance). **Table 1-1** presents the coordinates of the area to be dredged.

Table 1-1 Dredge area coordinates

Node	Coordinates (WGS84)	
1	003 ° 20.698	56 ° 00.530
2	003 ° 18.289	55 ° 98.791
3	003 ° 18.011	55 ° 98.912
4	003 ° 20.017	56 ° 00.590

It is anticipated that the majority of dredging would be undertaken by a Trailer Suction Hopper Dredger (TSHD). In areas where the water depth is greater than 4.0m CD, it is likely that a medium TSHD with a hopper capacity of approximately 4,500m³ would be employed (production rate of approximately 83,960m³ per week). At shallower depths a smaller TSHD with a hopper capacity of approximately 1,500m³ would be employed (production rate of approximately 25,680m³ per week). It is anticipated that the TSHDs may work concurrently. In the berth pocket and proximity to the Port of Leith, the TSHD would be supported by a plough vessel to remove sediment from corners and level out ridges. A breakdown of sediment types and estimated percentage breakdown of the material arising are presented in **Table 1-2**.



- NOTES**
1. ALL DIMENSIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
 2. ALL LEVELS ARE RELATIVE TO CHART DATUM (mCD) UNLESS NOTED OTHERWISE.
 3. DREDGE VOLUMES ARE ESTIMATED FOR THE PURPOSE OF ENVIRONMENTAL CONSENTING AND BASED ON ASSUMED SLOPE PROFILES. CONTRACTOR TO REVIEW GROUND INVESTIGATION INFORMATION PRIOR TO SITE WORKS.
 4. THE CONTRACTOR SHALL CONFIRM THE ACCURACY OF ALL SITE INFORMATION PROVIDED.

- LEGEND**
- 13.0mCD DREDGE POCKET
 - 9.0mCD DREDGE APPROACH CHANNEL
 - ESTIMATED TOP OF SLOPE
 - NARROW DEEP B DISPOSAL AREA

- REFERENCE DRAWINGS**
- PC4514-RHD-YY-XX-DG-GE-0022 - PROPOSED CAPITAL DREDGE GENERAL ARRANGEMENT
 - PC4514-RHD-YY-XX-DG-GE-0023 - PROPOSED CAPITAL DREDGE SECTIONS SHEET 1
 - PC4514-RHD-YY-XX-DG-GE-0024 - PROPOSED CAPITAL DREDGE SECTIONS SHEET 2
 - PC4514-RHD-YY-XX-DG-GE-0025 - PROPOSED CAPITAL DREDGE VIBROCORE SAMPLE LOCATION PLAN
 - PC4514-RHD-YY-XX-DG-GE-0026 - PROPOSED CAPITAL DREDGE SAFETY, HEALTH & ENVIRONMENTAL INFORMATION

SETTING OUT COORDINATES		
ID	EASTING (m)	NORTHING (m)
1	329968.160	680182.600
2	331492.450	681516.15
3	331797.420	681155.070
4	330274.140	679821.390

P01	01.12.23	FOR SPECIFICATION	BM	DB	BC
REV	DATE	DESCRIPTION	BY	CHK	APP

REVISIONS

CLIENT



PROJECT

PORT OF LEITH
OUTER BERTH DEVELOPMENT

TITLE

PROPOSED CAPITAL DREDGE
DISPOSAL AREA



DRAWN	BM	CHECKED	DB	APPROVED	BC
DATE	NOV 2023	SCALE	1:10,000	REF:	
DRAWING No.	PC4514-RHD-YY-XX-DG-GE-0027	SUITABILITY	S3	REVISION	P01



Table 1-2 Estimated sediment fractions of material to be dredged as part of the approach channel deepening

Sediment Type	Sediment Fractions (%)	
	Medium TSHD	Small TSHD
Silt/Clay	64	82
Fine Sand	20	17
Medium Sand	3	1
Coarse Sand	3	0
Gravel/Cobble	10	0

It is possible that some areas may also require the use of a Back-hoe Dredger (BHD), particularly within areas difficult for a TSHD to access or where rock or consolidated sediment is present. If a BHD would be used, it is expected that the BHD would work in place of one of the TSHDs. Given that the production rate of a BHD is below that of a TSHD, and would be working with rock or consolidated sediment, the resultant sediment plume would be smaller than that of the TSHD. To provide a worst-case assessment, the sediment dispersion modelling (see Chapter 7 of the accompanying sEIA Report) is based on all of the material being dredged by the TSHDs. Should any rock be encountered that cannot be dredged using the TSHDs, this would be dredged using a pecker attached to the BHD.

The dredged arisings would be transported to Narrow Deep B Spoil Disposal Ground (FO038) within the TSHD (or support barge in the case of material from BHD). Over the course of the dredge/disposal campaign, it is anticipated that there would be in the region of 800 round trips to the disposal site and dredge/disposal activities would take approximately four months.

Overall, dredging programme would be dependent on the dredging equipment scenario(s) employed (e.g. method, capacity); however, it is anticipated that the dredge would be completed within approximately four months.

1.2.2 Disposal Activities

The Narrow Deep B (FO038) spoil disposal ground is situated approximately 2.5 nautical miles east of the Port of Leith and has historically been used by Forth Ports for spoil disposal from the Port of Leith for over 50 years. The water depth within the spoil disposal ground ranges from -10m CD at the south-west corner and increases to -31m CD through the centre of the site and -34m CD at the north-east of the site. The boundary co-ordinates of the spoil disposal ground are presented in **Table 1-3**.

Table 1-3 Coordinates of Narrow Deep B Spoil Disposal Ground

Coordinates (WGS84)	
56° 00.566	003° 07.484
56° 01.298	003° 06.038
56° 01.106	003° 05.739
56° 00.374	003° 07.184

The Narrow Deep B spoil disposal ground is the deepest in the Firth of Forth. Whilst the licenced sites can be used by anyone with a licence from Marine Scotland, Narrow Deep B spoil disposal ground has mainly been used for dredged sediments from the Port of Leith. The volume of dredged material deposited at the Narrow Deep B spoil disposal ground from the ongoing maintenance dredging activities at the Port of Leith and approach channel from 2001 to 2021 ranged from 3,173m³ to 65,719m³ per annum. Annual spoil disposal volumes are presented in Table 1.4 of the accompanying Outer Berth BPEO Report.

Table 1-4 presents the total area of the Narrow Deep B spoil disposal ground and the area and volumes below the 20m and 30m contours, based on recent (August to November 2021) multibeam surveys undertaken by Forth Ports. The survey was undertaken after the disposal of material from the 2021 capital dredge works at the Fife Energy Park which required material to be disposed of below the 20m depth contour⁴.

Table 1-4 Narrow Deep B Spoil Disposal Ground Areas and Volumes

Narrow Deep B	Total Area (m ²)	Volume (m ³)
Whole area	958,331	-
Below 20 m CD depth contour	822,656	6,242,172
Below 30 m CD depth contour	252,305	467,790
Total	-	6,709,962

Source: Forth Ports February 2022 (as presented in ERM, 2022)

1.3 Description of Sediment to be Dredged and Disposed

In line with Marine Scotland's guidelines on pre-dredge sampling protocol⁵, A site-specific sampling survey was undertaken between 5 and 8 May 2022 and 28 and 29 August 2023 during which sediment samples were taken for the following chemical and physical analysis:

- Trace metals (As, Cd, Cr, Cu, Hg, Ni, Pb and Zn);
- Organotins (TBT and DBT);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- ICES 7 PCBs; and
- Particle Size Analysis (PSA).

Across both sampling campaigns, vibrocore (VC) samples were taken from 27 locations within the proposed dredge footprint at three depths: surface, mid and bottom of the cores. Cores were vibrated through the soft-surface sediments until refusal. Samples were sent for chemical and physical analyses and the results are presented in Appendix 8-3 of the accompanying sEIA Report. Note, no samples were recovered from station VCN11A.

The assessment of results of the analyses can be found in Section 8.5.3 of the accompanying sEIA Report. In summary, when averaged, all metals are present at levels below AL1. Whilst many of the PAHs exceed AL1, when averaged, the majority of these exceedances are marginal. Average levels of ICES 7 PCBs do not exceed AL1. These results are in line with the historic data collected between 1993 – 2020, where a few metals and most of PAHs were found to be above AL1 within Port of Leith and the Narrow Deep B disposal ground (reported on in the Outer Berth EIA Report).

⁴ The Marine Licence was for the disposal of 225,000 wet tonnes of dredge spoil at Methil (FO048) and Narrow Deep (FO038) disposal grounds. Rock material over 300 m was to go to the Narrow Deep site below the 20 m CD contour. It is not known what quantities were disposed of at each site.

⁵ Guidance for the sampling and analysis of sediment and dredged material to be submitted in support of applications for sea disposal of dredged material. Available online <http://www.scotland.gov.uk/Resource/0044/00443832.pdf>

1.4 Scope of the Report

This report supplements the accompanying Outer Berth BPEO Report, which should be read alongside this report. It provides an appraisal of available disposal options and short-lists those that are considered to be practicable. Options have been reviewed according to the Waste Hierarchy, as outlined in the Waste (Scotland) Regulations 2012.

The BPEO assessment methodology and available disposal options are presented in Sections 2 and 3 of the accompanying Outer Berth BPEO Report.

2 Assessment of Available Disposal Options

Available disposal options are described in detail in Sections 3.1 to 3.7 of the accompanying Outer Berth BPEO Report, which are as follows:

1. Coastal reclamation and construction fill
2. Sacrificial landfill
3. Beach nourishment
4. Incineration
5. Disposal to sea

The practicality for disposing the dredged material under each option is provided below. As per the accompanying Outer Berth BPEO Report, there are several steps that are common to the land-based options, and these are described in **Section 2.1** to avoid repetition.

2.1 Common Steps to Land-Based Disposal Options

Disposal options 1-4 above have land-based components. The steps that are common to the land-based disposal options are described in Section 3.2 of the accompanying Outer Berth BPEO Report, and which include:

- landing the dredge material;
- storage of dredge material;
- dewatering the dredge material; and
- loading and transport for disposal.

Forth Ports does not have suitable facilities at Leith, or elsewhere within the Firth of Forth area, for landing dredged material, as such a new coastal landing facility would be required to enable the material to be landed. This would need to include storage facility suitable for retaining the dredged material and associated run-off and dust, for which there is no land available. As such, land-based disposal of the material to be dredged has been discounted. This includes:

- Sacrificial landfill
- Incineration
- Construction fill

2.2 Coastal Reclamation

Forth Ports, Marine Scotland, Edinburgh City Council and NatureScot are the most likely bodies to be responsible for or aware of reclamation projects in the Forth. Whilst the material may be able to be reused for reclamation, no sites for coastal reclamation were identified through the consultation process undertaken to inform the Outer Berth BPEO Report, noting that this was based on the material being dredged for the Outer Berth development (comprising a mixture of sediment, glacial till, mudstone and rock).

Given the material to be dredged comprises mostly silts and clays, it is unsuitable as reclamation fill for construction projects unless its physical property is improved through the use of, for example, cement. This greatly increases the cost and carbon footprint of the project, potentially making it economically unviable. The material also has to be dewatered, which significantly increases the construction programme. For these reasons the use of the dredged material as reclamation fill for construction projects has been discounted.

The dredged material could be transferred into bunded lagoons at the edge of the Firth of Forth to create land that could be used for development or similar purposes. The majority of the intertidal area falls within the Firth of Forth Site of Special Scientific Interest (SSSI) and Outer Firth of Forth and St Andrews Bay Complex Special Protection Area (SPA). The SPA is a large estuarine/marine site consisting of the two adjacent Firths of Forth and Tay. NatureScot has previously expressed the view on similar BPEO assessments that further loss of intertidal habitats is not considered a realistic option (ERM, 2022a).

The dredged material has the potential to be used for habitat creation/enhancement, such as creating intertidal mudflat habitat and saltmarsh restoration; however, no opportunities for the use of the dredged material for this purpose were identified during the consultation undertaken on the Outer Berth BPEO Report, nor other recent BEPOs carried out on dredging projects within the Firth of Forth (ERM, 2022b⁶, 2021⁷). In addition, given the need to deepen the approach channel as soon as possible, there is not sufficient time to identify suitable locations and secure the required consents prior to the dredging being carried out. This, and the significant cost associated with using dredged material in this way (which would require pumping and / or rainbowing the material), means that using the dredged material for habitat creation/enhancement has been discounted.

2.3 Beach Nourishment

Beach nourishment requires materials of a similar composition to the existing beach materials and usually involves clean sand or gravel. Given the material to be dredged comprises mostly silts and clays, is not suitable for beach nourishment.

2.4 Disposal to Sea

Disposal to sea is the normal practice for disposal of dredged spoil from Leith and from other ports and harbours in the Forth Estuary and Firth of Forth. This approach takes place at sea and does not require the landing of any materials. It involves the dredger sailing to a licenced spoil disposal ground and releasing the materials through bottom doors or a split hull. To ensure that the material is deposited evenly across the disposal site and at the correct depths (below 20m CD) a grid patten will be applied across the disposal site and each barge load deposited will be tracked using a global positioning system (GPS) to record the spoil discharge locations.

⁶ ERM, 2022b. *Newhaven Harbour Maintenance Dredging Marine License Application Best Practicable Environmental Option Report 10 August 2022 Project No: 0496046.02*

⁷ ERM, 2021. *Port of Kirkcaldy Maintenance Dredge Disposal: Marine Licence Application Best Practicable Environmental Option Report 29 June 2021 Project No: 0447789*

There are seven licenced marine spoil disposal grounds in the Forth Estuary and Firth of Forth: Bo'ness, Oxcars, Blae Rock, Kirkcaldy, Methil and two sites designated at Narrow Deep (A and B).

For the dredging operations at Leith, Forth Ports propose to use the Narrow Deep B spoil disposal ground located approximately 2.5nm east of the Port of Leith within the Firth of Forth. This site is the deepest of the current licenced sites, has historically been used for the disposal of dredged material from Leith and for rocky material from other capital dredge sites, and is the closest site to the port, thus minimising the distance for vessel transport. The sites/facilities which are required for the sea disposal option are those which are already used. No other spoil disposal grounds have been indicated by Forth Ports as available at this time or more suitable for the dredged material from the Port of Leith.

The disposal site has not accepted this volume of dredged material previously, the maximum being the 100,980m³ related to the Outer Berth development in 2022. The assessments presented in the accompanying sEIA Report and supplementary Report to Inform Appropriate Assessment (PC4514-RHD-YY-XX-RP-EV-0018) confirm that the disposal of the dredged material would not result in significant effects to:

- Designated sites
- Coastal processes
- Marine water and sediment quality
- Marine ecology
- Fish and fisheries
- Ornithology
- Marine mammals

A recent (2021) multi-beam bathymetric survey of the Narrow Deep B spoil disposal ground has shown that the volume of ground below the 20m depth contour (below Chart Datum) is approximately 6 million m³. This survey was undertaken after a capital dredge disposal operation from the Fife Energy Park near Methil. Marine Scotland guidance for disposal of non-erodible material (i.e., rock, glacial till and mudstone) should not exceed 5% of the depth of the spoil disposal ground (ERM, 2023).

As shown above, the material to be dredged comprises silt/clay and sand, with a small proportion of gravel/cobbles. Given this, and the fact that the volume to be disposed of is well below 6 million m³, it is considered that the disposal site can accommodate the disposal of the dredged material.

The transport and disposal activities may cause some disruption to other users of the Firth of Forth; however, as disposal would only occur for a limited period of time and would be controlled directly by Forth Ports, it is not anticipated that there would be any significant interference. In addition, historic operations at Narrow Deep B have not resulted in any reported disruption to other Firth of Forth users (ERM, 2022).

3 Identification of the BPEO

For the reasons explained in Chapter 2, disposal to sea is considered to be the only practicable disposal option. Disposal at sea of the fine sediment fraction will keep the dredged material within the ecosystem, maintaining the sediment budget for the area, feeding the existing mudflat habitats within the Firth of Forth. In line with guidance from Marine Scotland, the BPEO is identified as the disposal at a licensed sea spoil disposal ground. The preferred site for this is the Narrow Deep B spoil disposal ground.

