Best Practicable Environmental Option Assessment

Covering Note

This Best Practicable Environmental Option (BPEO) Assessment was produced in April 2016 to support the marine licence application for dredging and disposal associated with the Aberdeen Harbour Expansion Project. The BPEO has been reviewed to assess its suitability to accompany an application for a marine licence to extend the duration of the dredging and disposal activity to 31st December 2021.

The total permitted dredge volume under the existing marine licence is 6,120,000 wet tonnes. The volume remaining to be dredged at the time of this application is approximately 1,191,980 wet tonnes, so approximately 81% of the total volume has already been dredged.

Table 1 provides a breakdown of the approximate volume remaining to be dredged in each area. The three areas with the greatest volumes, which make up approximately 92% of the remaining material to be dredged, are:

- West Quay: 435,416 wet tonnes
- Harbour Basin: 375,558 wet tonnes
- North Quay: 285,806 wet tonnes

The physical characteristics of the material remaining to be dredged within the West Quay and North Quay are similar: on average, 35% rock or coarse sediments (≥ 2.0 mm), 4% sand and 61% clay and silt (≤ 0.063 mm). Within the Harbour Basin, 90% of the material remaining is rock or coarse sediments (≥ 2.0 mm).

All of the remaining rock, and the majority of the remaining pebbles, cobbles, boulders and coarse sand, will be used on-site within the harbour construction works. This is in accordance with Option 1 in Section 3 of the BPEO. There will be no surplus of suitable dredged material available for use off-site.

As identified in Section 3 of the BPEO, the finer fractions of dredged material (clay, silt and fine sand) are not suitable for use on-site, or as land reclamation, construction materials or beach restoration. In accordance with the BPEO, the remainder of this material will continue to be deposited at the offshore disposal site Aberdeen CR110, along with a limited proportion of coarser sediments that are mixed with fine sediments and cannot easily be separated.

Table 1 Breakdown of material remaining to be dredged

	Dredge Area	**Dredge Depth** (metres below CD)	**Clay and Silt** (≤ 0.063 mm)	**Sand** (≤ 2.0 mm)	**Pebbles, Cobbles & Boulders** (≥ 2.0 mm)	**Quantity to be dredged** (m^3)	**Quantity to be dredged** (wet tonnes)
A	Harbour Basin plus B1+B2+B3	9.00	5%	5%	90%	174,892	375,558
B	North Quay	9.85	60%	3%	37%	133,096	285,806
C	East Quay (Scour protection)	12.95	14%	0%	86%	8,450	18,145
D	Entrance Channel	10.50	0%	77%	23%	24,183	51,930
E	South East Pier (Connection NBW)	11.45	0%	0%	0%	0	0
F	SBW Roundhead & trenches	15.24	0%	100%	0%	11,700	25,124
G	West Quay	9.85	62%	5%	34%	202,767	435,416
					Total	555,088	1,191,980

In summary, as the overall volume, methods and material types are unchanged from the existing marine licence, the content and conclusion of the BPEO Assessment has not changed as a result of the proposal to extend the duration of the dredging and disposal activity, i.e. the BPEO is considered to be a combination of:

- Use on-site within the harbour construction works for dredged materials that can be practicably recovered during the dredging process (particularly rock, gravel and larger pockets of coarse material); and
- Offshore sea disposal for dredged material that is not suitable for re-use (e.g. glacial till, other fine silts).

November 2019

ABERDEEN HARBOUR EXPANSION PROJECT

BEST PRACTICABLE ENVIRONMENTAL OPTION (BPEO) ASSESSMENT

October 2015

Updated April 2016

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1. Introduction

PURPOSE OF THIS REPORT

This report presents the Best Practicable Environmental Option (BPEO) assessment for the dredging and disposal associated with the Aberdeen Harbour Expansion Project. BPEO assessment is a method for identifying the option that provides the *most environmental benefit* or *least environmental damage*. It assesses the performance of different options in a range of criteria such as environmental impact, technical feasibility and cost.

LICENSING REQUIREMENTS

The Aberdeen Harbour Expansion Project will create a new deep water facility in Nigg Bay, south of the existing harbour, as shown on Figure 1.1.

It is proposed to dredge the harbour to 9.0 m below Chart Datum, and 10.5 m below Chart Datum at the east quay and in the entrance channel. A marine licence application will be made to Marine Scotland for capital dredging and sea disposal activity.

A separate marine licence will be made for the construction of the marine works, comprising:

- Construction of new north and south breakwaters to form the harbour;
- Land reclamation and construction of approximately 1,400 m of quays and associated support infrastructure;
- Construction of areas (on the quaysides) to provide fuel, bulk commodities and potable water; and
- Navigational aids.

This BPEO assessment is for the dredging and disposal elements of the development.

ENVIRONMENTAL IMPACT ASSESSMENT

An Environmental Statement (ES) was produced in October 2015, which presents the results of a comprehensive assessment of the marine and terrestrial environmental impacts associated with the development.

STRUCTURE OF THIS REPORT

The remainder of this report is structured as follows:

- Section 2 summarises the dredging requirements;
- Section 3 describes the available disposal options;
- Section 4 assesses the viable options; and
- Section 5 presents the BPEO.

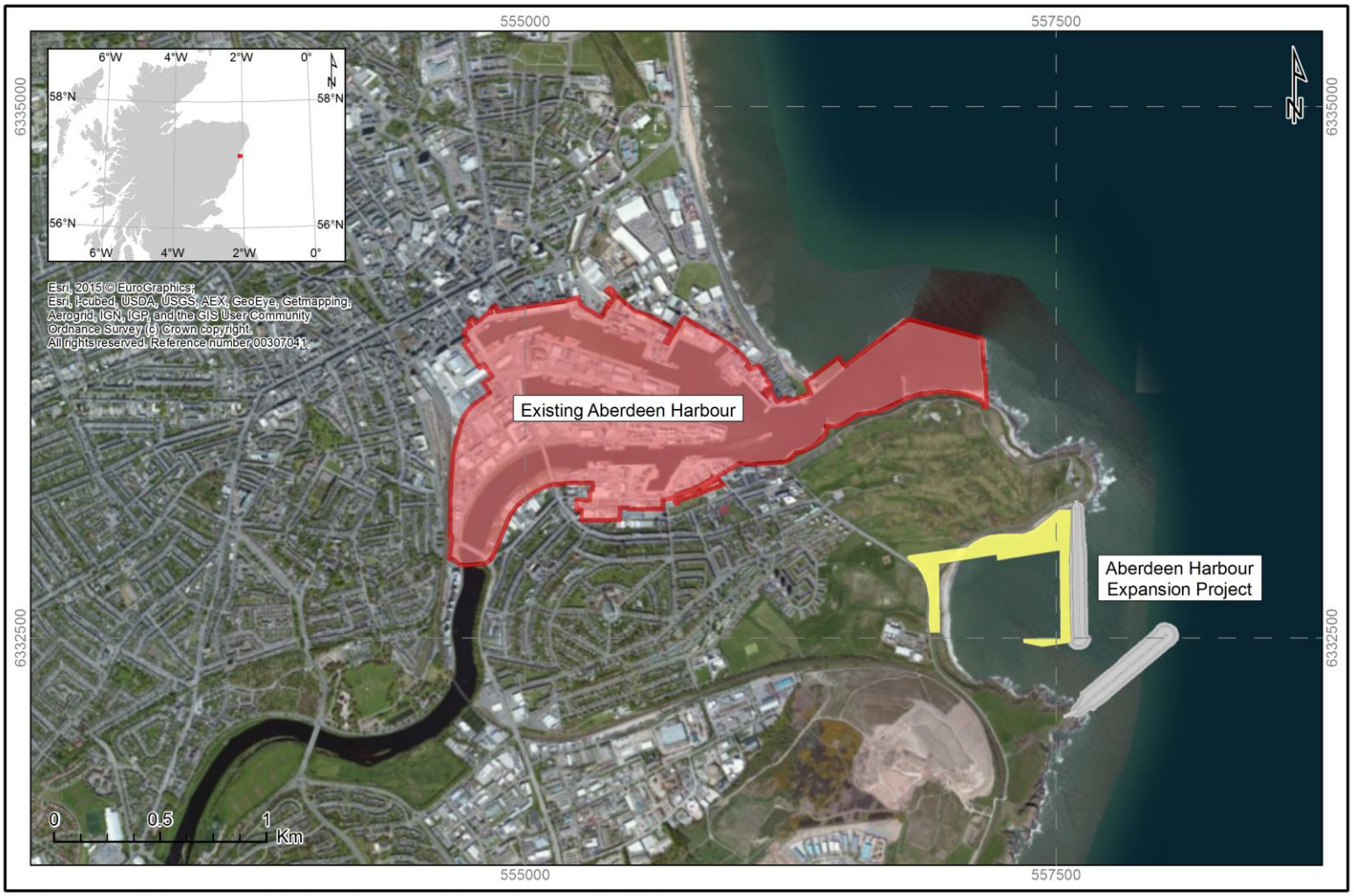

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Figure 1.1 Location of the existing Aberdeen Harbour and the proposed Expansion Project at Nigg Bay

2. Dredging Requirements

Dredging will take place as two distinct and separate operations: during the construction phase of the development, a capital dredging operation will form the inner harbour and entrance channel as described in Section 1 and below. Once the harbour is operational, maintenance dredging will be carried out as required to maintain the dredged areas to their design depths.

CAPITAL DREDGING

It is proposed to dredge the inner basin to 9.0 m below Chart Datum, and the east quay and the approach channel to the harbour to 10.5 m below Chart Datum. Figure 2.1 shows the areas that will undergo dredging. There will be areas that require localised deeper dredge pockets to facilitate construction, as shown in Figure 2.1.

Dredging activity expected to commence in early 2017 and is anticipated to take 19 months to complete. Dredging will be intermittent depending on the construction programme, and could take place 7 days a week throughout the year. It is likely that the trailer suction hopper dredgers (TSHDs) will be used earlier in the programme to remove the initial less consolidated layers of material, then backhoe dredgers will be used to excavate the rock layer, following any drilling and blasting that is required. Final selection of the dredging plant will not be determined until a contractor has been appointed, but it is considered that this is a likely dredging scenario.

Material to be dredged

The total volume of material to be dredged is estimated to be 2,850,000 m^3, of which 250,000 m^3 is estimated to be rock. The exact volumes will be dependent on the appointed contractor's methodology; these figures are based on the greatest volume estimate of the three contractors tendering for the project. Extensive geotechnical investigations undertaken between 2013 and 2015 have revealed that the substrate of the bay consists of loose sediments and sands and gravels of varying thickness, overlying glacial deposits below. The vast bulk of the material below the upper strata is glacial till comprising boulder clay, boulder fields, clays and gravels, overlying bedrock. Bedrock comprises granite, schist and gneiss but mostly crystalline granitic gneiss.

MAINTENANCE DREDGING

Once the harbour is operational, maintenance dredging operations will be carried out as required, depending on the rate of accretion within the inner basin and entrance channel, which will be monitored by hydrographic survey. A variety of dredger types could be used for the maintenance operation; this will be dependent on the type and quantity of material to be dredged, and the availability and cost of dredging equipment.

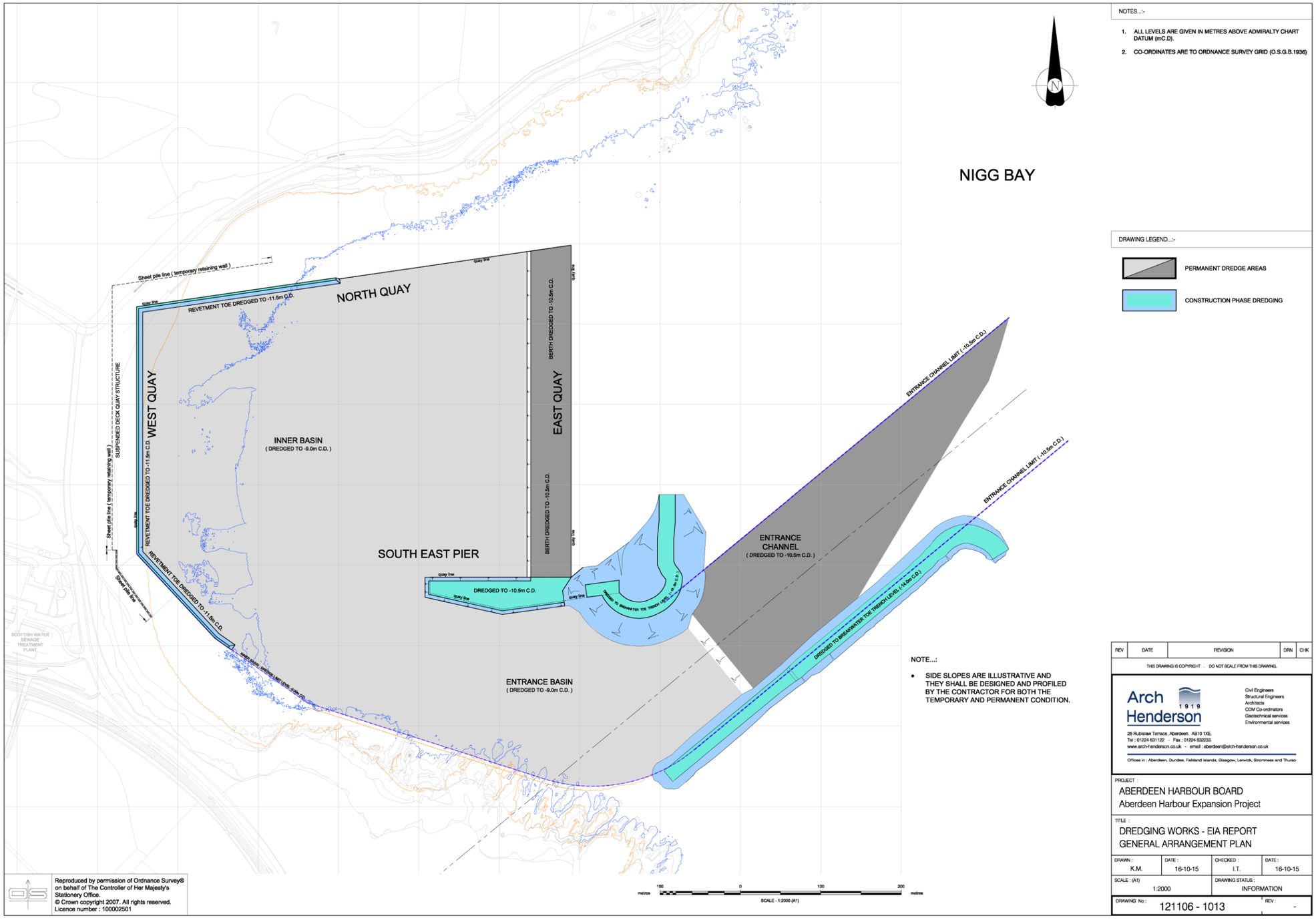

Figure 2.1 Dredge Plan

3. Available Disposal Options

A range of disposal options have been identified and assessed. As a contractor has not yet been appointed, the 'Rochdale Envelope' approach has been used to identify the range of possible disposal options (see ES Chapter 5: Environmental Impact Assessment Process for further details). These options will be considered and reassessed at the time of any future maintenance dredging. The options are listed below and described in more detail in the following subsections.

1. Land reclamation on site;
2. Construction material off site;
3. Beach restoration/other coastal protection; and
4. Offshore sea disposal.

OPTION 1: LAND RECLAMATION ON SITE

The construction of the quays will require the reclamation/infilling of land behind piled walls. A proportion of the coarser material to be dredged (e.g. rock, gravel and sand) could be suitable for use as reclamation material. The finer fractions (silt and fine sand) are not suitable for land reclamation.

OPTION 2: CONSTRUCTION MATERIAL OFF SITE

Similarly to Option 1, a proportion of the coarser material to be dredged could be suitable as a construction material for projects within Aberdeenshire or further afield.

Due to the large volumes of material to be dredged, and the lack of stockpile space within the site boundary, there is limited opportunity for temporary storage and/or processing of dredged material. This option, whilst a possibility, will be highly dependent on the demand for this material at the time of dredging.

OPTION 3: BEACH RESTORATION/OTHER COASTAL PROTECTION

Dredged material can be used as beach restoration/recharge material, or for other coastal protection works. However, it is often challenging to align the timescales for restoration and dredging projects.

Aberdeen Harbour Board has consulted widely throughout the EIA and consenting process for the development, including with Aberdeen City Council, and has not identified potential opportunities for beach restoration. Correspondence with Aberdeenshire Council in July 2015 has confirmed that the Council does not have any current plans that would make use of dredged material (see Appendix A). On this basis, the use of dredged material in beach restoration or other coastal protection projects is not considered a viable option.

OPTION 4: OFFSHORE SEA DISPOSAL

Aberdeen Harbour Board undertakes annual maintenance dredging of the existing harbour, and the dredged material is disposed at the licensed offshore disposal site CR110, located approximately 3.5 km offshore of Nigg Bay in water depths of 35 - 50 m, as shown on Figure 3.1. Due to the large area and deep water at this site, the disposal of dredged material is considered a viable option.

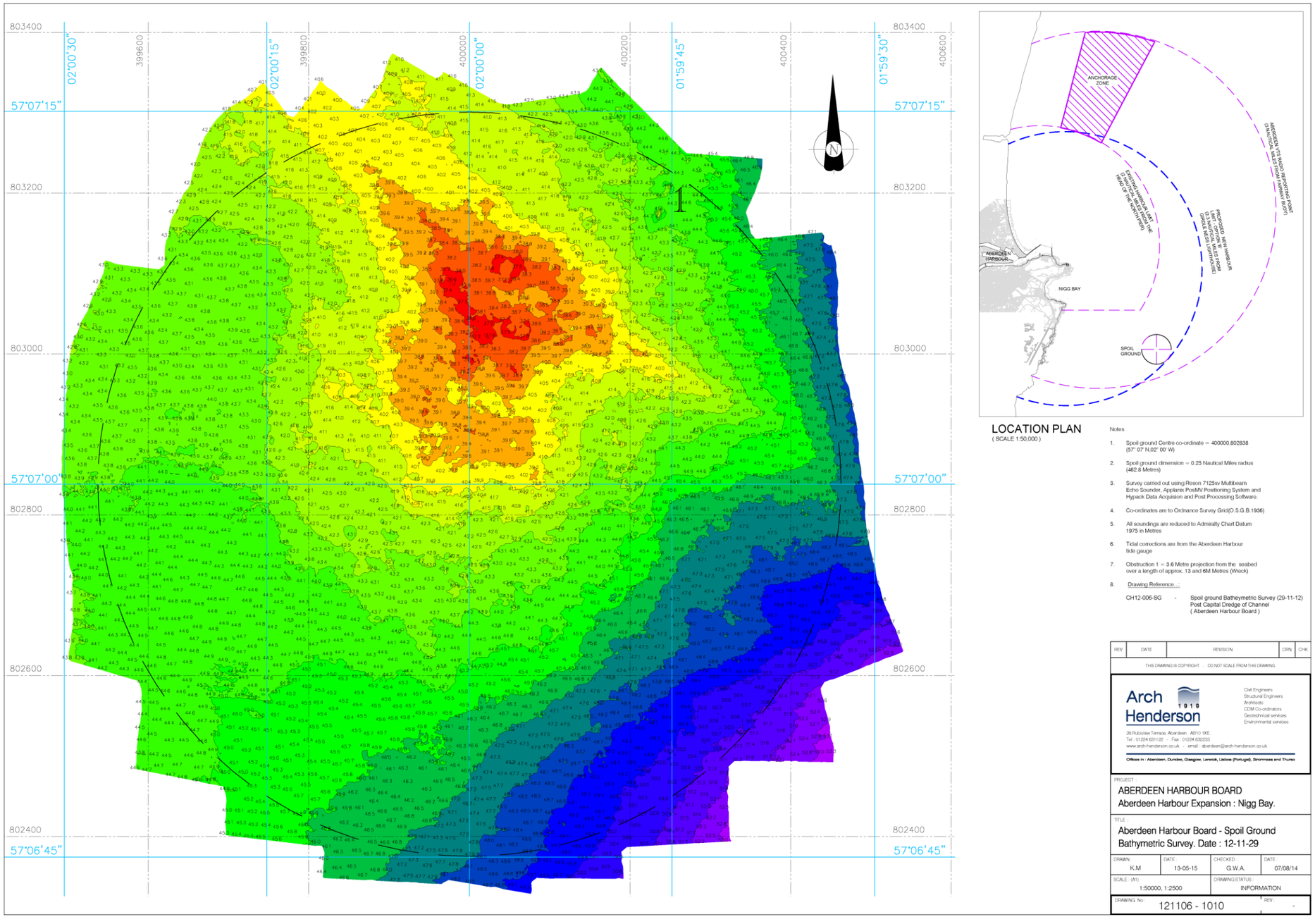

Figure 3.1 Offshore dredge disposal site

4. Assessment of Disposal Options

SUMMARY OF AVAILABLE DISPOSAL OPTIONS

The identification of available disposal options presented in Section 3 concluded that Option 3 (beach restoration/other coastal protection) is not considered to be a viable option due to a lack of demand in the foreseeable future.

In this section, Options 1, 2 and 4 are assessed further for strategic, environmental and cost considerations.

OPTION 1: LAND RECLAMATION ON SITE

Strategic considerations

The re-use of dredged material for reclamation and quay backfilling is a sustainable and efficient method of disposing of the material arising from the capital dredging. There would be no need for transport of the material off site. It is recognised that a substantial proportion of the material is not considered suitable for re-use, due to the fine nature of the material.

The material may require a waste management licence or exemption from the Scottish Environment Protection Agency depending upon the quality, need and end use of the material.

Environmental considerations

The use of dredged material for reclamation and quay backfilling has the following environmental advantages:

- The material is deposited very close to where it originated;
- There would be no need to transport the material off site by road;
- Material is not unnecessarily disposed at sea; and
- The amount of material which would otherwise have to be imported from quarries is reduced.

The material is considered suitable for re-use on land, as demonstrated by sediment sampling and chemical analysis undertaken in 2013, 2015 and 2016. The results are presented in Chapter 7 of the ES (Marine Water and Sediment Quality) and the Additional Environmental Information Report (22 April 2016). There are considered to be no chemical pollution risks associated with the use of the material in the reclamation.

Cost considerations

Costs associated with this option include the mobilisation and demobilisation of the dredging equipment, and a charge levied by The Crown Estate for use of a mineral resource on seabed that is within their ownership. The use of fuel by dredging equipment would be less than for Option 4 (offshore sea disposal) as the distance between the dredge site and the point of disposal is very short, i.e. within Nigg Bay.

OPTION 2: CONSTRUCTION MATERIAL OFF SITE

Strategic considerations

The use of the dredged material in construction for projects within Aberdeenshire or further afield is technically feasible, but it is likely to require considerable handling, transportation and reworking on site. Due to the large volumes of material involved, and the lack of stockpile space within the site boundary, there is limited opportunity for temporary storage and/or processing of dredged material. There are transportation implications, with the majority of the material likely requiring transit by road to the point of final use.

As for Option 1, it is recognised that the finer fractions of the dredged material (fine sand and gravel) would not be suitable as a construction material.

There is not a known market for this volume of dredged material at present.

Environmental considerations

Environmental considerations include: excessive vehicle movements between Nigg Bay and the recipient site(s), with potential to cause nuisance; road safety concerns; and reduced air quality concerns alongside transit routes.

Cost considerations

As for Option 1, costs associated with this option include the mobilisation and demobilisation of the dredging equipment, and a charge levied by The Crown Estate for the use of a mineral resource on seabed that is within their ownership. Additional costs include the processing of dredged material so that it is suitable for use as a construction material, and transport of the material to the recipient site(s).

OPTION 4: OFFSHORE SEA DISPOSAL

Strategic considerations

Offshore sea disposal is known to be technically feasible: the existing licensed disposal site approximately 3.5 km offshore of Aberdeen (shown on Figure 3.1) has been used for maintenance and capital dredging operations at the existing Aberdeen Harbour for many years. The site has not previously received this volume of material; however, it is a large site in deep water so there is considered to be sufficient capacity within the site; this is discussed further in Chapter 7 of the ES (Marine Water and Sediment Quality).

Environmental considerations

By definition, material disposed at sea is not re-used in a beneficial and sustainable way.

The disposal of material at sea generates sediment plumes that can adversely affect fish, shellfish and other marine species. The ES has considered the potential impacts of offshore disposal of dredged material on a wide range of environmental receptors, assuming the worst case scenario of all material (except the rock fraction) being disposed at sea. It concluded that there would be only minor effects on all receptors.

As discussed for Option 1, the material is considered suitable for re-use on land, as demonstrated by sediment sampling and chemical analysis undertaken in 2013, 2015 and 2016. The results are presented in Chapter 7 of the ES (Marine Water and Sediment Quality) and the Additional Environmental Information Report (22 April 2016). There are considered to be no chemical pollution risks associated with the disposal of the material offshore

Cost considerations

As for Options 1 and 2, costs associated with this option include the mobilisation and demobilisation of the dredging equipment. There would be additional fuel costs associated with regular transit to and from the offshore disposal site. As the material is being disposed, there would be a reduced charge from The Crown Estate compared to the charge for re-use of the material.

5. Identification of the BPEO

The BPEO is considered to be a combination of:

- Land reclamation on site for dredged materials that can be practicably recovered during the dredging process (particularly rock, gravel and larger pockets of coarse material); and
- Offshore sea disposal for dredged material that is not suitable for re-use (e.g. glacial till, other fine silts).

A wider range of options may become available when the significantly lower volumes of maintenance dredging are considered. These will be assessed in greater detail once the maintenance dredging requirements are clearer, i.e. when the harbour is operational.

Appendix A: Letter from Aberdeenshire Council regarding coastal protection and beach recharge

Aberdeenshire COUNCIL

JC/GG/S/1/175/3
D.11/1

Infrastructure Services
Roads
Carlton House
Arduthie Road
Stonehaven AB39 2QP
Tel 01569 768455
Fax 01569 768460
www.aberdeenshire.gov.uk
LP-5 STONEHAVEN

RECEIVED
17 JUL 2015

Keith Young
Engineering Director
Aberdeen Harbour Board
16 Regent Quay
Aberdeen
AB11 5SS

Please ask for Joanna Cubbage
Direct Dial 01569 768430
Email joanna.cubbage@aberdeenshire.gov.uk

15 July 2015

If you have difficulty reading this document please contact Joanna Cubbage on 01569 768430

Dear Mr Young

Coast Protection and Beach Recharge

Thank you for your letter dated 11 June 2015 regarding the potential use of dredged sand and silt from various activities taking place in Aberdeen Harbour.

I can confirm that we do not have any current plans which would make use of dredge material. However, there may be opportunities for mutually convenient options as we investigate and develop future flooding and coast protection and schemes along the Aberdeenshire coast.

Please do not hesitate to contact me should you wish to discuss this any further.

Yours sincerely

[Redacted]

Joanna Cubbage
Principal Engineer
Flooding and Coast Protection