Louise Treble
Marine Directorate Licensing Operations Team
By Email Only

Our ref 679083/CCAS/004
Telephone 0141-341-45040
E-mail cstewart@envirocentre.co.uk

12 July 2024

Dear Louise,

Port of Ardersier – Marine Construction License (MS-00009479)
Marine Construction Licence Application

We write on behalf of our clients, Ardersier Port (Scotland) Ltd, regarding the marine construction license (MS-00009479) which authorises the works to upgrade the existing quay to create a modern port facility capable of servicing the off-shore wind industries.

Following submission for a Screening Opinion (Ref: SCR-0080, dated 12th June 2024) it was confirmed that an EIA was not required to be carried out in respect of the proposed works. However, it was concluded by MDLOT that the proposed changes constitute a material change, and as a result a new application needs to be submitted rather than a variation to the existing licence. A new application form has been completed for submission and accompanies this letter.

As detailed previously in EnviroCentre letter 679083/ec/002, dated 27th March 2024, the application relates to the removal of existing hardstops within the Harbour to facilitate future dredging works which are planned for 2025.

Areas of existing hardstops for removal are detailed within drawing ArdPhase1-HAV-WP3-ZZ-DR-C-0001. It is estimated that 1,090 tonnes of steel piles circa 18 m in length, will be extracted from below MHWS with the recovered steel being recycled off site at a suitably licensed facility. As the extraction of the current quay wall is essentially the reverse of installing the sheet piled wall approved in the consented design, work will be undertaken taking account of the existing control and mitigation measures defined within the current Construction Environmental Management Document.

Early discussions on sheet pile removal had considered the requirement for the need for use of temporary bunds adjacent to the sheet piles to facilitate their removal. Through discussions with the contractor and method refinement, there is no longer a need for the use of temporary bunds for this part of the project.

As per recent discussions please find attached the following information appended to the end of this letter.

- Associated Drawings
- Marine Mammal Risk Assessment, April 2024
- Updated Bauer methodology for the quay wall construction , March 2024
- Coastal Modelling and Assessment Report, July 2024

- Sediment Transport Monitoring Plan, July 2024

Screening Request Clarification Point from NatureScot - The Coastal Modelling and Assessment Report and the Sediment Transport Monitoring Plan are separate reports and serve their own purposes. However, the coastal model report can inform the evolution of the Sediment Transport Monitoring Plan.

NOTE: Please note that in the accompanying Method Statement from the contractor Bauer there is an error in the total quay wall length which states that the diaphragm wall length is 1500 m. The correct length is 659 m of wall construction.

Should you require further information please do not hesitate to contact the undersigned.

Yours sincerely
for EnviroCentre Limited

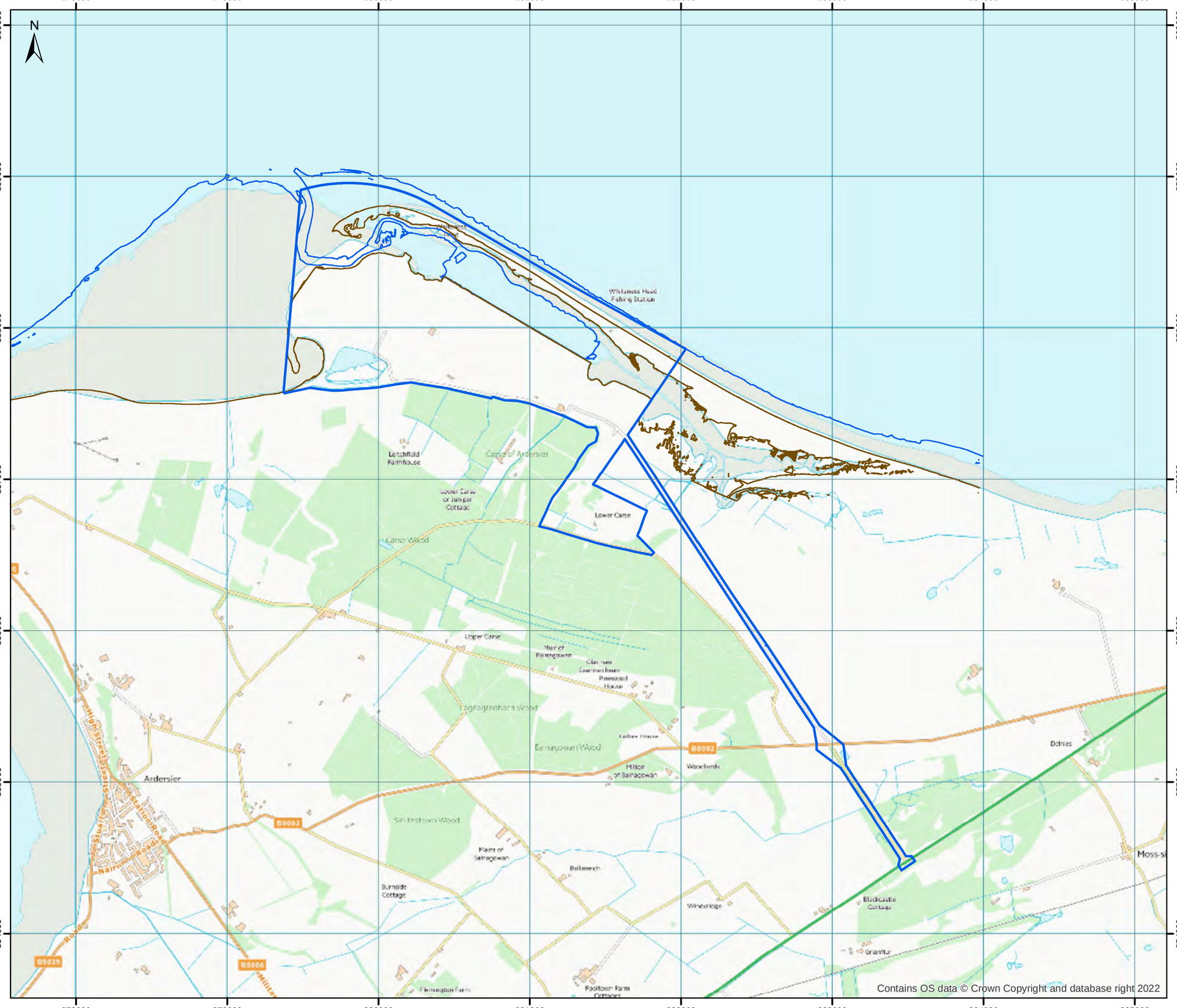
(issued electronically)

Campbell Stewart
Associate Director

Emma Cormack
Principal Consultant

CC: Campbell Fleming & Jonathan Milne – Haventus

Drawings



Legend

- Port Boundary
- Mean Low Water Spring (MLWS)
- Mean High Water Spring (MHWS)

Note: Mean high and low water spring tide extents from May 2018 bathymetric and topographic survey

Do not scale this map

Client
Ardersier Port (Scotland) Ltd.

Project
Ardersier Port

Title
Ardersier Port Site Boundary and Quay Wall Installation Boundary

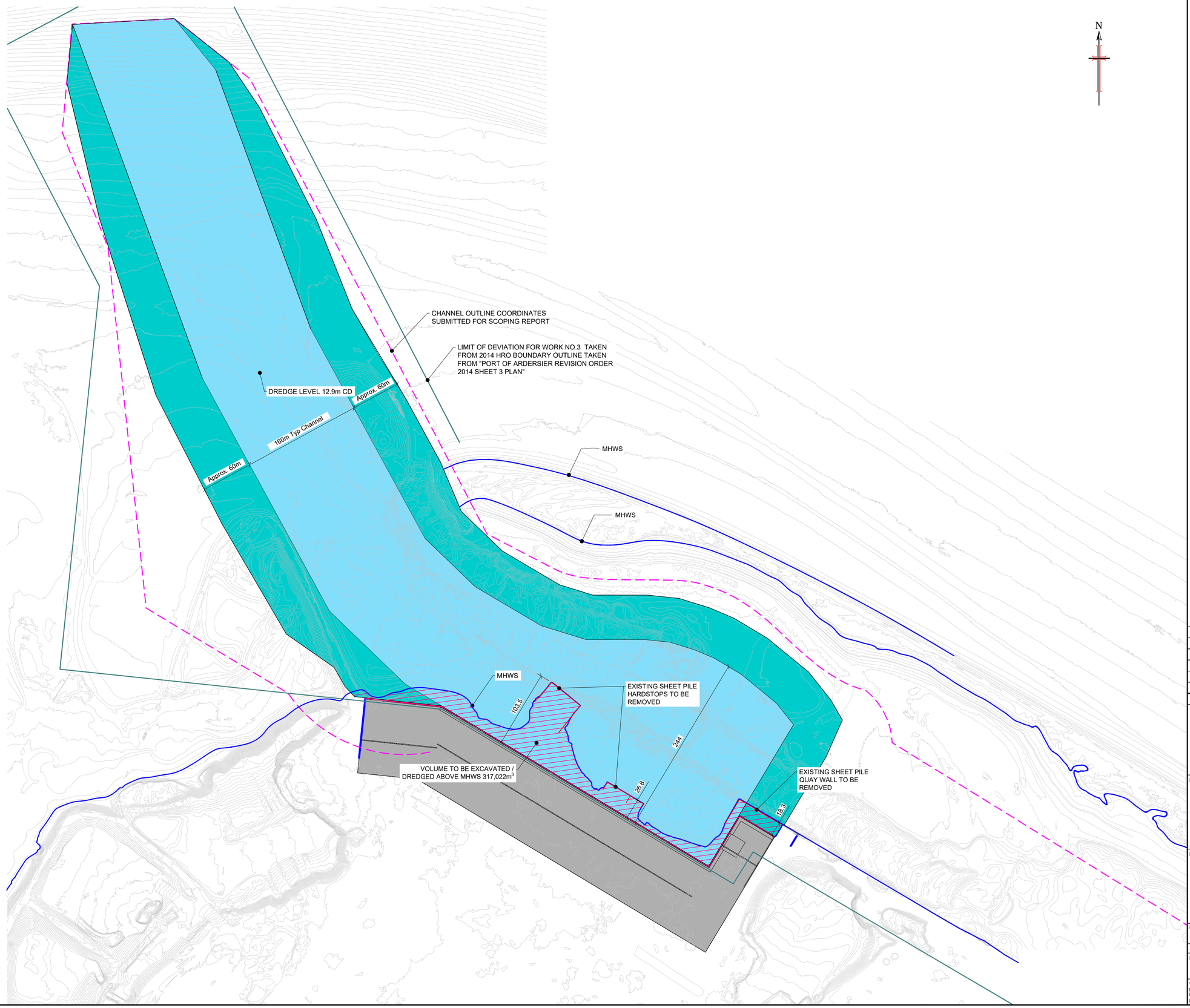
Status
FINAL

Drawing No.	Revision	Date
676030-GIS001	-	08 April 2022
Drawn	**Checked**	**Approved**
JAS	MS	CCAS

Scale
1:24,000 @A3
0 120 240 480 720 Metres

Rev	Date	Amendment	Initials
A	16/04/24	Title/dwg no corrected.	FR
B	17/04/24	Features removed.	FR

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



NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. ALL LEVELS ARE GIVEN IN METRES ABOVE CHART DATUM (m ACD). CORRECTION FOR ORDNANCE DATUM IS -2.14m (RELATIVE TO ORDNANCE DATUM AT NEWLYN).
4. EXISTING BATHYMETRY HAS BEEN INTERPRETED FROM MAY 2022 BATHYMETRY SURVEY AND MAY VARY.
5. VOLUME OF MATERIAL TO BE EXCAVATED / DREDGED BETWEEN THE EXISTING QUAY WALL/HARDSTOPS AND NEW QUAY WALL ASSUMED FROM LEVEL +6.5mCD TO -12.9mCD IN FULL EXTENT OF THE HATCHED AREA.

KEY:

- DREDGE CHANNEL
- DREDGE SLOPE
- AREA TO BE DREDGED / EXCAVATED ABOVE MHWS

0 50 100 150 200

SCALE 1:2500(A1)
SCALE 1:5000 (A3)
METRES

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd
P02	12/07/2024	FOR INFORMATION	JM	CF	CF
P01	22/03/2024	FOR INFORMATION	JM	GO	GO
P00	28/02/2024	FOR INFORMATION	JM	GO	GO

Haventus

Project

ARDERSIER PORT REDEVELOPMENT PHASE 1

Drawing title

PROPOSED WORKS BELOW MHWS

Drawing status

FOR INFORMATION

Scale	1:2500 @ A1, 1:5000 @ A3	DO NOT SCALE

Drawing number: ArdPhase1-HAV-WP3-ZZ-DR-C-0001

Rev: P02

Marine Mammal Risk Assessment

9 envirocentre

Ardersier Port
Marine Mammal Risk Assessment

April 2024

CONTROL SHEET

Client: Ardersier Port Ltd
Project Title: Ardersier Port
Report Title: Marine Mammal Risk Assessment
Document number: 13972
Project number: 677965

Issue Record

Issue	Status	Author	Reviewer	Approver	Issue Date
1	Final	JEP	GN	MM	21/02/2024
2	Final v2	CCAS	JEP	MM	25/03/2024
3	Final V3	CCAS/JEP	MM	MM	04/04/2024
	Final V4	CCAS/JEP	MM	GN	24/4/2024

EnviroCentre Limited Office Locations:

Glasgow **Edinburgh** **Inverness** **Banchory**

Registered Office: Craighall Business Park 8 Eagle Street Glasgow G4 9XA
Tel 0141 341 5040 info@envirocentre.co.uk www.envirocentre.co.uk

EnviroCentre Limited is registered in Scotland under no. SC161777.

VAT no. GB 348 6770 57.

EXECUTIVE SUMMARY

EnviroCentre Limited was commissioned by Ardersier Port Ltd. to provide a Marine Mammal Risk Assessment (MMRA) to inform a screening request for sea deposit of dredged material at local disposal sites within the Moray Firth at Sutors and Burghead. This element was not previously considered within the original EIA, and as such this activity has been assessed for potential risks to Marine Mammals (cetaceans and seals).

This document is a revision of the previously issued report. (Version 3) which was submitted in support of the EPS licence renewal in early April 2024.

It is considered that the following EPS species are present within the area and may be impacted by the proposed works; harbour and grey seals, harbour porpoise, bottlenose dolphin, white-beaked dolphin and minke whale.

The Ardersier Port lies within the Moray Firth Special Area of Conservation (SAC) which is a statutory designated site with bottlenose dolphin listed as a qualifying feature.

Underwater noise is considered to be the main activity which could negatively impact marine EPS, with injury, death and disturbance of individuals being a possibility. Underwater noise modelling was commissioned as part of this assessment based on the construction methods associated with the works and most significant for generating underwater noise; vibration piling and dredging.

Vibration piling and dredging have shorter risk ranges for Permanent Threshold Shift (PTS) for minke whale (110m and 34m, respectively), bottlenose dolphin and short-beaked dolphin (21m and 20m, respectively), whilst porpoises are at a greater risk (280m and 330m respectively), if stationary over an 8 hour period. The noise from vibration piling and dredging presents a higher risk range for Temporary Threshold Shift (TTS) for minke whale (1.4km and 370m, respectively) and bottlenose dolphin and white-beaked dolphin (270m and 220m, respectively), whilst porpoise are at a greater risk (3.6km and 2.8km, respectively), if stationary over an 8 hour period. Assuming that animals will flee as soon as they hear the noise from the vibropiling or dredging, the PTS range for any species is a maximum of 2m (vibropiling) or 3m (dredging) from the source of the noise. The TTS range for porpoises associated with vibropiling is a maximum of 210m, with other species below 9m, whilst TTS ranges associated with dredging for all species are a maximum of 3m (dredging).

Transportation of dredged sediments to the disposal sites also poses a potential risk from general disturbance from noise generation and potential vessel strike. The proposed vessels to be used for transportation of dredged material from the dredge site to the sea deposit area(s), based on available information, fall within the medium-size ships category (50m-100m) with a typical broadband source levels for these small to mid-size vessels are generally in the 165 - 180 dB (re: 1µPa) . Therefore, the use of a medium sized ship vessel to transport the dredged materials to the disposal site would have the same or less PTS or TTS impacts than the dredging depending on the broadband source levels. It is considered that for most types of marine traffic the risk of collision is minimal.

Mitigation in the form of a Marine Mammal Protection Plan (MMPP) outlined in Section 4 of this report, will be implemented and will reduce the risk of injury as well as limit the potential disturbance. The MMPP includes a Marine Mammal Observer (MMO) protocol with an exclusion zone of 500m and soft start construction methods at the site. MMO observations will also be undertaken at the sea disposal sites ahead of material deposit.

Even with mitigation in place, it is not considered possible to completely rule out disturbance to marine mammals as a result of works.

.

Contents

Appendices

Figures

Tables

1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Limited was commissioned by Ardersier Port Ltd. to provide a Marine Mammal Risk Assessment (MMRA) to inform a screening request for sea deposit of dredged material at local disposal sites within the Moray Firth. This element was not previously considered within the original EIA, and as such this activity has been assessed for potential risks to Marine Mammals (cetaceans and seals).

This document is a revision of the previously issued report. (Version 3) which was submitted in support of the EPS licence renewal in early April 2024.

1.2 Scope of Report

The aim of this report is to provide information required by Marine Directorate to determine whether the inclusion of transportation of dredged material to the operational disposal site(s) of presents a significant risk to Marine Mammals. The assessment considers the following elements:

- Update existing and collate new data in relation to marine mammals to establish which species are likely to be present within the development site and the wider zone of influence.
- Identify potential impacts to marine mammals which could occur as a result of the proposed development; and
- Detail mitigation which will be employed to reduce the risk of negative impacts.

1.3 Site Location

The ‘Site’ is situated approximately 7.5km to the west of Nairn, 18km northeast of Inverness and 3km northeast of the village of Ardersier (grid reference: NH812 576). The Site is located on the former McDermott Fabrication Yard land and extends to 307 hectares. The Site has been a vacant brownfield site for approximately 17 years.

The Site is bound to the north by the Moray Firth. Whiteness Head is situated to the east. Carse Wood is located to the south of the Site and an area of sand dunes and tidal mudflats is situated to the west. Fort George is located to the southwest of the Site boundary.

The site is relatively flat and benefits from an existing access road. The existing access road is 2.5km in length and connects the site to the B9092. The B9092 subsequently connects to the A96 which is the main transport route between Inverness and Aberdeen. The site includes an existing harbour which is protected by a naturally occurring sand and shingle spit, known locally as ‘Whiteness Head’.

1.4 Project Background and Overview

The proposed development includes the establishment of a port and port related services for offshore energy related uses. Works include marine channel dredging, quay realignment, repair and maintenance, erection of offices, industrial and storage buildings and associated infrastructure, delivery and export of port related cargo, associated new road access, parking, infrastructure,

services, temporary stockpiling of dredged material, re-grading and upfilling of landward areas and landscaping.

The construction phase will include:

Capital Dredge

- The Proposed Development allows for the construction of quay wall facilities and capital dredging to form an access channel for shipping and associated structures using the port facility.
- The capital dredge as per licence MS-00010583 permits the Capital dredging of 8,600,000 wet tonnes. This currently involves the dredging of the port entrance to -12.9m Chart Datum (CD). This will involve the removal of 2,300,000 m^3 of sand by Cutter Suction dredger (CSD), with the material initially being deposited directly via a discharge pipeline to the inner channel as reinstatement to the inner spit (200,000 m^3) and onshore storage at the site (2,100,000 m^3). An area of the inner channel is proposed to be dredged to -3mCD and will be carried out by either plough dredging, backhoe dredger or land-based equipment. This element of the proposed dredge is minor and represents 2-3% by volume of the overall dredge.
- The CSD process involves a rotating cutter head that loosens rocks and seabed, then a suction inlet that sucks up the loosened material up onto the vessel.
- Dredging programme is currently estimated to be 13 to 16 weeks, with the plant working up to 24 hours a day (therefore including night-time dredging), seven days a week between April and September 2025 (potentially into October with prior agreement from NatureScot).
- An existing condition within the licence stipulates that the outer channel can only be dredged between 1st April and 30th inclusive.

Quay Wall Construction Works

- The existing Marine Construction License (MS-00009479) which expires in August 2024 is currently subject to a screening request (SCR-0080) for a temporal variation to extend the period of validity with the purpose of using vibropiling methods for the decommissioning of the existing sheet piles and hardstops to facilitate the future removal of material to reveal the new quay wall following the completion of dredging works.
- Recent redesign of the quay wall means that it will all be constructed above MHWS, in the ground prior to excavation/dredging of residual material to expose the new quay wall to the marine environment. The length of piles needing extracted is 322m, some 30% reduction in linear meterage of the previously approved pile installation for the quay wall.

Surface Water Treatment

- The surface water system will incorporate appropriate SuDS (Sustainable Drainage System) measures to meet quality criteria for surface water discharge. Importantly, adequate land space will be identified to incorporate these measures within the detailed design of the development.
- In terms of quantity, the end discharge of the surface water system will be to the sea and therefore the control of peak runoff rates and runoff volumes will not be required as part of the system.

Vessel Movement

- The likely vessel requirements identified are detailed in Table 1.1.

Table 1.1: Vessel details and main activities

	Capital Dredging Works
Vessel details & (Number of vessels)	Principal: Cutter Suction Dredger (1) Support: Multicat workboat (1) Crew vessel (1) Survey vessel (1)
Main Activities	Initial deployment would be for the workboat and survey vessel. The workboat will lay out required pipelines for pumping the dredged material to their designated locations and this would commence two to four weeks before arrival of the cutter suction dredger. The dredger, when it arrives on site, will connect to the pipelines and commence dredging operations. The dredger will commence from existing deep water in the South Channel and proceed inwards to the port, creating the dredged channel as it proceeds. Movement of the dredger is slow as it progresses in towards the main port area and will be serviced by the attendant support vessels.

- The use of ducted propellers on vessels using the port will be allowed in accordance with the most recent guidance provided by NatureScot.
- All the vessels identified have ducted propellers fitted and which may be needed to manoeuvre in restricted waters, for navigational safety. However, it is to be highlighted that the principal vessel involved in the capital dredging operation, the dredger itself, will not use ducted propellers during the dredging operations. Movement of the cutter suction dredger is slow in progressing from the seaward end of the channel into the port and is controlled through a system of spuds and control wires.
- Vessel management will be under the control of the appointed contractor during dredging in consultation with Ardersier Port. Notice to Mariners will be published in advance of dredging works advising of dredging activity in the area.
- Vessels involved in undertaking the works at the port will be based at the port. Once on station, the cutter suction dredger should proceed with the dredging operation in a single transit of the channel, from the seaward end of the channel into the port area. The dredger will be attended by the support vessels.

1.5 Project Update April 2024

Capital Dredge

i. Dredge Licence (MS-00010583) was granted March 2024 for dredging of 8,600,000 wet tonnes with 400,000 wet tonnes to be deposited below Mean High Water Springs as reinstatement of an inner section of Whiteness Head Spit and the remaining amount to be placed above MHWS.

ii. Previous plans were to pump all of the dredged material ashore for reuse, however following review it is now understood that this option presents a number of challenges. Following consultation with the Marine Directorate, NatureScot, Highland Council and other parties, it has been identified that a number of options including beneficial reuse to reinstate a further section of the spit, and also provide dredge material to areas on Whiteness sands for the purpose of sediment nourishment. Sea disposal will be required to manage the remainder of the total volume. It is envisaged that he majority of material will be deposited a Burghead with a small proportion proposed for deposit at Sutors disposal site. More detail on these options is provided within the April 2024 updated Best Practicable Environmental Option (BPEO) Report.

A licence application with capacity to dispose of up to 2.5 million m^3 will need to be applied for to accommodate the material which cannot be accommodated within the reuse or beneficial reuse options available.

Quay Wall Construction

No further changes, MCL screening request pending.

Vessel Movements

As a result of the change in the construction methods there will be no shipping movements associated with the quay wall construction, only the capital dredge works with the key difference being the transportation of material to the two closest disposal sites Cromarty Sutors and Burghead. In addition to this, there will be the placement of dredged material at the restoration area on the spit as well as placement of material to the west of the channel as requested by NatureScot, and still to be formally agreed. There is also scope for pumping dredged material ashore for reuse. The associated vessels and outline of key activities is detailed below in Table 1.2 below.

Table 1.2: Vessel details and main activities (pre-contract award 2024)

	Capital Dredging Works
Vessel details & (Number of vessels)	Cutter Suction Dredger (1) Trailing Hopper Suction Dredger (1) Split Hopper Barges (SHB) – multiple up to 10 (TBC) Support: Multicat workboat (1) Crew vessel (1) Survey vessel (1)

Main Activities	Initial deployment would be for the workboat and survey vessel to undertake the preliminary bathymetric survey as starting reference point. The workboat will lay out required pipelines for pumping the dredged material to their designated locations and this would commence two to four weeks before arrival of the cutter suction dredger. The dredger, when it arrives on site and commence dredging operations. It is envisaged that the dredger will commence from existing deep water in the South Channel and proceed inwards to the port, creating the dredged channel as it proceeds. Movement of the dredger is slow as it progresses in towards the main port area and will be serviced by the attendant support vessels. Dredged material to be pumped ashore via pipeline until agreed volume met, with drained water from lagoon to discharge to the harbour. The spit restoration works will involve the deposition of material from either pipeline or floating spreader pontoon, with the deposited material subsequently reworked using traditional earth moving equipment like bulldozers and excavators to gain the final profile. No plant will be allowed above mean highwater springs i.e. on the spit and will be confined to below mean high water springs at all times. The final methodology is to be agreed pending appointment of the dredging contractor. All works will be executed in line with the appropriate CEMP, which will be submitted for approval by key stakeholders ahead of the works commencing. It should be noted that a further area of restoration on the spit has been identified by NatureScot further west and has been included within the most recent licence variation request. The position of this relative to the currently agreed part of the site is detailed within drawing ArdPhase1-HAV-WP3-ZZ-DR-C-0006 in Appendix A. The restoration works in this area has identified a requirement for 280,000m^3 across both areas as a combined total. The proposed replenishment of sediment within Whiteness Sands will be undertaken within two areas. These areas are detailed on drawing ArdPhase1-HAV-WP3-ZZ-DR-C-0006 as Whiteness Sands East and Whiteness Sands West. A combined total volume of 120,000m^3 is proposed to be utilised across these areas for the purpose of sediment nourishment with material to be placed between 5m bCD and mean low water springs. As with the spit restoration element of the works, the contractor has not been appointed and therefore the methodology not concluded, but it is considered likely that the material will be placed in this area using either split hopper barges or Trailer Suction Hopper Dredger with placement through bottom dumping directly to the sea floor. Another possibility will be the use of a spreader pontoon and pipeline which would be manoeuvred into position by a multicat vessel to help focus the deposition of material into target areas. Due to the shallow water in these areas on Whiteness Sands, all deposition activities would be confined to periods of high tide to enable vessel access. SHBs to transport dredged material to disposal site(s) with the current plan noted to involve vessels to travel in convoy to and from site. Based on current information it is envisaged that there would be between 13 and 23 barge round trips per day with each vessel travelling at 10 to 12 knots, although generally at speeds of around 10 knots. Once within the spoil ground manoeuvring the vessel into position and dumping the dredge material will take approximately 10 to 15 minutes prior to returning to the dredge site.

1.6 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre Limited.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre Limited for review to ensure that any relevant changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

Whilst the Client has a right to use the information as appropriate, EnviroCentre Limited retains ownership of the copyright and intellectual content of this report. Any distribution of this report should be managed to avoid compromising the validity of the information or legal responsibilities held by both the Client and EnviroCentre Limited (including those of third party copyright). EnviroCentre Limited does not accept liability to any third party for the contents of this report unless written agreement is secured in advance, stating the intended use of the information.

EnviroCentre Limited accepts no liability for use of the report for purposes other than those for which it was originally provided, or where EnviroCentre Limited has confirmed it is appropriate for the new context.

2 MARINE MAMMAL BASELINE

2.1 Desk Study

In order to anticipate the potential marine mammal ecological sensitivities at the site, a desk study including a review of existing information pertaining to marine mammals was obtained for the site in 2018 with updates in 2024 as required. The following sources were checked:

- NatureScot (NS) Sitelink[1] for designated sites;
- Commercially available records form the National Biodiversity Network (NBN)[2] within 5km of the development, and within the Moray Firth Special Area of Conservation (SAC);
- The Joint Nature Conservation Committee (JNCC) guidance relating to marine mammals and underwater noise risk[3] and Atlas of Cetacean Distribution [4];
- Sea Watch Foundation (SWF) website for recent sightings [5];
- NatureScot website for details of marine mammals in Scotland and the Moray Firth dolphin population[6 & 7];
- Whale and Dolphin Conservation (WDC) website for species guides[8];
- Scottish Marine Animal Stranding Scheme (SMASS)[9] for stranding records within 20km of the site;
- Marine Scotland Maps NMPI for species distributions[10]; and
- Marine Scotland regional baseline for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters[11].

2.1.1 Disclaimer

It should be noted that the baseline is limited by the reliability of third party information and the geographical availability of biological and/or ecological records and data. The absence of species from biological records cannot be taken to represent actual absence. Species distribution patterns should be interpreted with caution as they may reflect survey/reporting effort rather than actual distribution.

[1] NatureScot SiteLink available at: https://sitelink.nature.scot/map (Accessed January 2024)
[2] NBN Atlas available at: https://scotland.nbnatlas.org/ (Accessed January 2024)
[3] JNCC Statutory Nature Conservation Agency Protocol for Minimising the Risk of Injury to Marine Mammals from Piling Noise (2010) available at: http://jncc.defra.gov.uk/pdf/JNCC_Guidelines_Piling%20protocol_August%202010.pdf (Accessed January 2024)
[4] Reid, J B, Evans, P G H, and Northridge, S P. JNCC Atlas of Cetacean Distribution in north-west European waters (2003) available at: http://jncc.defra.gov.uk/page-2713#download (Accessed January 2024)
[5] Sea Watch Foundation Cetaceans of Western Scotland available at: http://seawatchfoundation.org.uk/wp-content/uploads/2012/07/WesternScotland.pdf (Accessed January 2024)
[6] NATURESCOT About Scotland's Nature: Marine Mammals available at: http://www.NatureScot.gov.uk/about-scotlands-nature/species/mammals/marine-mammals/ (Accessed January 2024)
[7] Site Condition Monitoring of bottlenose dolphins within the Moray Firth SAC: 2014-2016 available at: https://www.nature.scot/sites/default/files/2018-04/Publication%202018%20-%20NATURESCOT%20Research%20Report%201021%20-%20Site%20Condition%20Monitoring%20of%20bottlenose%20dolphins%20within%20the%20Moray%20Firth%20Special%20Area%20of%20Conservation%202014-2016.pdf (Accessed January 2024)
[8] WDC species guides available at: http://uk.whales.org/species-guide (Accessed January 2024)
[9] Scottish Marine Animal Stranding Scheme (SMASS) available at: https://strandings.org/map/ (Accessed January 2024)
[10] Marine Scotland Map NMPI species distribution data, available at: https://marinescotland.atkinsgeospatial.com/nmpi/ (Accessed February 2024)
[11] E L Hague, R R Sinclair and C E Sparling. 2020. Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters. Scottish Marine and Freshwater Science Vol 11 No 12, available at: Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters | Marine Scotland Data Publications (Accessed February 2024)

2.2 Designated Sites

The Ardersier Port lies within the following designated sites:

- Moray Firth SAC
- Moray Firth Special Protected Area (SPA)
- Inner Moray Firth SPA
- Whiteness Head Special Site of Scientific Interest (SSSI)

The Moray Firth SAC is the only statutory designated site relating to marine EPS, with bottlenose dolphin (*Tursiops truncatus*) listed as a qualifying feature.

An assessment of the proposed works in relation to the designated site features are presented in the shadow Habitats Regulation Appraisal (HRA) in Appendix B.

2.3 Cetaceans

The cetacean fauna (whale, dolphins and porpoises) of Eastern Scotland (which includes the Moray Firth) is considered moderately rich, with eight cetacean species (just under 29% of the 28 UK species) having been regularly recorded since 1980, in waters off the Grampian and Highland coasts. Cetacean species regularly sighted in Eastern Scotland region include:

- Bottlenose dolphin
- Harbour porpoise (*Phocoena Phocoena*)
- Minke whale (*Balaenoptera acutorostrata*)
- White-beaked dolphin (*Lagenorhynchus albirostris*)
- Risso's dolphin (*Grampus griseus*)
- Atlantic white-sided dolphin (*Lagenorhynchus acutus*)
- Long-finned pilot whale (*Globicephala melas*)
- Killer whale (*Orcinus orca*).

Unusual cetacean sightings have included humpback whale (*Megaptera novaeangliae*), Sperm whale (*Physeter macrocephalus*), Beluga (*Delphinapterus leucas*), Northern bottlenose whale (*Hyperoodon ampullatus*), Sowerby's beaked whale (*Mesoplodon bidens*), short-beaked common dolphin (*Delphinus delphis*), False killer (*Pseudorca crassidens*) and striped dolphin (*Stenella coeruleoalba*).

2.3.1 Bottlenose Dolphins

Bottlenose dolphin are common in nearshore waters of the Moray Firth, particularly at the entrances to Cromarty Firth (around North & South Sutors), Inverness Firth (Chanonry Point & Fort George), and Beauly Firth (North & South Kessock) in Highland Region, all of which are to the west of the site. Bottlenose dolphins are present in all months of the year, with peak numbers recorded July to October.

Bottlenose dolphin have a varied diet, taking a wide variety of benthic and pelagic fish (both solitary and schooling species), as well as cephalopods and shellfish. Haddock (*Melanogrammus aeglefinus*), saithe (*Pollachius virens*), cod (*Gadus morhua*), hake (*Merluccius merluccius*), blue whiting (*Micromesistius poutassou*), snipefish (*Macroramphosus scolopax*), mullet (*Mugil cephalus*), silvery pout (*Gadiculus argenteus*), eels (*Anguilla sp.*), salmon (*Salmo salar*), trout (*Salmo trutta*), bass (*Micropterus salmoides*), sprat (*Sprattus sprattus*) and sandeels (*Ammodytes tobianus*), as well as octopus and other cephalopods can comprise the diet of bottlenose dolphin, who feed solitarily or more commonly in groups.

As a qualifying feature of the Moray Firth SAC monitoring is undertaken to determine the condition of bottlenose dolphin, which are currently considered in Favourable (maintained) condition according to the last assessment in 2016.

Monitoring using timing porpoise detectors (T-PODs[12]) between 2004-2008 to assess the baseline activity of bottlenose dolphins and harbour porpoise associated within the Moray Firth. Bottlenose dolphin were detected regularly at the entrance to Cromarty Firth, only rarely in the outer Moray Firth, and at an intermediate level at Lossiemouth[13].

Photo-identification surveys and Passive Acoustic Monitoring (PAM) studies in core sampling areas within the Moray Firth SAC during the summers (May to September) 2014-2016 were undertaken by Cheney *et al*. (2018)[14], which estimated 85 individual dolphins used the SAC during the summer of 2014, 104 in 2015 and 103 in 2016, indicating numbers of dolphins using the SAC has remained stable. Chelonia PODs (CPODs)[15] were also deployed to the west (Lossiemouth), north (Sutors) and east (Chanonry) of Whiteness Head (2011-2016), with data confirming there remains a peak in dolphin detections during the summer months but also suggests that dolphins may use certain areas of the SAC outside the summer months (high numbers recorded in April and December). The maps provided in Cheney *et al* (2018), Figure 2-1 shows the locations of encounters with groups of dolphins during surveys conducted in a) 2014, b) 2015 and c) 2016, where it is clear that the deep water channel immediately adjacent/north of Whiteness Head is an important area for bottlenose dolphin.

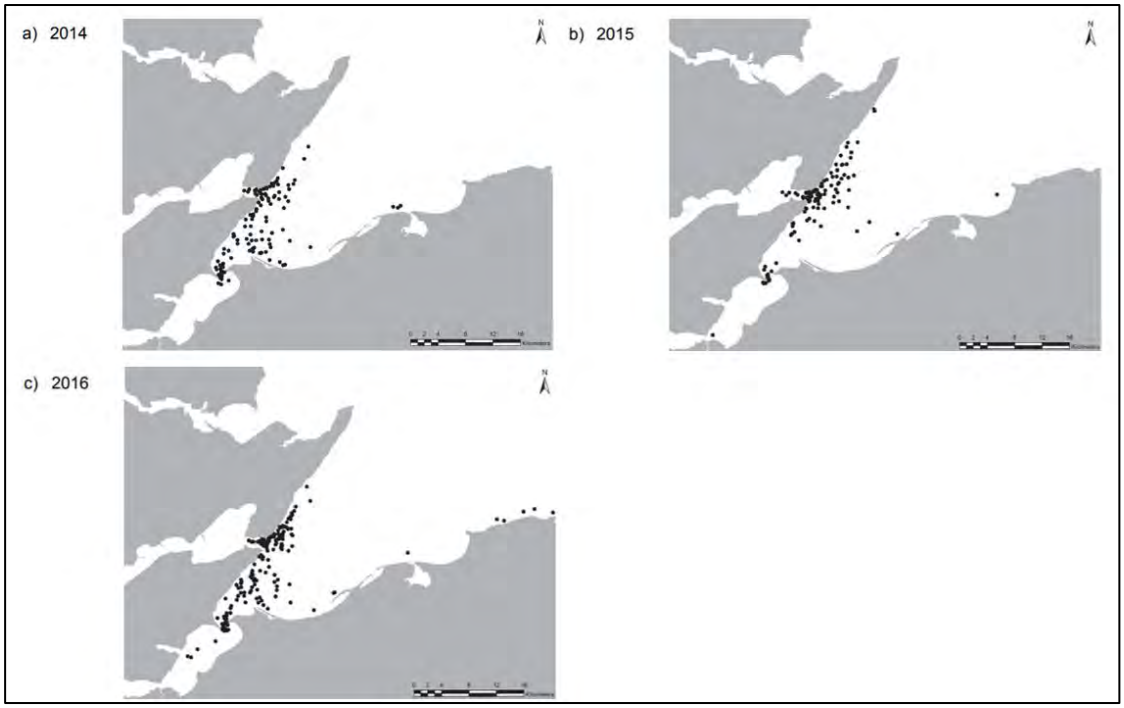


Figure 2-1: Maps showing the location of encounters with groups of dolphins during photo-identification surveys in 2014 (a), 215 (b) and 2016 (c) undertaken by Cheney *et al* (2018)

[12] T-PODS are autonomous data recorders for detecting cetacean echolocation clicks and potentially provide cost-impactive opportunities for monitoring cetacean activity.
[13] Bailey, H., Clay, G., Coates, E.A., Lusseau, D., Senior, B. and Thompson, P.M., 2010. Using T-PODs to assess variations in the occurrence of coastal bottlenose dolphins and harbour porpoises. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *20*(2), pp.150-158, available at: https://www.abdn.ac.uk/sbs/documents/Bailey2010.pdf (Accessed January 2024)
[14] Cheney, B., Graham, I.M., Barton, T.R., Hammond, P.S. & Thompson, P.M. 2018. Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area of Conservation: 2014-2016. Scottish Natural Heritage Research Report No. 1021, available at: https://www.nature.scot/sites/default/files/2018-04/Publication%202018%20-%20SNH%20Research%20Report%201021%20-%20Site%20Condition%20Monitoring%20of%20bottlenose%20dolphins%20within%20the%20Moray%20Firth%20Special%20Area%20of%20Conservation%202014-2016.pdf (Access January 2024)
[15] Similar to T-PODs but a different patent

Annual distribution and relative abundances of bottlenose dolphin based on data obtained between 1979-1997 show the waters surrounding the site to host 1.65-3.65 individuals on average, as per Figure 2-2. In addition, Bottlenose dolphin abundance and density (animals/km2) estimates from SCANS-III data show an abundance of 151 and a density of 0.004, with mean group size being 2, in Block S which includes the area around Ardersier port.

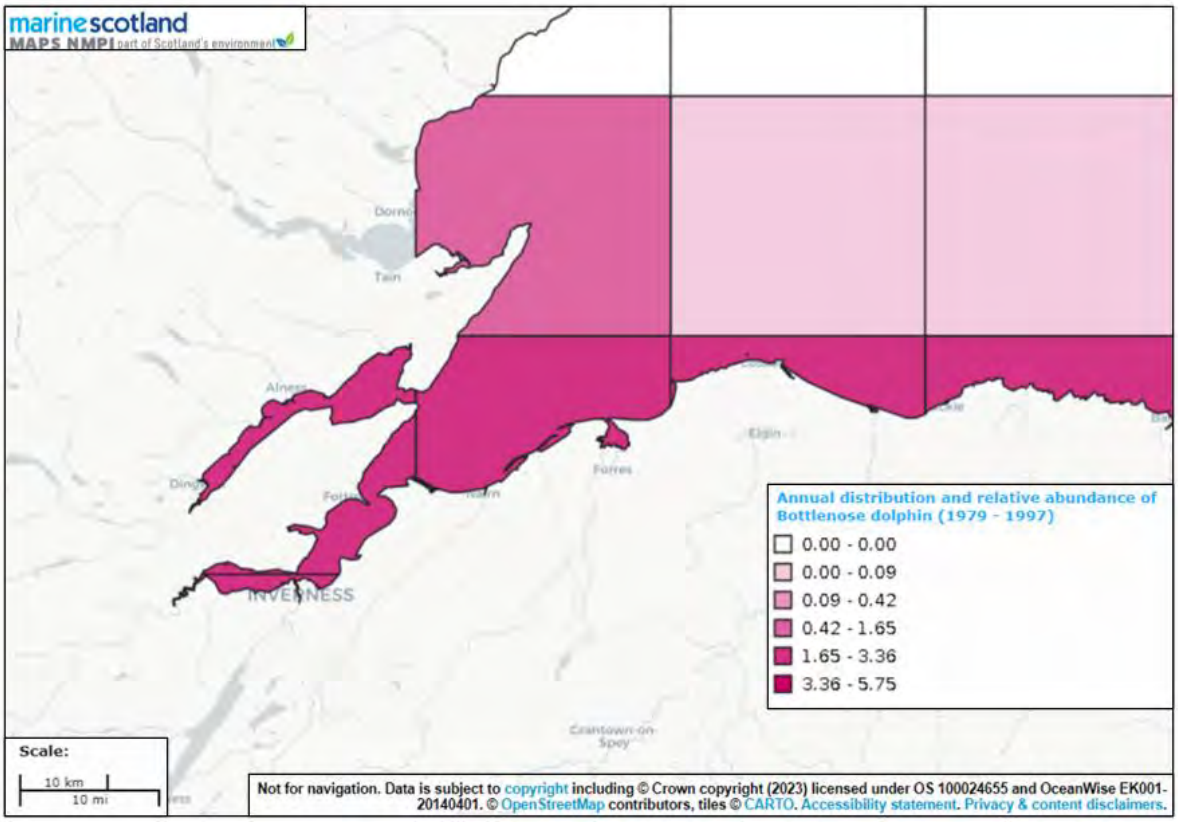


Figure 2-2: Map showing annual distribution and relative abundance of bottlenose dolphin (1979-1997) obtained via National Marine Plan interactive (NMPi)

Between March and December 2023 SWF received 26 sightings of bottlenose dolphin within the North East, consisting of 162 individuals. The nearest was sighted off the coast of Cromarty, approximately 7.6km north (shortest route by water) of the site. 31 records of bottlenose dolphins within 20km of the site (via shortest water route) have been submitted to SMASS between 1992-2021, with two records associated with the site in 2001 and 2021. Seven commercially available records were returned from NBN Atlas of bottlenose dolphin within a 5km radius of the site between 2011-2011, predominantly associated with Chanonry Point[16] approximately 5.2km south west (shortest route by water) of the site.

2.3.2 Harbour Porpoise

Harbour porpoise are fairly common in nearshore waters throughout the north east region, with peak numbers recorded between July and February. However, the west of Scotland is home to a higher density of harbour porpoise than is found elsewhere.

Harbour porpoise diet comprises a wide variety of small fish species, including small gadoids such as whiting (*Merlangius merlangus*), poor cod (*Trisopterus minutus*) and Norway pout (*Trisopterus*

[16] Data obtained via NBN Atlas, from data resource: Highland Biological Recording Group (2023). HBRG Vertebrates (not Badger) Dataset. Occurrence dataset https://doi.org/10.15468/vaassa accessed via GBIF.org on 2024-01-25.

esmarkii), with herring (*Clupea harengus*), sandeels and gobies also being important at certain times or locations.

Harbour porpoises were detected regularly during the T-POD monitoring[17] in the outer Moray Firth, only rarely off the coast of Lossiemouth, and at an intermediate level at the entrance to the Cromarty Firth.

Annual distribution and relative abundances of harbour porpoise based on data obtained between 1979-1997 show the waters surrounding the site to host 0.00 - 0.09 individuals on average, as per Figure 2-2. In addition, Bottlenose dolphin abundance and density (animals/km^2) estimates from SCANS-III data show an abundance of 6147 and a density of 0.152, with mean group size being 1.35, in Block S which includes the area around Ardersier port.

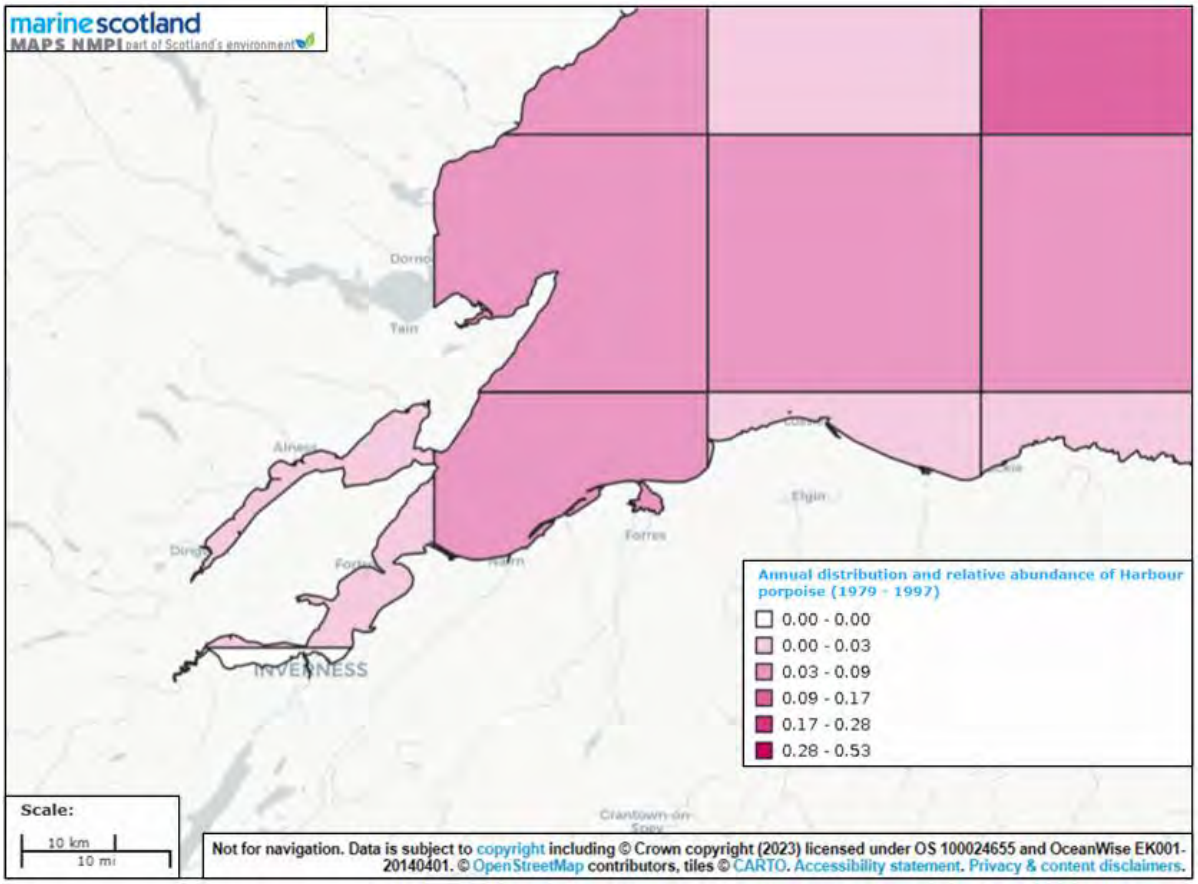


Figure 2-3: Map showing annual distribution and relative abundance of harbour porpoise dolphin (1979-1997) obtained via National Marine Plan interactive (NMPi)

Between March and December 2023 SWF received 16 sightings of harbour porpoise within the North East, consisting of 39 individuals. The nearest was sighted off the coast of Chanonry Point, (approx. 5.2km south west). One commercially available record was returned from NBN Atlas of harbour porpoise, associated with Chanonry Point in 2007[14].131 records of harbour porpoise within 20km of the site (via shortest water route) have been submitted to SMASS between 1992-2021, with one record associated with the site in 2016.

[17] T-PODS are autonomous data recorders for detecting cetacean echolocation clicks and potentially provide cost-impactive opportunities for monitoring cetacean activity.

2.3.3 Minke Whale

Minke whales are the most commonly seen baleen whale in Scotland and sightings are frequent and widespread from May to October, peaking in July. The southern and Outer Moray Firth are thought to be particularly important areas for minke whales, with the coastal waters of the Moray Firth providing rich, inshore feeding grounds for minke whales during the summer and autumnal months.

Minke whale diet comprises of a wide variety of fish such as herring, cod, capelin (*Mallotus villosus*), haddock (*Melanogrammus aeglefinus*), saithe, and sandeel, as well as euphausiids and pteropods. Sandeels are highly targeted by minke whales in the Moray Firth.

A study undertaken by Robinson *et al* (2023)[18] examined the distribution and feeding behaviours of adult versus juvenile minke whales using data from long-term studies in the Moray Firth. Data collected during dedicated boat surveys between 2001 and 2022 (inclusive), from which 784 encounters with 964 whales of confirmed age-class (471 juveniles and 493 adults) were recorded. Adults and juveniles were occasionally seen together, but in general juveniles preferred shallower, inshore waters with sandy-gravel sediments, and adults preferred deeper, offshore waters with greater bathymetric slope.

The closest recorded sightings of minke whales, submitted to Seawatch Foundation since June 2018, to the proposed Ardersier Port are off the coast off Covesea, approximately 40km to the east.

Observed adjusted densities of minke whale from 2000-2012, show the waters surrounding the site to host between 0.00-2.00 densities of mink whale as per Figure 2-4. In addition, minke whale abundance and density (animals/km^2) estimates from SCANS-III data show an abundance of 383 and a density of 0.010, with mean group size being 1, in Block S which includes the area around Ardersier port.

[18] Robinson KP, MacDougall DAI, Bamford CCG, Brown WJ, Dolan CJ, Hall R, Haskins GN, Russell G, Sidiropoulos T, Sim TMC, Spinou E, Stroud E, Williams G, Culloch RM. Ecological habitat partitioning and feeding specialisations of coastal minke whales (Balaenoptera acutorostrata) using a recently designated MPA in northeast Scotland. PLoS One. 2023 Jul 19;18(7):e0246617. doi: 10.1371/journal.pone.0246617. PMID: 37467252; PMCID: PMC10355456, available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10355456/ (Accessed January 2024)

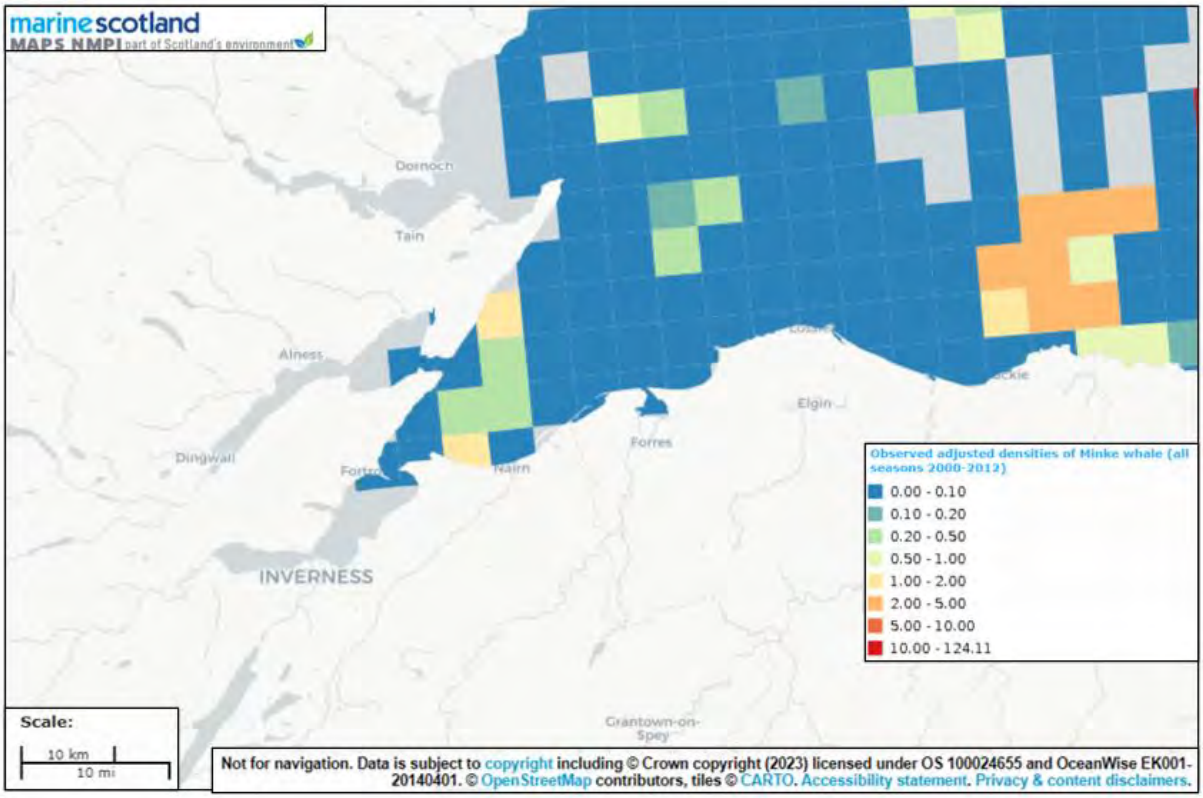


Figure 2-4: Map showing observed adjusted densities of minke whale (2000-2012) obtained via National Marine Plan interactive (NMPi)

Between March and December 2023 SWF received 8 sightings of harbour porpoise within the North East, consisting of 9 individuals. The nearest was sighted off the coast of Culbin, approximately 17km east (shortest route by water) of the site. 7 records of minke whale within 20km of the site (via shortest water route) have been submitted to SMASS between 1992-2020, with one record associated with the site in 1995. No records were returned from NBN Atlas of minke whale within a 5km radius of the site.

2.3.4 White-beaked dolphin

White-beaked dolphin is considered the commonest dolphin off the north coast of Scotland, and offshore in the northern North Sea, with peak numbers and frequency of sightings occurring between June and September (particularly August). However, the majority of records are associated with the inner Hebrides along the west coast of Scotland.

White-beaked dolphin diet consists of a variety of fish including mackerel, herring, cod, capelin, whiting, haddock, Trisopterus spp., navaga, hake, scad (*Trachurus trachurus*), snow crab (*Chionoecetes opilio*), and various species of sandeels, gobies, flatfishes, and scaldfishes; and amongst cephalopods, the octopus (Eledone cirrhosa).

Annual distribution and relative abundances of white-beaked dolphin based on data obtained between 1979-1997 show the waters surrounding the site to host 0.00 individuals on average, as per Figure 2-4. In addition, white-beaked dolphin abundance and density (animals/km^2) estimates from SCANS-III data show an abundance of 868 and a density of 0.007 – 0.03, with mean group size being 3, in Block S which includes the area around Ardersier port.

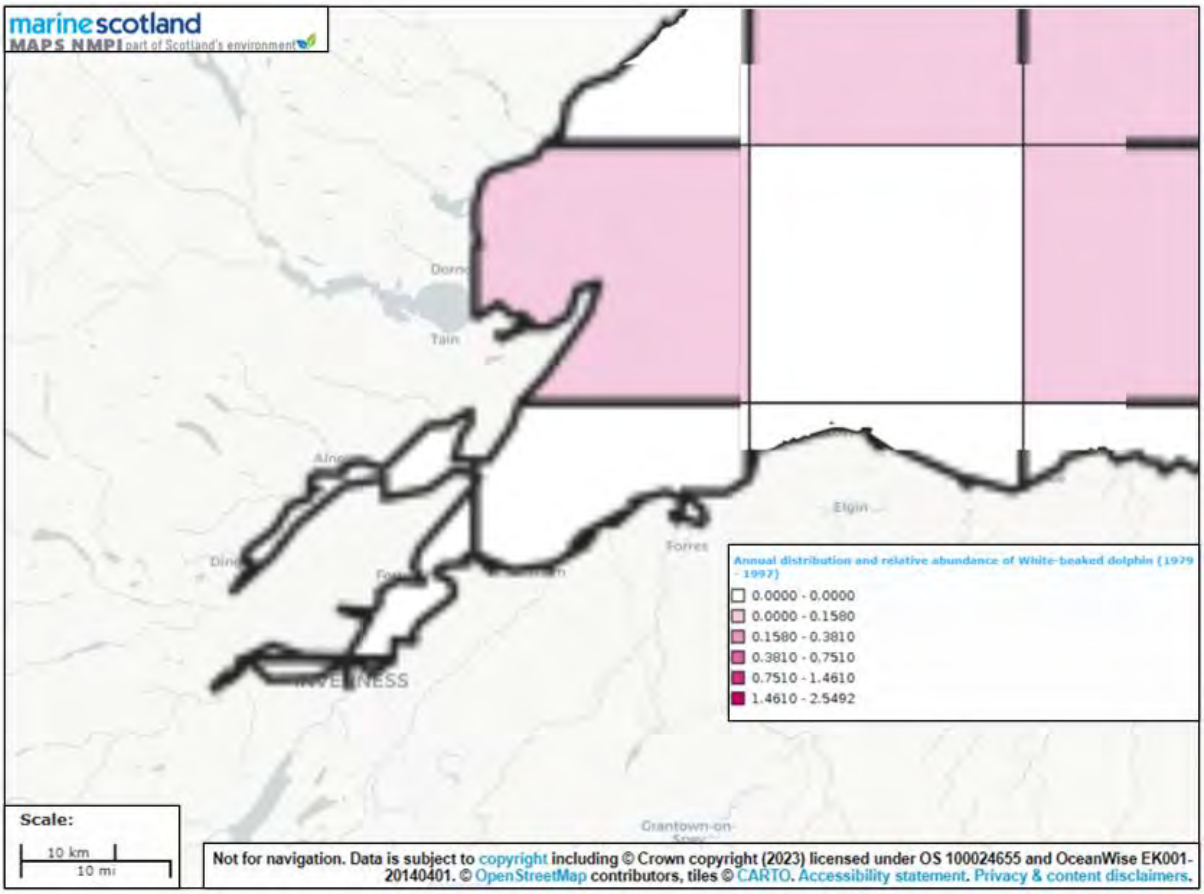


Figure 2-5: Map showing annual distribution and relative abundance of white beaked dolphin (1979-1997) obtained via National Marine Plan interactive (NMPi)

No records of white-beaked dolphin were reported to SWF in 2023. Five records of white-beaked dolphin within 20km of the site (via shortest water route) have been submitted to SMASS in 2012, with the nearest record being approximately 4km south west of the site. Three records of white-beaked dolphin were returned from NBN Atlas within a 5km radius of the site in 2012, with the nearest located 4km south of the site[14 & 19].

2.3.5 Risso's dolphin

Risso's dolphin are widely distributed, usually comprising of groups of 5-20 individuals. They are recorded annually, between April and September (mainly after July), mainly off the north Caithness coast and in the Pentland Firth.

Risso's dolphins have been reported to feed predominantly on cephalopods, although small fish have also been noted to be taken.

Density (animals/km^2) estimates from SCANS-III data show a density of 0 in Block S which includes the area around Ardersier port.

Between March and December 2023 SWF received 11 sightings of Risso's dolphin within the North East, consisting of 64 individuals. The nearest was sighted off the coast of Dunbeth, Caithness,

[19] Data obtained via NBN Atlas, from data resource: National Museums Scotland (2021). National Museums Scotland marine strandings Z.2014.21. Occurrence dataset https://doi.org/10.15468/6ioqfr accessed via GBIF.org on 2024-01-25.

approximately 78km north (shortest route by water) of the site. No records of Risso's dolphin have been submitted to SMASS or NBN Atlas.

2.3.6 Atlantic white-sided dolphin

White-sided dolphins are a pelagic species often found in continental shelf waters and deep water to the north of Scotland throughout the year. Although they could occasionally be present in the Moray Firth, they are unlikely to utilise the shallow waters in proximity to Ardersier.

The diet of Atlantic white-sided dolphins consists of a wide variety of fish, particularly gadoids such as blue whiting, whiting, Trisopterus spp., cod and hake, clupeids, particularly herring, and silvery pout, lantern fishes, pearlsides, mackerel, horse mackerel and salmonids.

Density (animals/km^2) estimates from SCANS-III data show a density of 0 in Block S which includes the area around Ardersier port.

Six records of Atlantic white-sided dolphin within 20km of the site (via shorted water route) have been submitted to SMASS between 1994-2007, with the nearest record being approximately 6.5km south of the site at Ardersier. No records of Atlantic wite-sided dolphin were returned from SWF or NBN Atlas.

2.3.7 Long-finned pilot whale

Long-finned pilot whale are considered common and widely distributed offshore in the northern North Sea throughout the year, occasionally coming into coastal waters, being most frequently observed between June and January.

Long-finned pilot whale diets are considered diverse, with a total of 12 genera of cephalopods, 15 genera of fish, and 3 species of crustaceans being recorded in the same study. The commonest two fish types were mid-water shoaling species occurring off the continental shelf, namely blue whiting and greater Argentine *(Argentina silus*).

Density (animals/km^2) estimates from SCANS-III data show a density of 0 – 0.003 in Block S which includes the area around Ardersier port.

In August 2017, a pod of 30 long-finned pilot whales travelled up the Moray Firth to North Kessock, approximately 5km west of Ardersier, meaning they would have swum within approximately 500m of Ardersier Port. The sighting was extremely rare, however important to note, as if they become stressed, entire pods of pilot whales are known to beach themselves.

Four records of long-finned pilot whale within 20km of the site (via shorted water route) have been submitted to SMASS between 2015-2017, with the nearest being recorded approximately 2km east off the coast of Delnies. No records of long-finned pilot whale were returned from SWF or NBN Atlas.

2.3.8 Killer whale

Killer whale have been recorded annually in the northern North Sea, mainly between June and September, and occasionally in the Firth of Forth between March and June. Killer whales may come close to the coast anywhere in the region, often in response to aggregations of breeding seals upon which the species sometimes feeds. Killer whales often occur offshore particularly in winter months.

Killer whales have one of the most varied diets of all cetaceans, ranging from fish and squid to birds, turtles, seals and other cetaceans.

Density estimates for Killer whale are not available from SCANS III data.

A pod of six orca were identified in the Moray Firth in 2016, approximately 11km north west of Findhorn (and approximately 24km north east of Ardersier Port).

Between March and December 2023 SWF received 23 sightings of killer whale within the North East, consisting of 89 individuals. The nearest was sighted off the coast of Rosemarkie Beach, Fortrose, approximately 5.5km south west (shortest route by water) of the site. No records of killer whale were returned from NBN Atlas.

2.4 Occasional Cetacean Visitors

2.4.1 Common Dolphin

Common dolphins are thought to prefer deeper, continental shelf waters and are occasionally seen in the North Sea between June and September. Although they could occasionally be present in the Moray Firth, they are unlikely to utilise the shallow waters in proximity to Ardersier.

Between March and December 2023 SWF received three sightings of common dolphin within the North East, consisting of 46 individuals. The nearest was sighted off the coast of Dunbeath, Caithness approximately 78km north of the site. 16 records of common dolphin within 20km of the site (via shorted water route) have been submitted to SMASS between 1997-2020, with the nearest being recorded approximately 6.5km south of the site at Ardersier. One record of common dolphin was returned from NBN Atlas within a 5km radius of the site in 2011, located 6.5km south of the site[20].

2.4.2 Humpback Whale

Humpback whales were observed in the Moray Firth in 2016 and 2017. In 2016, one individual was identified from Cromarty Sutors, approximately 13km north east of Ardersier; and in 2017 two individuals were observed from between Hopeman and Burghead, approximately 42 km east along the Moray coast.

Between March and December 2023 SWF received six sightings of humpback whale within the North East, consisting of 7 individuals. The nearest was sighted off the coast of Chanonry Point, approximately 5.2km south west of the site. No records of humpback whale have been returned from NBN Atlas of SMASS.

2.5 Dornoch Firth and Morrich More SAC Seals

The Dornoch Firth and Morrich More SAC is designated for its population of common seals (*Phoca vitulina*) (also known as harbour seals) which are currently classed as ‘Unfavourable – declining’ (2013). The development lies approximately 48km from the SAC, which is within the range of observed common seal movements between haulout areas (the locations on land where seals come ashore to rest) and also well within the ‘normal’ range of foraging trips. SNH also know that common seals tagged at the Dornoch Firth use the Ardersier area.

As well as being protected through designated SACs, seals are also protected by the Marine (Scotland) Act 2010; it is an offence to kill or injure a seal except under licence or for welfare reasons,

[20] Data obtained via NBN Atlas, from data source: National Museums Scotland (2021). National Museums Scotland marine strandings Z.2014.21. Occurrence dataset https://doi.org/10.15468/6ioqfr accessed via GBIF.org on 2024-01-25.

outlawing unregulated seal shooting that was permitted under previous legislation. A number of seal conservation areas around Scotland have been introduced, designed to protect vulnerable, declining common seal populations. The Act also agreed to provide additional protection for seals at designated haulouts. In Scotland the coastline has been divided into management units for common seals based on ecological boundaries. The relevant Management Unit for both common and grey seals in this area is the Moray Firth. Grey seal management units use the same boundaries although it is recognised that they are more likely to move between management units outside the breeding season.

There is a designated haulout site at Whiteness Sands (Ardesier), approximately <500m west of the proposed development site. This site holds 20% of the Moray Firth population of common seals and is seen as the most important haulout for this species not only in the Moray Firth but on the east coast of Scotland. The average moult counts (during August) between 1994 and 2013 remained around 200 animals. Between 2014 and 2016, numbers declined to an average of 32 animals. 2017 onwards saw an increase in numbers, with the 2019 count for Ardesier of common seal being 116 animals[21]. . The location is also used for pupping with a count undertaken in June 2011 having 216 adult common seals and 28 mean number of pups (56 pups was higher figure). The location is also used by large numbers of grey seals (*Halichoerus grypus*); 98 animals recorded during the August count 2019[22].

2.6 Conclusion

Based on the above information, it has been assessed that the most frequently observed species in the site locale, and therefore the species considered to be of most concern within the zone of influence of the proposed works are:

- Bottlenose dolphin
- Harbour porpoise
- Minke whale
- White beaked dolphin
- Common and grey seals

The other species are less frequently observed within the Moray Firth waters and/or the habitat within and adjacent to the site is sub-optimal and so it is highly unlikely that they will be affected by the proposed works.

[21] NatureScot Research Report 1256 – Aerial surveys of seals in Scotland during the harbour seal moult, 2016 – 2019. Available at: https://www.nature.scot/doc/naturescot-research-report-1256-aerial-surveys-seals-scotland-during-harbour-seal-moult-2016-2019#Moray+Firth+SMA (Accessed April 2024).

[22] NatureScot Research Report 1256 – Aerial surveys of seals in Scotland during the harbour seal moult, 2016 – 2019. Available at: https://www.nature.scot/doc/naturescot-research-report-1256-aerial-surveys-seals-scotland-during-harbour-seal-moult-2016-2019#Moray+Firth+SMA (Accessed April 2024).

3 MARINE MAMMAL RISK ASSESSMENT

3.1 Activities Affecting Marine Mammals

3.1.1 Underwater Noise Producing Activities

The main risk to marine EPS from the proposed development is considered to be the generation of underwater noise which can cause injury, disturbance or, in extreme circumstances, death to individuals. Both vibro-piling and dredging have been identified as sources of underwater noise into the marine environment which have potential to cause disturbance, injury or in extreme circumstances death.

Vibropiling operations tend to generate underwater noise at a large range of levels unlike, for example, impact piling, where each strike is more or less the same level unless conditions change.

There can be considerable variation in the noise levels and frequency components of noise from the suction dredger, which may be due to variations in engine speed as the vessel maintains its course, or in the suction force applied or there is change in the material being dredged.

3.1.2 Increased Vessel Movement

During dredging, there will be an increase in vessel movement in and out of Ardersier Port relating to the transportation of dredge spoil to the disposal sites at Sutors (CR019) and Burghead (CR030).; the increase in vessel capacity will also lead to an increase in vessel traffic post-construction.

The increase in the number of vessels travelling through to Ardersier Port, both during construction and operation, would increase the risk of collision with marine mammals, potentially resulting in death or injury to individuals.

Disturbance caused by an increased human presence can have a negative impact on seals. Seals that are on land are usually resting to conserve energy or may be nursing young. Disturbing seals into the water costs them energy, creates stress and can lead to impacts on health[23]. Stampeding adults can also injure pups. The population utilising the Ardersier haul out site may be temporarily disturbed by an increase in vessel traffic and land-based construction noise and vibration.

Based on available information, it is estimated that between 13 and 23 round trip barge movements will be undertaken each day from the dredge site to the two disposal grounds for a period of 8 to 10 weeks during the dredge campaign. Due to capacity differences, it is planned that the majority of material will be deposited at Burghead disposal site. The capital dredge campaign itself is envisaged to have a total duration of 13 to 16 weeks exclusive of mobilisation and demobilisation.

The vessels travelling from the dredge site to the deposit site(s) will follow the route that marine traffic generally adheres to when heading east along the coastline.

[23] Scottish Natural Heritage: A Guide to Best Practice for Watching Marine Wildlife available online at: https://www.nature.scot/sites/default/files/2017-06/Publication%202017%20-%20A%20Guide%20to%20Best%20Practice%20for%20Watching%20Marine%20Wildlife%20SMWWC%20-%20Part%202%20-%20April%202017%20%28A2263517%29.pdf last accessed 13/06/2018

3.2 Impact Assessment

3.2.1 Underwater Noise

Cetaceans rely on their hearing for foraging, navigation and mating. The impact of noise to a population level is difficult to determine, however the expected impact on an individual animal's hearing ability and potential damage that could be caused by noisy activities during construction is assessed by modelling representative scenarios, taking into account environmental variables and the animal's hearing capabilities.

The Marine Scotland 'Guidance for Scottish Inshore Waters: The Protection of Marine European Protected Species from Injury and Disturbance' defines what disturbance means to cetaceans as: 'Changes in behaviour which may not appear detrimental in the short-term but may have significant long-term consequences. Additionally, the effects may be minor in isolation, but may become more significant in accumulation'. Disturbance may be identified via the following behaviour:

- Changes in (direction or speed of) swimming or diving behaviour;
- Bunching together or females shielding calves;
- Certain surface behaviours such as tail splashes and trumpet blows; and
- Moving out of a previously occupied area.

The following negative effects are linked to disturbance:

- Displacement from important feeding areas;
- Disruption of feeding;
- Disruption of social behaviours such as communication, calving, breeding, nursing, resting and feeding; and
- Increased risk of injury or mortality;
- Increased vulnerability of an individual or population to predators or physical stress; and
- Changes to regular migration pathways to avoid human interaction.

The way in which noise affects marine mammals is dependent on several factors, including the type of noise generated, the noise level, the species of marine mammal and the distance between the animal and the source of the noise. The National Oceanic and Atmospheric Administration (NOAA) describes how different groups of marine mammals hear and are affected by sounds, which can be found in the *'Guidance for Assesing the Effects of Anthropogenic Sound on Marine Mammal Hearing'*[24]. The effects can be described as either a Permanent Threshold Shift (PTS), where an animal experiences irreversible damage to their hearing which can in turn affect their ability to forage and reproduce and in extreme circumstances result in death; or a Temporary Threshold Shift (TTS) which an animal can recover from, but may experience 'masking' which reduces its ability to communicate with other animals and locate prey, resulting in fatigue[25].

Underwater noise modelling was originally commissioned to support the 2018 EIA for the project, however, is still considered relevant to the activities still to be completed and was used to inform this document. Please refer to Appendix C for the full underwater noise report.

The underwater noise model was run using three assumptions: vibropiling/dredging continuously for eight hours, 12 hours and a worst case scenario of 24 hours. The results are used to determine an appropriate mitigation zone in order to provide effective mitigation for marine mammals during

[24] NOAA guidance available at: http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm (Accessed January 2024)
[25] JNCC UK Marine Noise Registry: Information Document available at: http://jncc.defra.gov.uk/pdf/MNR__Draft_InfoDoc_V1_20160808.pdf (Accessed January 2024)

underwater noise producing activities, i.e. the distance that is required between the noise source and the animal to prevent the risk of PTS. Although piling works are anticipated to be 09.00-17.00, the 12-hour assumption was used to determine the impacts, to account for any overrunning works and to reflect a worst-case scenario. The 24-hour scenario was used to determine the impacts from dredging.

Vibration Piling

The risk of PTS onset would only be present if a harbour porpoise were to stay within 500m of the vibropiling works over a 24-hour period, which is highly unlikely. The risk of PTS for low frequency cetaceans (minke whale) would be onset if they were to stay within 190m of the vibropiling works over a 24h period and for mid frequency cetaceans (bottlenose dolphin and white-beaked dolphin) it would be 38m over a 24h period. Assuming that animals will flee as soon as they hear the noise from the vibropiling, the PTS range for any species is a maximum of 2m from the source of the noise. Whilst following the MMO protocol, an animal should not be this close to the vibropiling activities when they commence.

The TTS limits for harbour porpoise are between 200- 210m from noise over 8-24 hours, when assuming animals will flee from the noise source. Harbour porpoise could experience TTS out to ranges of 3.6km, 4.4km or 6.5km (8, 12 and 24 hours respectively), however this is only if they remain stationary, which is unlikely. TTS for minke whale ranges from 1.4km at 8 hours increasing to 2.5km for 24hours, whilst bottlenose dolphin and white-beaked dolphin have lower TTS limits; 270m, 350m and 490m for 8, 12 and 24 hours respectively. However, again this is assuming that an animal is stationary for the duration of the noise, which is unlikely and therefore fleeing distances are all below 9m for low and mid frequency cetaceans.

By implementing the MMO protocol (to determine no marine mammals are present within the mitigation zone prior to vibropiling commencing) and assuming a maximum (worst-case scenario) 12 hour working day, there will be no risk of PTS to marine mammals including seals, once they have vacated the mitigation zone. The above ground noise of vibropiling does have the potential to cause disturbance to the any seals hauled out at the designated Ardersier haul out site.

It should be noted that site-based observation with regards to the location of the haulout site is further to the west than that published and gives a distance in excess of 800m between the proposed dredge works at its closest point and the active haulout areas. Please refer to HCGF/2023/002 in Appendix D for further reference.

Dredging and Disposal

The risk of PTS onset would only be present if a harbour porpoise were to stay within 570m of the dredging works for a 24-hour period, which is highly unlikely. The risk of PTS for low frequency cetaceans (minke whale) would be onset if they were to stay within 61m of the dredging works over a 24h period and for mid frequency cetaceans (bottlenose dolphin and white-beaked dolphin) it would be 36m over a 24h period. Assuming that animals will flee as soon as they hear the noise from the dredging, the PTS range for any species is a maximum of 3m from the source of the noise.

The TTS limits for harbour porpoise are 230m from noise over 8-24 hours, when assuming animals will flee from the noise source. Harbour porpoise could experience TTS out to ranges of 2.8km, 3.3km or 4.3km (8, 12 and 24 hours respectively), however this is only if they remain stationary, which is unlikely. TTS for minke whale ranges from 370m at 8 hours increasing to 640m for 24hours, whilst bottlenose dolphin and white-beaked dolphin have lower TTS limits; 220m, 280m and 390m for 8, 12 and 24 hours respectively. However, again this is assuming that an animal is stationary for the duration of the noise, which is unlikely and therefore fleeing distances are all 2m for low and mid frequency cetaceans.

By implementing the MMO protocol and assuming a maximum (worst-case scenario) 24 hour working day, there will be no risk of PTS to marine mammals including seals once they have vacated the mitigation zone.

The proposed vessels to be used for transportation of dredged material from the dredge site to the sea deposit area(s), based on available information, fall within the medium-size ships category (50m-100m) with a typical broadband source levels for these small to mid-size vessels are generally in the 165 - 180 dB (re: 1µPa)[26]. Therefore, the use of a medium sized ship vessel to transport the dredged materials to the disposal site would have the same or less PTS or TTS impacts than the dredging depending on the broadband source levels.

3.2.2 Effects of Increased Vessel Movement

Bottlenose dolphins and white-beaked dolphins are regularly seen approaching vessels or bow-riding. These dolphins are fast, powerful swimmers and are manoeuvrable in water.

Harbour porpoises often live in the vicinity of vessel traffic and reactions by porpoises to various types of vessels showed only short-term negative effects from speedboats and large ferries in a study by the Sea Watch Foundation[27]. HWDC[28] indicate that as harbour porpoise are naturally shy of boats, they will for the most part avoid them, and so for most types of marine traffic the risk of collision is minimal. There is more potential for collision with fast-moving engine-powered vessels due to their speed and ability to change direction quickly.

Minke whale may experience negative effects as a result of increased vessel movements, in part as the low frequency noise generated may interfere with their communication. Unlike some other species, minke whale are less able to adapt their vocalisations to adapt to increased background noise[29]. They are also less able to manoeuvre away from vessels to avoid vessel strike. There are records of minke whale in proximity to the Burghead disposal site around Covesea, so are known to be present periodically within the area.

Vessel speed has been identified in many studies to affect the likelihood of collision and injury to the animal Speed limits of 10 knots have frequently been applied in sensitive areas [30]. Information provided by prospective dredging contractors indicates that SHB vessels are typically moving at 10-12 knots while in transit, but generally around the 10 knots. Maintaining these speeds, and implementation of mitigation measures at the disposal site as outlined within section 4, will help minimise this associated risk to more vulnerable species.

AIS data available on Marine Directorate NMPI for the route density annual totals would indicate that marine traffic is fairly low for the route between the dredge site and Burghead with vessel averages noted up to 777 in the main channel adjacent to the dredge site and 326 in the main channel adjacent to Burghead disposal site in the busiest areas. This equates to 2.12 and <1 vessel movement per day on average respectively. While the proposed dredge programme expects an increase of daily

[26] OSPAR Commission, Overview of the impacts of anthropogenic underwater sound in the marine environment, 2009.
[27] Sea Watch Foundation: The Harbour Porpoise in UK Waters available at: http://seawatchfoundation.org.uk/wp-content/uploads/2012/07/Harbour_Porpoise.pdf last accessed 13/12/2022
[28] HWDC Harbour Porpoise information available at: https://hwdt.org/harbour-porpoise last accessed 12/12/2022
[29] Helble, T.A., Guazza R.A., Martin, C.R., Durbach, Alongi, G.C., Martin, S.W., Boyle, J.K. and Henderson, E.E (2020) Lombard effect: Minke whale boing call source levels vary with natural variations in ocean noise. The Journal of Acoustical Society of America Vol 147 (2).
[30] https://marine-mammals.info/collision-strike/

movements, this will be for a short period, at low speed and because low density shipping in the area usually cumulative impacts are not considered to be a concern.

3.3 Conclusion

It has been assessed that the primary risk from the works is to harbour porpoise, with consideration given to bottlenose dolphin, minke whale and white-beaked dolphin (although not considered at risk due to infrequent sightings, killer whale, common dolphin and humpback whale are covered by the groups assessed at risk), common and grey seal. . Works may result in **temporary disturbance** from underwater noise associated with increased vessel movements, vibropiling and dredging. The noise is not predicted to cause long term negative effects on the local populations of the aforementioned species due to its short duration and to adherence to the detailed Marine Mammal Observation Protocol (MMOP) in section 4.

Vessel collision risk is considered minimal with slower moving vessels such as the SHBs which will transport material to the disposal sites with the exception of minke whale which may experience negative effects from low frequency noise. The typical operating speeds of SHBs is noted to be around 10 knots which is the speed adopted for sensitive areas.

A map showing the Marine Mammal Mitigation Zone can be found in Appendix A.

Given the mitigation which will be employed and the relatively short-term nature of the works producing underwater noise, the number of individuals affected will be negligible and any disturbance which may occur will not fall under the JNCC (2008) definition of significant disturbance. Therefore, it is considered that the MMOP will be sufficient to prevent short term negative effects for each of the three activities identified.

4 MARINE MAMMAL PROTECTION PLAN

The marine mammal mitigation will comprise a standard MMO protocol as per JNCC guidance which will be implemented during vibration and dredging operations in optimal sea states and during times of optimal visibility, and avoidance of works commencing during low hours of visibility and when sea state exceeds 2. F) [31] [32].

Marine mammal observation will also be undertaken at the sea deposit site(s) based on conditions included within licenses for material deposited at sea deposit sites within the Moray Firth as detailed in section 4.6.2.

4.1 The MMO

A suitably qualified Marine Mammal Observer (MMO), competent in the identification of marine mammals at sea, will be present during the vibratory piling, dredging and sea deposit activities. The MMO will undertake observation for marine mammals within the mitigation zone before and during vibratory piling, dredging and sea deposit activities and will be dedicated to that one task for the duration of any watch. The MMO will advise the contractors and crews on the implementation of the procedures set out in the agreed protocol, to ensure compliance with those procedures.

The JNCC guidance provides the following definitions:

Marine Mammal Observer (MMO): Individual responsible for conducting visual watches for marine mammals. It may be requested that observers are trained, dedicated and/or experienced.

Trained MMO: Has been on a JNCC recognised course.

Dedicated MMO: Trained observer whose role on board is to conduct visual watches for marine mammals.

Experienced MMO: Trained observer with three years of field experience observing for marine mammals, and practical experience of implementing the JNCC guidelines.

4.2 MMO Equipment

MMOs will be equipped with binoculars and/or spotting scopes, a copy of the agreed protocol and the Marine Mammal Recording Form, which is a Microsoft Excel spreadsheet containing embedded worksheets named Cover Page, Operations, Effort and Sightings. A Microsoft Word document named Deck forms is also available, and MMOs may prefer to use this when observing before transferring the details to the Excel spreadsheets. Although these forms were developed for seismic surveys, they can be used for piling operations, although many columns will not be applicable. The ability to determine the range of marine mammals is a key skill for MMOs, therefore a hand-held or boat-mounted GPS device or rangefinder will be used to verify the range.

All MMO forms, including a guide to completing the forms, are available on the JNCC website: http://jncc.defra.gov.uk/marine/seismic_survey

[31] https://data.jncc.gov.uk/data/31662b6a-19ed-4918-9fab-8fbcff752046/JNCC-CNCB-Piling-protocol-August2010-Web.pdf

[32] It should be noted that these protocols do not document measures to mitigate disturbance effects but have been developed to reduce to negligible levels of risk of injury or death to marine mammals in close proximity to piling operations.

4.3 Communication

The contractor will be responsible for the communication channels between those providing the mitigation service and the crews working on the piling or on the dredger or split hopper barges used for sea deposit. The MMO Operatives will have a workable communication procedure established at the outset, so that any visual and acoustic detections can be corroborated by both. A formal chain of communication from the MMO Operative to the contractor, who will start/stop piling, dredging or disposal activities, will be established. In order to confirm the chain of communication and command MMO Operatives will attend any relevant pre-mobilisation meetings. The ECoW will be informed of all communication.

4.4 Mitigation Zone

The JNCC guidance defines the mitigation zone as the area where a MMO keeps watch for marine mammals (and delays the start of activity should any marine mammals be detected). The extent of this zone represents the area in which a marine mammal could be exposed to sound that could cause injury and will be determined by factors such as the pile diameter, the water depth, the nature of the activities and the effect of the substrate on noise transmission.

Upon interpolation of the underwater modelling data, it is considered that the standard, minimum 500m mitigation zone would be sufficient to mitigate against PTS/TTS during vibropiling and dredging noise on all marine mammal species. This is because, when fleeing (the likely reaction of any marine mammal to disturbance), the maximum TTS limit for any species is 230m.

The MMO will be located on the most appropriate viewing platform (e.g. vessel or elevated location within the surrounding landscape) to provide effective coverage of the mitigation zone and a good all-round view of the sea.

4.5 MMO Protocol

4.5.1 Dredging and Vibropiling Activities

The standard JNCC protocol is outlined below[33] which will be used to provide effective mitigation for all species during vibropiling and dredging activities:

1. Vibropiling or dredging will not commence during periods of darkness or poor visibility (such as fog) or during periods when the sea state is not conducive to visual mitigation (above sea state 4 is considered not conducive) as there is a greater risk of failing to detect the presence of marine mammals. Harbour porpoise have small dorsal fins, therefore the MMO shall take additional precautions if the sea state exceeds 2[34]. During the winter months it is likely that sea state 2 will be exceeded on a regular basis. An elevated platform for the MMO to monitor from, such as a cherry picker for example, would be beneficial when the sea state is between 2 and 4.

2. The mitigation zone will be monitored visually by the MMO for an agreed period prior to the commencement of piling and, dredging. This will be a minimum of 30 minutes.

3. The MMO will scan the waters using binoculars or a spotting scope and by making visual observations. Sightings of marine mammals will be appropriately recorded in terms of date, time,

[33] There is a 'variation of standard piling protocol' allowed in the guidance if required.
[34] Detection of marine mammals, particularly porpoises, decreases as sea state increases. According to the JNCC guidance ideally sea states of 2 or less are required for optimal visual detection.

position, weather conditions, sea state, species, number, adult/juvenile, behaviour, range etc. on the JNCC standard forms. Communication between the MMO and the contractor and the start/end times of the activities will also be recorded on the forms.

4. Piling or, dredging will not commence if marine mammals are detected within the mitigation zone or until 20 minutes after the last visual detection. The MMO will track any marine mammals detected and ensure they are satisfied the animals have left the mitigation zone before they advise the crew to commence piling or dredging activities.

5. A soft-start will be employed, with the gradual ramping up of piling power incrementally over a set time period until full operational power is achieved. The soft-start duration will be a period of not less than 20 minutes. This will allow for any marine mammals to move away from the noise source. The MMO should monitor any seals that are hauled-out at the adjacent haul-out site during the soft-start, to identify any signs of disturbance (increased alertness, agitation and stampeding into the water). If this behavior is observed, the MMO should inform contractors to cease using the piling rig until the seals have returned to the water.

6. If a marine mammal enters the mitigation zone during the soft-start then, whenever possible, the piling operation will cease, or at least the power will not be further increased until the marine mammal exits the mitigation zone and there is no further detection for 20 minutes.

7. When piling or dredging at full power this will continue if a marine mammal is detected in the mitigation zone (as it is deemed to have entered voluntarily[35]).

8. If there is a pause in the piling or dredging operations for a period of greater than 10 minutes, then the pre-piling and pre-dredging search and pre-piling soft-start procedure will be repeated before piling or dredging recommences. If a watch has been kept during the piling operation, and MMO is able to confirm the presence or absence of marine mammals, it may be possible to commence the soft-start immediately. If there has been no watch, the complete pre-piling search and soft-start procedure will be undertaken.

9. Where night time dredging works are required, these can only be undertaken following a MMO pre-dredging search being undertaken during daylight hours and constant dredging from this point through the night. If a pause in the dredging operations (dredging rather than transport of dredged materials) for a period for greater than 10 minutes during night time, then works must cease until daylight hours, when another MMO search can be undertaken.

4.5.2 Sea Deposit of Dredged Material

Based on other dredge licenses for deposition of dredged material within the Moray Firth SPA/SAC the following is proposed for the sea deposit element. A watch will be undertaken by a trained Marine Mammal Observer (MMO) or someone following the general guidance for and acting in the role of an MMO. A watch must be undertaken prior to the deposit of dredged substances or objects to ensure no marine mammals are within 200m of the deposit activity. If marine mammals are observed within this area, then the deposit activity must stop until the area has been clear for at least 20 minutes.

[35] The guidance states that there is no scientific evidence for this voluntary hypothesis; instead it is based on a common sense approach. Factors such as food availability may result in marine mammals approaching piling operations; in particular, the availability of prey species stunned by loud underwater noise may attract seals into the vicinity.

4.6 Reporting

As per the JNCC guidance, reports detailing the piling/dredging activity and marine mammal mitigation (the MMO reports) will be sent to MD/NatureScot via the EMG at the conclusion of piling/dredging activity. Reports will include:

- Completed Marine Mammal Reporting Forms (MMRFs);
- Date and location of the piling/dredging activities;
- A record of all occasions when piling occurred, including details of the duration of the pre-piling search and soft-start procedures, and any occasions when piling activity was delayed or stopped due to presence of marine mammals;
- A record of all occasions when dredging occurred, including details of the duration of the pre-dredging search, and any occasions when dredging activity was delayed or stopped due to presence of marine mammals;
- Details of watches made for marine mammals, including details of any sightings and details of the piling/dredging activity during the watches;
- Details of any problems encountered during the piling/dredging activities including instances of non-compliance with the agreed piling/dredging protocols; and
- Any recommendations for amendment of the protocols.

4.7 Vessel Movement Mitigation Plan

The following guidelines will be adhered to in order to minimise any potential risk to marine mammals if noted during vessel movements.

- All vessels during sea deposit activities will comply with the measures set out in the MMPP;
- All vessels will adhere to instructions and guidance from the Harbour Master;
- All vessels will comply with the International Maritime Organisation (IMO)/Maritime Coastguard Agency (MCA) codes for the prevention of oil pollution;
- All vessels must have on-board Ship Oil Pollution Emergency Plans (SOPEPs);
- Vessels must comply with the protocols outlined in the Invasive Non-Native Species (INNS) Management Plan; and
- All movements of vessels, which also include site deliveries, will be coordinated with the Harbour Master.
- Keep a safe distance. Never get closer than 100m (200m if another boat is present) if within 100m, switch the engine to neutral;
- Never drive head on to, or move between, scatter or separate basking sharks. If unsure of their movements, simply stop and put the engine into neutral;
- Spend no longer than 15 minutes near the animals;
- Special care must be taken with mothers and young;
- Maintain a steady direction and a slow ‘no wake’ speed; and
- Avoid sudden changes in speed.

Operators should familiarise themselves with the NatureScot Wildlife code of conduct publications which are available on their website[36].

[36] https://www.nature.scot/sites/default/files/2017-06/Publication%202017%20-%20The%20Scottish%20Marine%20Wildlife%20Watching%20Code%20SMWWC%20-%20Part%201%20-%20April%202017%20%28A2263518%29.pdf

4.8 Additional Good Practice Recommendations

If any dead marine mammals are anecdotally observed during construction or operation, it should be reported to the Scottish Marine Animal Stranding Scheme (SMASS) (www.strandings.org) and live marine mammal strandings will be reported to British Divers Marine Live Rescue (www.bdmlr.org.uk).

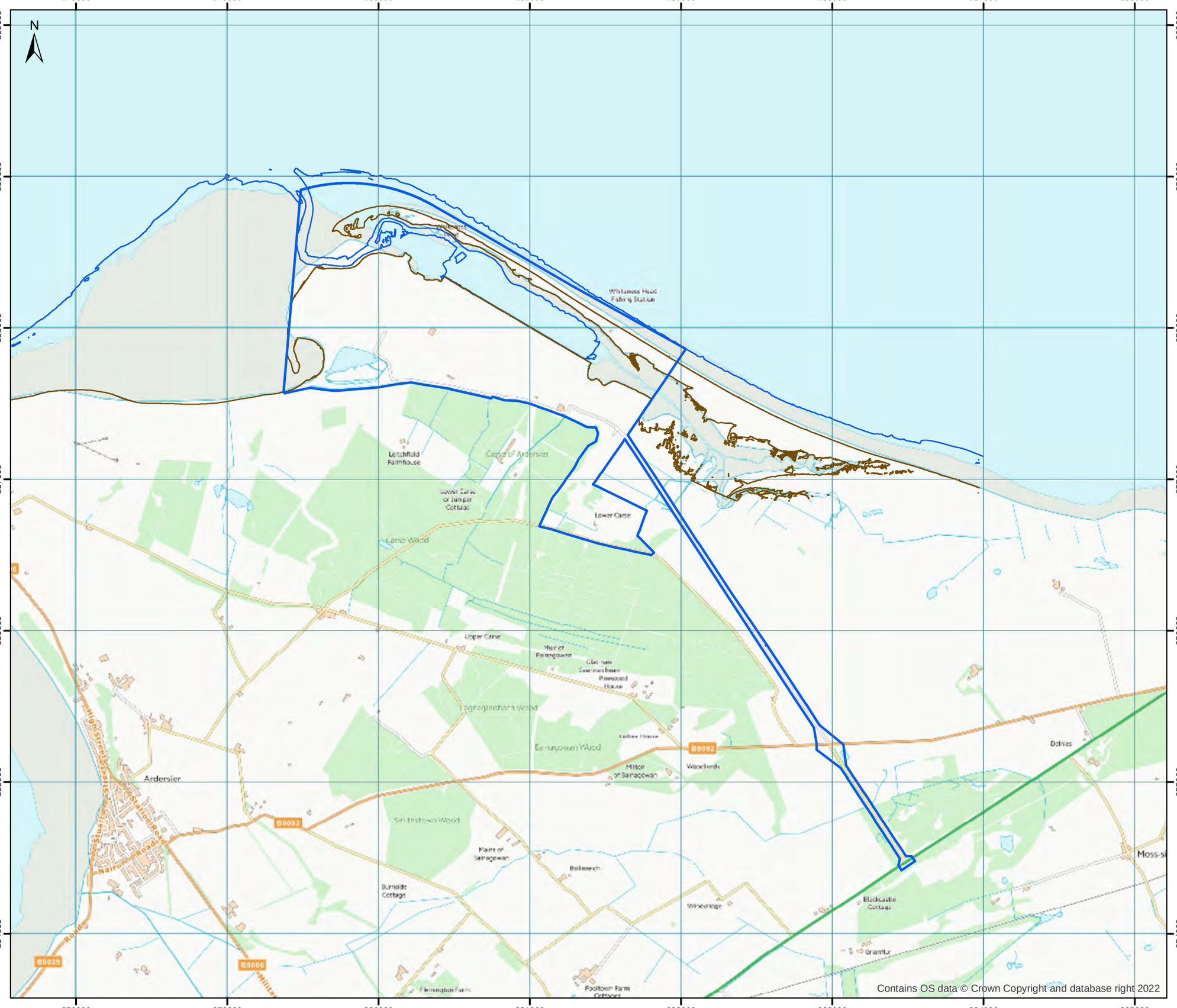
The MMO should keep a record of all marine mammal sightings, whether in the mitigation zone or not, to be issued to NatureScot. An understanding of the location of species is essential to appropriately assess the impacts of a proposed development and plan and target effective mitigation, therefore this data could be used to inform future projects. Biodiversity data are extremely important as, aside from use in planning and decision making, they are key to delivering state of environment reporting, education, modelling trends in species and habitat distribution, and research and policy making.

5 MARINE MAMMAL LICENSING

The previous EPS disturbance licence has elapsed, and a new licence has been applied for.

APPENDICES

A FIGURES



Legend

- Port Boundary
- Mean Low Water Spring (MLWS)
- Mean High Water Spring (MHWS)

Note: Mean high and low water spring tide extents from May 2018 bathymetric and topographic survey

Do not scale this map

Client
Ardersier Port (Scotland) Ltd.

Project
Ardersier Port

Title
Ardersier Port Site Boundary and Quay Wall Installation Boundary

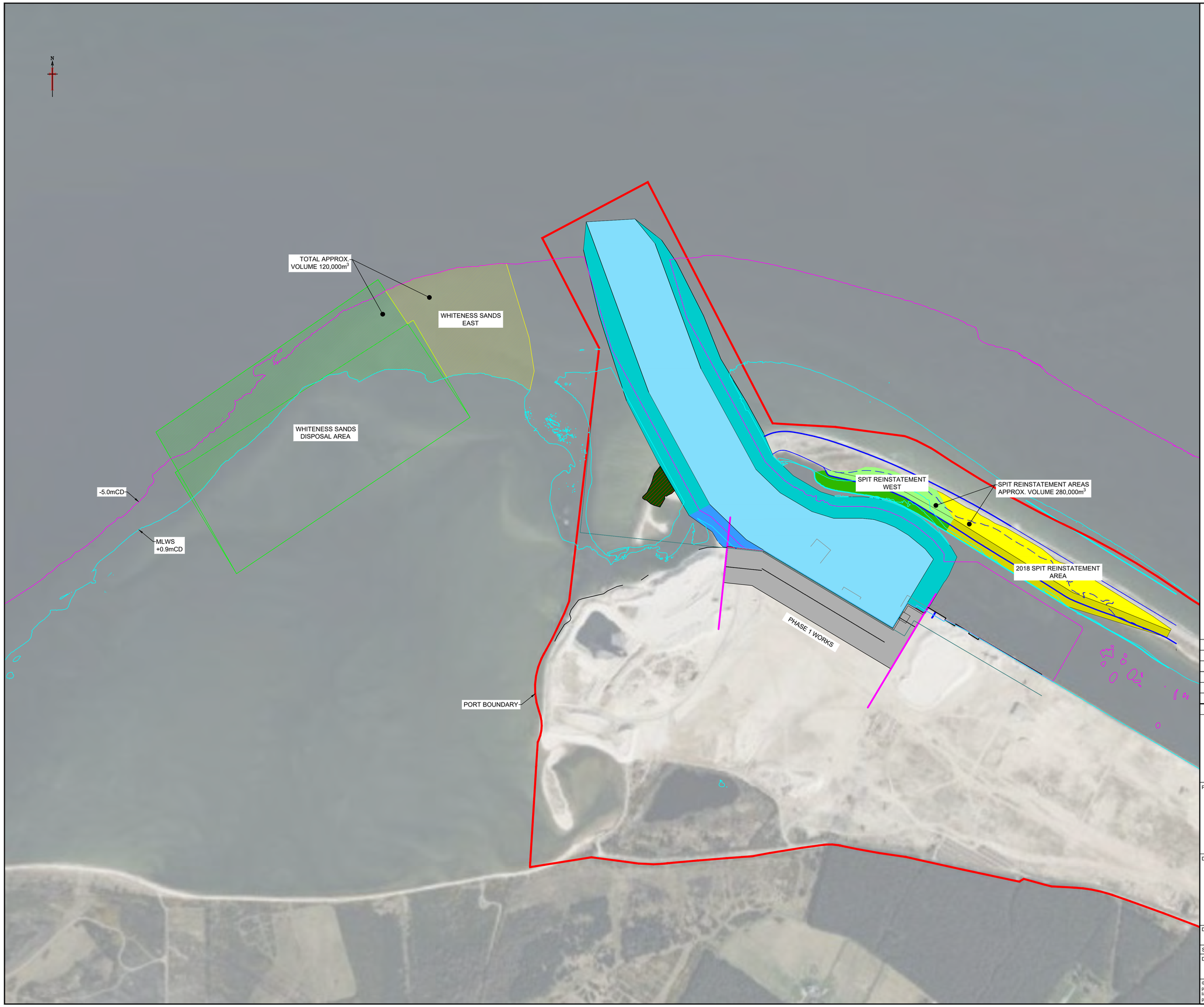
Status
FINAL

Drawing No.	Revision	Date
676030-GIS001	-	08 April 2022
Drawn	**Checked**	**Approved**
JAS	MS	CCAS

Scale
1:24,000 @A3
0 120 240 480 720 Metres

Rev	Date	Amendment	Initials
A	16/04/24	Title/dwg no corrected.	FR
B	17/04/24	Features removed.	FR

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



NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. ALL LEVELS ARE GIVEN IN METRES ABOVE CHART DATUM (m ACD). CORRECTION FOR ORDNANCE DATUM IS -2.14m (RELATIVE TO ORDNANCE DATUM AT NEWLYN).

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd
P01	18/04/2024	FOR INFORMATION	OM	CF	CF

Haventus

Project

ARDERSIER PORT REDEVELOPMENT PHASE 1

Drawing title

BENEFICIAL REUSE AREAS FOR CROWN ESTATES

Drawing status

FOR INFORMATION

Scale	1:5000 @A1	DO NOT SCALE

Drawing number

ArdPhase1-HAV-WP3-ZZ-DR-C-0006

Rev P01

278000 278500 279000 279500 280000 280500 281000 281500 282000

860500 860000 859500 859000 858500 858000 857500 857000

N

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Capital Dredge Boundary (2024 Licence)
- Marine Mammal Mitigation Zone - Quay Wall Construction Works (Current Licence)
- Marine Mammal Mitigation Zone - Capital Dredge (500m)
- Quay Wall Construction Works Extents 2018 License Application
- Mean High Water Spring (MHWS)
- Mean Low Water Spring (MLWS)
- Marine Mammal Observer (MMO) Location (see note below)
- Designated Seal Haulout Site

Note:
Tidal contours from May 2018 Aspect Topographic and Bathymetric survey

During the capital dredge the MMO will be located on a boat and will therefore be unfixed.

Do not scale this map

Client
Ardersier Port (Scotland) Ltd.

Project
Ardersier Port Redevelopment

Title
Marine Mammal Protection Plan

Status
FINAL

Drawing No.	Revision	Date
676693-GIS011	-	26 Apr 2024
Drawn	**Checked**	**Approved**
MMF	CCAS	CCAS

Scale
1:15,000 @A3
0 75 150 300 450 Metres

Rev	Date	Amendment	Initials
-	-	-	-

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

B SHADOW HABITATS REGULATIONS APPRAISAL

Ardersier Port – Deeper Dredge
Habitat Regulations Appraisal

April 2024

CONTROL SHEET

Client: Haventus Ltd
Project Title: Ardersier Port – Deeper Dredge
Report Title: Habitat Regulations Appraisal
Document number: 13679
Project number: 676693

Issue Record

Issue	Status	Author	Reviewer	Approver	Issue Date
1	Final	GN	MS	CCAS	15/9/2023
2	Draft for Comment V2	GN	CCAS	CCAS	06/10/2023
3	Final	GN	CCAS	CCAS	13/10/2023
4	Final	GN	CCAS	CCAS	13/12/2023
5	Final	GN/JEP	EC	EC	04/04/2024

EnviroCentre Limited Office Locations:

Glasgow **Edinburgh** **Inverness** **Banchory**

Registered Office: Craighall Business Park 8 Eagle Street Glasgow G4 9XA
Tel 0141 341 5040 info@envirocentre.co.uk www.envirocentre.co.uk

EnviroCentre Limited is registered in Scotland under no. SC161777.

VAT no. GB 348 6770 57.

EXECUTIVE SUMMARY

EnviroCentre was commissioned by Haventus Ltd to undertake a Habitat Regulation Appraisal (HRA) to support a marine licence for disturbance activities (MS-00009936), requested by Marine Scotland.

The consented dredge activity is provided in ARUP Drawing 294067-ARUP-XX-XX-DR-CG-002001 P01, where the consented increase to the dredge is as follows:

i. Increase the dredge depth from the approved -6.5m CD to -12.9m CD; and
ii. Increase the associated dredging volume from the approved quantity of 4,600,000 wet tonnes (wt) (comprising 4,000,000 wt for beneficial reuse and 600,000 wt to form the permanent dredge spoil storage bund) to 8,600,000 wet tonnes (increasing the volume identified for beneficial reuse by 4,000,000 wt to 8,000,000 wt), with 400,000 wet tonnes to be deposited below Mean High Water Springs as reinstatement of an inner section of Whiteness Head Spit and the remaining amount to be placed above MHWS.
iii. Previous plans were to pump all of the dredged material ashore for reuse, however following review it is now understood that this option presents a number of challenges. Following consultation with the Marine Directorate, NatureScot, Highland Council and other parties, it has been identified that a number of options including beneficial reuse and sea disposal will be required to manage the total volume. More detail on these options is provided within the March 2024 updated Best Practicable Environmental Option (BPEO) Report. A licence application with capacity to dispose of up to 3.7 million m3 has been submitted to accommodate the material which cannot be accommodated within the reuse or beneficial reuse options available.

The dredging of Ardersier Port is in the proximity of European designated sites, therefore a Habitats Regulations Appraisal (HRA) is required to determine the effects of the deeper dredge works on the qualifying features of the designated sites.

Likely Significant Effects (LSE) of the following designated features could not be scoped out during the screening stage and where therefore taken through to Appropriate Assessment (AA):

- Inner Moray Firth SPA (Common Tern, Red Breasted Merganser, Waterfowl assemblages)
- Moray Firth SAC (Bottlenose dolphin)
- Dornoch Firth and Morrich More SAC (Harbour seal)
- Cromarty Firth SPA (Common Tern)

During the AA process it was possible to rule out adverse effects from impacts to the assessed designated sites. Mitigation to be enacted includes:

- Adherence to the site-specific Marine Mammal Protection Plan.
- Adherence to the site specific Construction Environmental Management Document (CEMD) detailing pollution prevention measures.
- The following good practice guidelines will be adhered to and incorporated into the CEMD:
    - GGP5: Works and maintenance in or near water;
    - PPG 6: Working at construction and demolition sites;
    - PPG 7: Safe Storage – The safe operation of refuelling facilities;
    - GPP21: Pollution and incident response planning; and
    - PPG22: Incident response – dealing with spills.
- An Ecological Clerk of Works (ECoW) will be employed throughout the construction phase to audit adherence to the mitigation outlined in the CEMD.
- The existing Habitat Management Plan which sets out compensatory and enhancement actions for the site should be updated to reflect the loss of bird nesting and roosting habitat on the spit.

Contents

Appendices

Tables

1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre was commissioned by Haventus Ltd to undertake a Habitat Regulation Appraisal (HRA) to support a marine licence for disturbance activities (MS-00009936), requested by Marine Scotland.

The consented dredge activity is provided in ARUP Drawing 294067-ARUP-XX-XX-DR-CG-002001 P01, where the consented increase to the dredge is as follows:

i. Increase the dredge depth from the approved -6.5m CD to -12.9m CD; and
ii. Increase the associated dredging volume from the approved quantity of 4,600,000 wet tonnes (wt) (comprising 4,000,000 wt for beneficial reuse and 600,000 wt to form the permanent dredge spoil storage bund) to 8,600,000 wet tonnes (increasing the volume identified for beneficial reuse by 4,000,000 wt to 8,000,000 wt), with 400,000 wet tonnes to be deposited below Mean High Water Springs as reinstatement of an inner section of Whiteness Head Spit and the remaining amount to be placed above MHWS.
iii. Previous plans were to pump all of the dredged material ashore for reuse, however following review it is now understood that this option presents a number of challenges. Following consultation with the Marine Directorate, NatureScot, Highland Council and other parties, it has been identified that a number of options including beneficial reuse and sea disposal will be required to manage the total volume. More detail on these options is provided within the March 2024 updated Best Practicable Environmental Option (BPEO) Report. A licence application with capacity to dispose of up to 3.7 million m3 has been submitted to accommodate the material which cannot be accommodated within the reuse or beneficial reuse options available.

A HRA is required to assess whether the deeper dredging work, alone or in combination with other projects, will have an adverse impact on the integrity of the European designated site. It is the responsibility of the competent authority to conduct the HRA. This document aims to provide the information necessary for them to carry out the HRA assessment by:

- Providing a description of the proposed works;
- Identifying those European designated sites which are connected to and/or could potentially be affected by the proposed works;
- Identifying how the proposed works may impact on the qualifying features of the designated site(s);
- Considering other projects which may have “in combination” effects on the European designated sites; and
- Recommending the designated sites which need to be taken forward for further assessment if impacts on their qualifying features cannot be ruled out.

1.2 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre Limited.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre Limited for review to ensure that any relevant

changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

Whilst the Client has a right to use the information as appropriate, EnviroCentre Limited retains ownership of the intellectual content of this report. Any distribution of this report should be managed to avoid compromising the validity of the information or legal responsibilities held by both the Client and EnviroCentre Limited (including those of third party copyright). EnviroCentre Limited does not accept liability to any third party for the contents of this report unless written agreement is secured in advance, stating the intended use of the information.

EnviroCentre Limited accepts no liability for use of the report for purposes other than those for which it was originally provided, or where EnviroCentre Limited has confirmed it is appropriate for the new context.

2 METHODOLOGY

2.1 The Habitats Regulations Appraisal Process

The HRA is a four-stage process. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. The stages are summarised in Table 2-1. It is stated within the EU guidelines that "where, without any detailed assessment at the screening stage, it can be assumed (because of the size or scale of the project or the characteristics of the national site network) that significant effects are likely, it will be sufficient to move directly to the appropriate assessment (Stage Two) rather than complete the screening assessments explained below."

Table 2-1 Key Stages in the HRA Process

Stage 1	
Screening for Likely Significant Effect (LSE)	- Identify international sites in and around the project area. - Examine conservation objectives of the interest feature(s) (where available). - Review plan policies and proposals and consider potential effects on UK sites (magnitude, duration, location, extent). - Examine other plans and programmes that could contribute to 'in combination' effects.
	- If no effects likely – report no likely significant effect. - If effects are judged likely or uncertainty exists – the precautionary principle applies, proceed to Stage 2. - If following screening the project is reviewed and includes integral mitigation which will ensure no likely significant effects, then no further Appropriate Assessment needed.
Stage 2	
Appropriate Assessment (AA)	- Complete additional scoping work including the collation of further information on sites as necessary to evaluate impact in light of conservation objectives. - Agree scope and method of AA with the competent authority. - Consider how the project 'in combination' with other projects will interact when implemented (the Appropriate Assessment). - Consider how effects on integrity of the site could be avoided by changes to the project and the consideration of alternatives. - Develop mitigation measures (including timescale and mechanisms). - Report outcomes of AA including mitigation measures.
	- If the project will not adversely affect European site integrity proceed with plan. - If effects or uncertainty remain following the consideration of alternatives and development of mitigation proceed to Stage 3.
Stage 3	
Alternative Solutions	- Consider alternative solutions, delete from project or modify. - Consider if priority species/habitats affected - identify 'imperative reasons of overriding public interest' (IROPI), economic, social, environmental, human health, public safety (only applicable in highly exceptional circumstances).
Stage 4	
Imperative Reasons of Overriding Public Interest (IROPI)	- Stage 4 is the main derogation process of Article 6(4) which examines whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a UK site to proceed in cases where it has been established that no less damaging alternative solution exists. - The extra protection measures for Annex I priority habitats come into effect when making the IROPI case. Compensatory measures must be proposed and assessed. The Commission must be informed of the compensatory measures.

	Compensatory measures must be practical, implementable, likely to succeed, proportionate and enforceable, and they must be approved by the Minister.

2.2 Screening

Screening determines whether or not the project is likely to (or potentially could) have significant effects on the national site network. A list of all SACs, cSACs, SPAs and potential SPAs (pSPAs) that are within proximity to the site, or sites designated for mobile species which have the potential to be affected by the proposed development, was compiled and the qualifying interest features noted. Following this, the key environmental conditions (conservation objectives) needed to support site integrity were detailed for each site.

With reference to the NatureScot guidance[1]the screening stage determines whether Appropriate Assessment is required, by:

- Determining whether a project (or plan) is directly connected with or necessary to the conservation management of any European sites;
- Describing the details of the project (or plan) proposals and other projects that may cumulatively affect any European sites;
- Describing the characteristics of relevant European sites; and
- Appraising likely significant effects of the proposed project on relevant European sites.

The guidance gives the following definition of LSE:

"The test of significance is where a plan or project could undermine the site's conservation objectives. The assessment of that risk (of 'significance') must be made in the light, amongst other things, of the characteristics and specific environmental conditions of the site concerned."

*"A likely effect is one that cannot be ruled out on the basis of objective information. The test is a 'likelihood' of effects rather than a 'certainty' of effects. Although some dictionary definitions define 'likely' as 'probable' or 'well might happen', in the Waddenzee case the European Court of Justice ruled that a project should be subject to Appropriate Assessment "**if it cannot be excluded, on the basis of objective information, that it will have a significant effect on the site, either individually or in combination with other plans and projects**". Therefore, 'likely', in this context, should not simply be interpreted as 'probable' or 'more likely than not', but rather whether a significant effect can objectively be ruled out."*

2.3 Appropriate Assessment

The Appropriate Assessment establishes whether or not a project's LSE identified during the screening stage will have an adverse effect on the integrity of the affected site with regard to its conservation objectives. Based on the guidance provided by NatureScot guidance the effects of the proposal on the designated sites' qualifying features will be determined by:

- Gathering information required to assess impacts (from site documents, scientific literature, EU and UK guidance on impact assessment and impact assessments from similar projects);
- Predicting the type and nature of impacts e.g. direct or indirect, short or long term;
- Assessing whether there will be adverse effects on the integrity of the site as defined by the conservation objectives and the status of the site. The precautionary principle must be applied

[1]NatureScot, formerly SNH guidance available at : https://www.nature.scot/sites/default/files/2019-07/Habitats%20Regulations%20Appraisal%20of%20Plans%20-%20plan-making%20bodies%20in%20Scotland%20-%20Jan%202015.pdf (Accesses 20/12/2022)

at this stage. If it cannot be demonstrated with supporting evidence that there will be no adverse effects, then adverse effects will be assumed; and

- Ascertaining if it is possible to mitigate adverse effects.

2.4 In-Combination Effects

Under Regulation 43(1)(a) of the Habitats Regulations 1995 (as amended) it is necessary to consider whether a plan or project is likely to have a significant effect on a national site network site "either alone or in combination with other plans or projects."

These should include:

- Approved but as yet uncompleted plans or projects;
- Plans and projects for which an application has been made and which are currently under consideration but not yet approved by the competent authorities; and
- Permitted ongoing activities such as discharge consents, abstraction licences or consecutive/simultaneous maintenance activities.

3 PROJECT AND PROPOSED WORKS DESCRIPTION

3.1 Site Location and Project Background

Ardersier Port is within the Inner Moray Firth Special Protection Area ("SPA"), Moray Firth SPA, and Whiteness Head Site of Special Scientific Interest ("SSSI"). Ardersier Port was originally developed to service the offshore oil and gas industry in 1972. Initial construction of the yard area saw the formation of the navigation channel and harbour with the dredged material being pumped ashore for land reclamation purposes to create the main yard area. Subsequent maintenance dredging operations were carried out at typically 18-24 month intervals up until 2001.

A dredging licence was consented as part of plans to re-open Ardersier Port in 2014, which included a navigation channel width of 120 m and a dredge to -8.5 mCD. The planned dredging did not take place at that time and a subsequent dredging licence was consented in 2018 which included a navigation channel width of 120 m and a dredge to -6.5 mCD. Dredging of the harbour and navigation channel commenced under this consent in 2022.

3.2 Proposed Dredge Activity

The consented dredge activity is provided in ARUP Drawing 294067-ARUP-XX-XX-DR-CG-002001 P01, where the consented increase to the dredge is as follows:

i. Increase the dredge depth from the approved -6.5m CD to -12.9m CD; and
iv. Increase the associated dredging volume from the approved quantity of 4,600,000 wet tonnes (wt) (comprising 4,000,000 wt for beneficial reuse and 600,000 wt to form the permanent dredge spoil storage bund) to 8,600,000 wet tonnes (increasing the volume identified for beneficial reuse by 4,000,000 wt to 8,000,000 wt), with 400,000 wet tonnes to be deposited below Mean High Water Springs as reinstatement of an inner section of Whiteness Head Spit and the remaining amount to be placed above MHWS.
v. Previous plans were to pump all of the dredged material ashore for reuse, however following review it is now understood that this option presents a number of challenges. Following consultation with the Marine Directorate, NatureScot, Highland Council and other parties, it has been identified that a number of options including beneficial reuse and sea disposal will be required to manage the total volume. More detail on these options is provided within the March 2024 updated Best Practicable Environmental Option (BPEO) Report. A licence application with capacity to dispose of up to 3.7 million m3 has been submitted to accommodate the material which cannot be accommodated within the reuse or beneficial reuse options available.

The proposal increases the previously consented dredge depth in 2018 by 6.4 m within the eastern extent and the earlier consented dredge depth in 2014 by 4.4 m. The navigation channel width now varies (130 – 150 m at the outer approach, 150 – 278 in the mid-channel and 102 – 168 m in the inner harbour approach), compared to the previously consented 120 m width. The dredge profiles have a slope of 1v:6h to maintain a 25m buffer between the dredging and the edge of the spit (dimensions from ARUP Drawing 294067-ARUP-XX-XX-DR-CG-002001 P01). It is anticipated the western end of the spit will be removed, although a small predator free island will be retained. A cutter suction dredger will be used to minimise sediment suspension for all dredging.

The key difference in the dredging amendment and the previous dredge plan is that the footprint of the dredge area will be larger (additional 20.74 ha). The footprint of the consented dredge area compared to the original application is depicted in figure 3-1 below 676693-GIS002 in Appendix A.

4 SCREENING FOR LIKELY SIGNIFICANT EFFECT

4.1 Likely Significant Effect

For significant effects to arise, there must be a risk enabled by having a 'source' (e.g. construction works at a proposed development site), a 'receptor' (e.g. a European site or its qualifying interests), and a pathway between the source and the receptor (e.g. mobile marine species travelling between the proposed development site and the designated site). The identification of a pathway does not automatically mean that significant effects will arise. The likelihood for significant effects will depend upon the characteristics of the source (e.g. duration of construction works), the characteristics of the pathway (e.g. what species and the number of individuals travelling between the two sites) and the characteristics of the receptor (e.g. the sensitivities of the European site and its qualifying interests).

NatureScot (2015) guidance states that sites with mobile species should be considered within the screening process where there is a significant ecological link between the designated site and the proposed development site. It also states that for developments which could increase recreational pressures on designated sites, all sites within reasonable travel distance of the development should be considered for screening. It is also necessary to consider sites which are part of the same coastal ecosystem, where the proposed development may affect coastal processes.

4.1 Relevant European Sites

The following sites have been scoped in for assessment due to them being within proximity to the site and/ or considered connected to the site via dispersal of designated mobile species:

The sites are listed in Table 4-1, along with their screening assessment The location of the designated sites in relation to the proposed development is shown in Appendix A.

4.2 In- Combination Effects

No significant cumulative impacts were identified within the original EIA and given the highly localised nature of the additional impacts identified for the consented deeper dredge, it is considered that this is still likely to be the case.

Table 4-1: List of European Designated Sites within proximity to the site along with their Qualifying Features and Screening Assessment for Likely Significant Effects

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
Moray Firth proposed SPA (within the site boundary)	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species. This contribution will be achieved through delivering the following objectives for each of the site's qualifying features: a) Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term; b) maintain the habitats and food resources of the qualifying features in favourable condition.	Common eider (*Somateria mollissima*) Common goldeneye (*Bucephala clangula*) Common scoter (*Melanitta nigra*) Great northern diver (*Gavia immer*) Greater scaup (*Aythya marila*) Long-tailed duck (*Clangula hyemalis*) Red-breasted merganser (*Mergus serrator*) Red-throated diver (*Gavia stellate*) Slavonian grebe (*Podiceps auritus*)	Pathway for LSE identified. All of the qualifying species can be found in the adjacent open water of the Moray Firth. They are wintering populations and do not breed on site. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging grounds. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. Overwintering surveys in 2019/2020 highlighted very few numbers of these qualifying species within or in the vicinity of the dredge site, with the majority present in Dornoch Firth. With the works having a very limited zone of influence, and the qualifying species found some distance away in their preferred marine foraging habitat, any impact is considered unlikely.	Screened out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
		Velvet scoter (*Melanitta fusca*)		
		European shag (*Phalacrocorax aristotelis*)	Pathway for LSE identified. European shag could make use of both the sand habitat within the site and the open water, or exclusively open water. They are present year round within the pSPA as well as over-wintering. They could be impacted directly by habitat loss or deterioration during the dredging. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. During breeding bird surveys in 2018 and overwintering survey in 2019/20, very small numbers of Shags were present within or in the vicinity of the dredge area (a peak count of 3 birds), indicating that this area is not a main foraging area for this species. With the works having a very limited zone of influence, any impact is considered unlikely.	Screened out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
Inner Moray Firth SPA (within the site boundary)	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within the site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species No significant disturbance of the species	Common tern (*Sterna hirundo)*	Pathway for LSE identified. Common Tern use the coast for foraging and roosting opportunities. They could be impacted directly by habitat loss or deterioration during the dredging works. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability. And possibly failed nest attempts.	**Scoped in**
		Osprey (*Pandion haliaetus*)	Pathway for LSE identified. Osprey may utilise the channel and the shallow coastal waters to forage during the breeding season and on passage. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			These impacts could result in injury or death of individuals as well as reduced prey availability. However there is no suitable breeding locations around the dredge area, and they are rarely recorded in the vicinity compared to their preferred foraging grounds along the Moray Coast. No LSE is predicted.	
		Bar-tailed godwit (*Limosa lapponica)*	Pathway for LSE identified. Bar-tailed Godwit overwinter in the SPA. They could make use of the sand habitat within the site. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. There has been a shift in foraging and roost locations in recent years, with numbers declining from Whiteness Head. further west to Whiteness Sands, approximately 500m away.	Screened out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			This distance is considered to be outside the distance for disturbance for this species[2].	
		Greylag goose (*Anser anser*)	Pathway for LSE identified. Greylag Goose may be present in the open water within the Inner Moray Firth during the winter months (September – April). The distance between the site and suitable agricultural foraging grounds is approximately 10km, but it is unlikely that the site or surrounding area will be used for roosting as roost sites are typically on inland freshwater bodies, and Greylag geese are not known to frequent the area around Whiteness Sands. The geese could be impacted directly in the short term if pollutants are released into the water during the dredging phase of the development. These pollutants could impact birds in the open water or potentially at roost sites if they are carried there through dispersal. These impacts could result in injury or death of individuals but given the scope of works and the typical location of congregating geese, any LSE is considered unlikely. No LSE is predicted.	Screened Out
		Red-breasted merganser	Pathway for LSE identified.	**Screened in**

[2] Disturbance Distances in selected Scottish Bird Species – NatureScot Guidance | NatureScot (Accessed 12/10/23)

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			There is potential for red-breasted merganser to utilise the open water habitat within the site for foraging whilst they are present over-winter. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during deeper dredging or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability.	
		Redshank (*Tringa totanus*)	Pathway for LSE identified. Redshank may use the surrounding sand habitats and rocky shores for foraging and roosting over-winter. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			Overwintering surveys in 2019/2020 show that Redshank almost exclusively forage and roost within he Delnies saltmarsh habitat, considered to be outside the distance of disturbance for non- breeding redshank (200m)[3]. No LSE identified.	
		Scaup	Pathway for LSE identified. Scaup may be present in the open water within the Inner Moray Firth during the winter months (September – April). They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability. The great rafts of overwintering Scaup are found in the Cromarty Firth, or in the Inner Moray Firth between Castle Stuart and the Kessock Bridge in Inverness and are very rarely seen around Whiteness. No LSE identified.	Screened Out

[3] Disturbance Distances in selected Scottish Bird Species – NatureScot Guidance | NatureScot (Accessed 14/09/2023)

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
		Waterfowl assemblage Qualifying species additionally include: curlew (*Numenius arquata),* goosander (*Mergus merganser),* goldeneye (*Bucephala clangula),* teal (*Anas crecca),* wigeon (*Anas Penelope),* cormorant (*Phalacrocorax carbo).*	Pathway for LSE identified. Species in this assemblage are predominantly found foraging on Whiteness Sands <500m west of the site, and away from any dredging activity, or in the Moray Firth. This distance is considered to be mostly outside the distance for disturbance for non-breeding aggregates of these species. However, +100 curlew have been recorded on site during monitoring surveys and all species could make use of the sand habitat within the site. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability.	**Screened in**
Moray Firth SAC (within site boundary)	To avoid deterioration of the habitats of bottlenose dolphin or significant disturbance to this species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to	Bottlenose dolphin (*Tursiops truncates*)	LSE pathway identified. Bottlenose dolphin may be subject to increased underwater noise from the deeper dredging. High levels of underwater noise have the potential to cause injury to marine mammals via temporary or permanent threshold shifts (TTS or PTS) in hearing. In extreme circumstances, loud noises generated in close proximity to individuals can cause death due to pressure	**Screened in**

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	achieving favourable conservation status; and To ensure that the following are established then maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within the site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species		changes. In lower levels, noise can cause disturbance and changes in behaviour through masking (where man-made noise drowns out natural noises, affecting communication between individuals, ability to hunt and/or navigate) or displacement from habitats. During the dredging pollutants may be released into the water or through increased noise and machinery movement during dredging could have temporary impacts on bottlenose dolphin either directly, or indirectly, if prey items are affected. Toxic pollutants could result in habitat avoidance, injury or death of individuals and/or reduced prey availability leading to loss of condition. Prolonged vessel use as a result of deeper dredging could increase the risk of collision, resulting in death or injury to individuals.	
	To avoid deterioration of the qualifying habitat thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and	Subtidal sandbanks	Pathway for LSE identified. Subtidal sandbanks will not be directly affected by the prosed deeper dredge. It is possible that pollutants released during dredging could reach the habitats within the designated site through dispersion.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	To ensure for the qualifying habitat that the following are maintained in the long term: • Extent of the habitat on site • Distribution of the habitat within site • Structure and function of the habitat • Processes supporting the habitat • Distribution of typical species of the habitat • Viability of typical species as components of the habitat • No significant disturbance of typical species of the habitat		However, as the deeper dredge works has a very limited zone of influence from the approved. Therefore, no LSE are predicted.	
River Moriston SAC (55km south-west)	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and	Atlantic Salmon (*Salmo salar)*	Pathway for LSE identified. Atlantic salmon returning to the river Moriston from the sea will have to pass through the Moray Firth. As Atlantic salmon enter the Firth they tend to follow the coastline and could be present within the water near the dredge area. However, it is likely that numbers of fish migrating/emigrating past the development site will do so in areas of deeper water i.e. along the contours of the navigation channel, and where tidal flows, local currents and sediment movement, will be unaffected by the development.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	To ensure for the qualifying species that the following are maintained in the long term: • Population of the species, including range of genetic types for salmon, as • a viable component of the site; • Distribution of the species within site; • Distribution and extent of habitats supporting the species; • Structure, function and supporting processes of habitats supporting the • species; • No significant disturbance of the species; • Distribution and viability of freshwater pearl mussel host species; • Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species.		Disturbance-related impacts (noise/ sediments) during dredging has the potential to result in the displacement of fauna from using habitats. These impacts could result in disturbance, injury or in extreme circumstances death to individuals. However, as the deeper dredge works has a very limited zone of influence from the approved. Therefore, no LSE are predicted.	
		Freshwater pearl mussel (*Margaritifera margaritifera*)	No LSE identified. The site is located c. 55km form the dredge works. Given the very limited and localised zone of influence of the dredge works, no LSE are predicted.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
Dornoch Firth and Morrich More SAC (24km north)	To avoid deterioration of the qualifying habitat thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitat that the following are maintained in the long term: • Extent of the habitat on site; • Distribution of the habitat within site; • Structure and function of the habitat; • Processes supporting the habitat; • Distribution of typical species of the habitat; • Viability of typical species as components of the habitat; and • No significant disturbance of typical species of the habitat.	• Coastal dune heathland • Atlantic salt meadows • Dunes with juniper thickets • Lime-deficient dune heathland with crowberry • Shifting dunes • Estuaries • Dune grassland • Humid dune slacks • Intertidal mudflats and sandflats • Reefs • Glasswort and other annuals colonising mud and sand • Subtidal sandbanks Maintained • Shifting dunes with marram	Pathway for LSE identified. The distance between the dredge site and Dornoch Firth and Morrich More SAC is c.24km and the deeper dredge works has a very limited zone of influence from the approved. Therefore, no LSE are predicted. any materials reaching the designated site would be dilute and the effects on the habitats would be negligible.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	Otter (*Lutra lutra)*	LSE pathway identified. Otters are mobile animals and can range over 50km (Chanin, 2003). It is feasible that otters within the SAC could utilise the habitats within and adjacent to the dredge area for foraging and commuting and the spit area for resting. During the dredging otter could be impacted temporarily by noise and vehicle movements. This could result in displacement and a temporary reduction in the availability of habitat outside of the SAC. Pollutants/ sediments released into the water during dredging could have temporary impacts on otter either directly, or indirectly, if prey items are affected. Toxic pollutants could result in avoidance of supporting habitat out with the SAC, injury or death of individuals and/or reduced prey availability outside of the SAC, leading to loss of condition. No impacts on the structure, function or supporting processes of habitats within the SAC are predicted due to the distance between the proposed development and the designated site. Otter are highly mobile and there is extensive suitable foraging, commuting and resting habitat in the local landscape. Therefore, no LSE from deeper dredge activities is predicted.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
		Harbour seal (*Phoca vitulina*)	Pathway for LSE identified. Harbour seal is a mobile species which will travel in order to find prey and move between haul out sites. Seals from the Dornoch Firth and Morrich More SAC could be present within the water near the proposed development and at the designated haulout site at Whiteness sands. During the dredging works otter could be impacted temporarily by noise and vessel movements. This could result in displacement and a temporary reduction in the availability of habitat outside of the SAC. Harbour seal could be impacted directly in the short term if any pollutants are released into the water. They could be impacted indirectly if pollutants affect their food source (mainly small fish). Any pollutants dispersing to the site would be dilute and have insignificant effects on the seals and their prey. These impacts could result in disturbance, injury or in extreme circumstances death to individuals. According to NatureScot (2018) harbour seals are found throughout the wider Moray Firth and may range widely in search of prey (up to 50km). However, they have high fidelity to their favoured haul out sites and they tend to remain close to the sites. There is a designated haulout site in close proximity to the proposed development site, at Whiteness Sands, west of the dredge area.	**Screened In**

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			The deeper dredge works has a very limited zone of influence from the approved. Therefore, no LSE are predicted.	
Cromarty Firth SPA (9km north)	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species	Common tern	Pathway for LSE identified. Common Tern use the coast for foraging and roosting opportunities. They could be impacted directly by habitat loss or deterioration during the dredging works. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. Increased habitat removal, alteration or increased noise and machinery movement during deeper dredging leading to loss, disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability. And possibly failed nest attempts.	**Screened in**

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	• Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species	Osprey	Pathway for LSE identified. Osprey may utilise the channel and the shallow coastal waters to forage during the breeding season and on passage. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water or through increased noise and machinery movement during dredging leading to disturbance or displacement from their preferred foraging or roosting grounds. These impacts could result in injury or death of individuals as well as reduced prey availability. However there is no suitable breeding locations around the dredge area, and they are rarely recorded in the vicinity compared to their preferred foraging grounds along the Moray Coast. No LSE is predicted.	Screened Out
		Bar-tailed godwit Whooper swan Greylag goose Waterfowl	Pathway for LSE identified. Bar-tailed godwit, whooper swan and greylag goose overwinter within the SPA but do not breed. They could be impacted directly in the short term if pollutants are released into the water during dredging and through increased noise and machinery movement leading to disturbance or displacement from their preferred foraging or roosting grounds. They could be impacted indirectly during	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			dredging if pollutants affect their food source within the intertidal mud habitat. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. Bar -tailed Godwit predominantly feed on Whiteness Sands, to the west of the site. Whooper swan and greylag goose are rarely recorded in the vicinity, although both may forage on Whiteness Sands, or use the lagoon in the west of the site occasionally on passage or during the winter. The deeper dredge has a very limited zone of influence from the approved, therefore no LSE is predicted.	
Moray and Nairn Coast SPA (9km east)	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term:	Osprey	Pathway for LSE identified. Osprey may utilise the channel and the shallow coastal waters to forage during the breeding season and on passage. They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during the dredging or through increased noise and lighting during dredging leading to disturbance or displacement from their preferred foraging or roosting grounds.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	• Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of habitats supporting the species • No significant disturbance of the species		These impacts could result in injury or death of individuals as well as reduced prey availability. However there is no suitable breeding locations around the dredge area, and they are rarely recorded in the vicinity compared to their preferred foraging grounds along the Moray Coast. No LSE is predicted.	
		Bar-tailed godwit Greylag goose Pink-footed goose Redshank Waterfowl	Pathway for LSE identified. Bar-tailed godwit, waterfowl and geese overwinter within the Moray Firth but do not breed. They could be impacted directly in the short term if pollutants are released into the water or through increased noise and machinery movement during dredging leading to disturbance or displacement from their preferred foraging or roosting grounds. They could be impacted indirectly during dredging if pollutants affect their food source within the intertidal mud habitat. These impacts could result in disturbance, injury or death to foraging birds and reduced availability of suitable foraging habitat. Godwit predominantly feed on Whiteness Sands, to the west of the site. Geese are rarely recorded in the vicinity, although may forage on Whiteness Sands, or use the lagoon or adjacent fields occasionally on passage or during the winter. The waterfowl assemblage is predominantly found on the	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
			Moray Firth. Bird accumulations around Whiteness Head are not as rich as those within the Moray and Nairn Coast designation which includes Findhorn Bay, Lossie Estuary and Spey Bay. The deeper dredge has a very limited zone of influence from the approved, therefore no LSE is predicted. No LSE identified.	
Loch Flemington (6km south)	To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and To ensure for the qualifying species that the following are maintained in the long term: • Population of the species as a viable component of the site • Distribution of the species within site • Distribution and extent of habitats supporting the species • Structure, function and supporting processes of	Slavonian grebe	Pathway for LSE identified. Slavonian grebe breeds at Loch Flemington. They are likely to mainly remain at the loch but may forage in the open waters by the proposed development. They could be impacted directly in the short term if pollutants are released into the water or through increased noise and machinery movement during dredging leading to disturbance or displacement from their preferred foraging grounds. They may also be impacted by pollutants indirectly, if prey species (mainly fish) are affected. The structure and function of their habitat at Loch Flemington will not be affected by the development and there will be no significant disturbance to the species, which is occasionally recorded offshore from Whiteness in winter. The deeper dredge has a very limited zone of influence from the approved, therefore no LSE is predicted.	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	habitats supporting the species • No significant disturbance of the species			
Culbin Bar SAC (9km east)	To avoid deterioration of the qualifying habitats (listed below) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and To ensure for the qualifying habitats that the following are maintained in the long term: • Extent of the habitat on site • Distribution of the habitat within site • Structure and function of the habitat • Processes supporting the habitat • Distribution of typical species of the habitat • Viability of typical species as components of the habitat	Perennial vegetation of stony banks Atlantic salt meadows Embryonic shifting dunes	Pathway for LSE identified. The distance between the proposed development site and Culbin Bar SAC is c.24km and the deeper dredge has a very limited zone of influence from the approved. Any materials reaching the designated site would be dilute and the effects on the habitats would be negligible. No LSE is identified	Screened Out

Site Name and Distance to Proposed Development	Conservation Objectives	Qualifying Features	Likely Significant Effect (LSE)	Screening Assessment
	• No significant disturbance of typical species of the habitat			

4.3 Screening Conclusion

The outcome of screening for appropriate assessment is to reach one of the following determinations:

a) A stage 2 AA of the proposed development is required if it is concluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site.
b) A stage two AA of the proposed development is not required if it can be concluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will not have a significant effect on a European site.

Following an examination, analysis and evaluation of the relevant information including, in particular, the nature of the proposed development and the likelihood of significant effects on scoped in designated sites

- Inner Moray Firth SPA
    - Common Tern
    - Red Breasted Merganser
    - Waterfowl assemblages
- Moray Firth SAC
    - Bottlenose dolphin
- Dornoch Firth and Morrich More SAC
    - Harbour seal
- Cromarty Firth SPA
    - Common Tern

5 APPROPRIATE ASSESSMENT INNER MORAY FIRTH SPA

Conservation Objectives:

To ensure for the qualifying species that the following are maintained in the long term:

1. Population of the species as a viable component of the site
2. Distribution of the species within the site
3. Distribution and extent of habitats supporting the species
4. Structure, function and supporting processes of habitats supporting the species

5.1 Common Tern

The Inner Moray Firth SPA qualifies under Article 4.1 by regularly supporting populations of European importance of Common Tern (310 pairs, 2% of the GB population).

At Ardersier/Whiteness Head, Common Terns no longer breed, but post-breeding tern flocks (including Common Tern) do roost at Whiteness Head during late summer (July-August).

5.1.1 Assessment of Potential Impacts on Conservation Objectives

They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

Permanent loss of roosting habitat and temporary disturbance during dredging is also a potential impact. It is considered that the birds have access to alternative roosting and feeding habitat and the loss of the habitat proposed during the deeper dredge will not impact on the conservation status of the wider population. There will be an overall reduction of habitat available for roosting within the development area and so the effects will be significant at a site level. It is considered that the existing Habitat Management Plan which sets out compensatory and enhancement actions for the site will be updated to reflect the loss of habitat within the spit/ island.

The population and distribution of the species should be maintained, and the overall distribution and function of supporting habitat should not be adversely impacted.

5.2 Red-breasted Merganser

The Inner Moray Firth SPA further qualifies under Article 4.2 by regularly supporting populations of European importance of the migratory (1992/93 to 1996/97 winter peak means) red-breasted merganser (1,184 individuals, 1% of the NW & Central Europe biogeographic population).

Surveys undertaken at Ardersier/Whiteness Head indicate that occasionally larger numbers of this species are present, with a peak count of 92 in August 2021 and 47 in February 2020. The peak count of 92 represents nearly 8% of the SPA population.

5.2.1 Assessment of Potential Impacts on Conservation Objectives

Red-breasted Merganser could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

Temporary disturbance during dredging is also a potential impact. It is considered that the birds have access to alternative foraging habitat within the Inner Moray Firth itself. Disturbance effects will not result in barriers to movement, so there would be no significant energy expenditure and possible reduction in body condition required for survival and subsequent migration. Therefore, there will not be an impact on the conservation status of the wider population.

The population and distribution of the species should be maintained, and the overall distribution and function of supporting habitat should not be adversely impacted.

5.3 Waterfowl Assemblages

The Inner Moray Firth SPA qualifies under Article 4.2 by regularly supporting in excess of 20,000 individual waterfowl. Between 1992/93 to 1996/97 a winter peak mean of 26,800 individual waterfowl comprising 16,800 wildfowl and 10,000 waders including nationally important populations of the following species: scaup (118 individuals, 1% of the GB population); curlew Numenius arquata (1,262 individuals, 1% of the GB population); goosander (325 individuals, 4% of the GB population); goldeneye (218 individuals, 1% of the GB population); teal (2,066 individuals, 1% of the GB population); wigeon (7,310 individuals, 3% of the GB population); cormorant (409 individuals, 3% of the GB population); redshank (1,621 individuals, 1% of the GB population); red-breasted merganser (1,184 individuals, 12% of the GB population); greylag goose (2,651 individuals, 3% of the GB population) and bar-tailed godwit (1,090 individuals). In the five-year period 1991/92 to 1995/96, a winter peak mean of 33,148 individual waterfowl was recorded with the assemblage additionally including a nationally important population, greater than 2,000 individuals, of oystercatcher (3,063 individuals, 0.9% of the GB population).

5.3.1 Assessment of Potential Impacts on Conservation Objectives

Waterfowl assemblages could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

Permanent loss of roosting habitat and temporary disturbance during dredging is also a potential impact. It is considered that the birds have access to alternative roosting and feeding habitat and the loss of the habitat proposed during the deeper dredge will not impact on the conservation status of the wider population. There will be an overall reduction of habitat available for roosting within the development area and so the effects will be significant at a site level. It is considered that the existing Habitat Management Plan which sets out compensatory and enhancement actions for the site will be updated to reflect the loss of some habitat within the spit/ island.

The population and distribution of the species should be maintained, and the overall distribution and function of supporting habitat should not be adversely impacted.

5.4 Appropriate Assessment Conclusion

Assuming GPP are in place and the site Habitat Management Plan is implemented then no adverse effects on the integrity of the Inner Moray Firth SPA are predicted in relation to the conservation objectives for Common Tern, Red-breasted Merganser and Waterfowl assemblages.

6 APPROPRIATE ASSESSMENT FOR THE MORAY FIRTH SAC

Conservation Objectives:

1. To maintain site integrity and ensure the site continues to make a contribution to bottlenose dolphin remaining at favourable conservation status in UK waters.
2. To ensure for the qualifying species that the following is maintained in the long term; population of the species as a viable component of the site.
3. To ensure for the qualifying species that the following is maintained in the long term; distribution of the species within the site.
4. To ensure for the qualifying species that the following is maintained in the long term; distribution and extent of habitats supporting the species.
5. To ensure for the qualifying species that the following is maintained in the long term; structure, function and supporting processes of habitats supporting the species.
6. To ensure for the qualifying species that the following is maintained in the long term; no significant disturbance of the species.

6.1 Bottlenose Dolphin

Bottlenose dolphin live predominantly in inshore coastal water within 10km of land but may range further. They usually live in small groups of up to 20 individuals and can live for 20 to 50 years. Calves can be born any time of year but typically between March and September. They eat a wide range of fish species including cod, saithe, whiting, salmon and haddock (Santos et al., 2001) as well as squid, crabs and shrimp. They are present in the Moray Firth SAC all year round.

The Moray Firth supports the only known resident population of bottlenose dolphin in the North Sea and is one of only two UK sites designated for the species as a primary qualifying feature. The northeast of Scotland population is estimated to comprise approximately 195 individuals. Between 1990 and 2013, annual estimates of the number of dolphins using the SAC ranged between 43 and 134. The main sensitivities bottlenose dolphin as identified in the site designation consultation document (SNH, 2018) are as follows:

- Removal of non-target and target species (i.e. entanglement of bottlenose dolphin in fishing gear and removal of their prey species);
- Contaminants (e.g. through effects on water quality and bioaccumulation of contaminants that in turn affect the survival and productivity rates of bottlenose dolphin);
- Underwater noise from vessels (recreational and commercial);
- Underwater noise from development activity (e.g. piling, blasting, dredging, seismic survey and general engine noise); and
- Death or injury by collision (predominantly in relation to collision with various types of fast-moving vessels from commercial shipping to personal leisure craft and potentially from tidal turbines).

Due to recognised declines and threats to the species all bottlenose dolphins are European Protected Species (EPS), protected under the Conservation (Natural Habitats, &c.) Regulations 1994.

6.1.1 Assessment of Potential Impacts on Conservation Objectives

The proposed works will occur within The Moray Firth SAC boundary. There is the potential for bottlenose dolphin to be disturbed, injured or, in extreme circumstances, killed as a result of equipment movements underwater noise or pollution generated during dredging.

The main impact predicted to arise from the dredging, in relation to marine mammals, is the generation of underwater noise. Underwater noise modelling undertaken to inform the 2018 EIA included modelling of noise which would be generated by dredging using a cutter suction dredger. The consented deeper dredge won't alter the parameters of the modelling (e.g. noise generated by the vessel will not be different) Figure 3-1 below shows the results of the modelling with regards to distances for Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) thresholds for different hearing groups. It is assumed that marine mammals will swim away from any noises which are causing them disturbance or are harmful, the shorter exposure periods for the modelling are therefore the most likely to be experienced.

Assuming that animals will flee as soon as they hear the noise from the dredging, the PTS range for any species is a maximum of 3m from the source of the noise. The TTS limits are all within 230m (within 2m for all species when excluding harbour porpoise) when assuming animals will flee from the noise source. The expected disturbance is therefore highly localised to the dredge site, with individuals present within the wider Moray Firth unlikely to be impacted. There is only considered to be a risk to marine mammals if they are in close proximity to the dredge vessel when dredging is commencing. The modelling also shows that there is no difference to the TTS and PTS threshold distances regardless of if the activity continues for 8 hours or 24 (as long as they do not remain stationary). In order to avoid and minimise the risk of injury and disturbance to marine mammals, a Marine Mammal Protection Plan (MMPP) is in place and key mitigation is outlined in section 9 of this report.

In terms of habitat loss it is considered that there is sufficient alternative foraging habitat for bottlenose dolphin such that there would be no loss in individual condition, breeding success or long-term population viability as a result of displacement.

During dredging works there is the potential for pollutants to be released into the water. This could have temporary impacts on the function and supporting processes of bottlenose dolphin foraging habitat, which could lead to reduced prey availability in the short term. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

No changes to the distribution or extent of habitats supporting bottlenose dolphin within or out with the SAC are predicted as a result of the deeper dredging. No impacts to the structure, function and processes of habitats supporting bottlenose dolphin are predicted within the designated site. Disturbance will be temporary and the favourable conservation status of bottlenose dolphin in UK waters will not be impacted by the dredging works.

6.2 Appropriate Assessment Conclusion

If the mitigation presented in the MMPP and section 9 of this report are adhered to then no significant effects on the integrity of The Moray Firth SAC are predicted in relation to the conservation objectives for bottlenose dolphin.

7 APPROPRIATE ASSESSMENT FOR THE DORNOCH FIRTH AND MORRICH MORE SAC

Conservation Objectives

To ensure for the qualifying species that the following is maintained in the long term; population of the species as a viable component of the site:

1. To ensure for the qualifying species that the following is maintained in the long term; distribution of the species within the site.
2. To ensure for the qualifying species that the following is maintained in the long term; distribution and extent of habitats supporting the species.
3. To ensure for the qualifying species that the following is maintained in the long term; structure, function and supporting processes of habitats supporting the species.
4. To ensure for the qualifying species that the following is maintained in the long term; no significant disturbance of the species.

7.1 Harbour Seal

The harbour or common seal (*Phoca vitulina*) occurs in the North Atlantic and North Pacific. There are about 83,000 harbour seals in Europe. About 35% of this population is found in UK waters, and 83% of these in Scottish waters. Harbour seals prefer more sheltered waters and have a more restricted range than grey seals. Harbour seals are found throughout the wider Moray Firth and may range widely in search of prey (up to 50km).

Harbour seals are typically found hauled out on sandbars and shores at the mouth of the estuary which are used habitually as favoured locations by the same groups of individuals. Notable haul-out sites include the intertidal sandflats of Dornoch and Whiteness Sands and the intertidal sand bars of the Gizzen Briggs which consistently support around 600 seals. These areas are also used as breeding sites, including locations which are inundated by the tide as pups can swim within an hour after birth with pupping typically occurring in early to mid-June/July. Adult seals undergo an annual moult between August and September during which they spend extended period out of the water.

Harbour seals are present within the Dornoch Firth year-round. The harbour seal breeding season is from June to August inclusive.

The main sensitivities for harbour seal as identified in the site designation consultation document (NatureScot, 2018) are as follows:

- underwater noise from vessels (recreational and commercial);
- development activity (e.g. piling, blasting, dredging, seismic survey and general engine noise);
- recreational disturbance – particularly at haul out sites;
- potential persecution from fisheries;
- marine pollution;
- capture in fishing nets; and potentially tidal turbines.

7.1.1 Assessment of Potential Impacts on Conservation Objectives

The proposed works are approximately 24km outside Dornoch Firth and Morrich More SAC boundary. The majority of the potential impacts listed in Table 4.1 are therefore not expected to impact on harbour seal nor the habitat supporting them within the designated site.

During dredging there is the potential for pollutants to be released into the water. This could have temporary impacts on the function and supporting processes of a harbour seal foraging habitat out with the SAC which could lead to reduced prey availability in the short term. It is predicted that the risk of such an event occurring will be minimal if the mitigation and relevant GPP, detailed in section 9 of this report, is adhered to.

There is also the potential for harbour seal utilising the habitats within and adjacent to the deeper dredge site to experience disturbance during dredging. There is a designated seal haulout site[4] at Whiteness Sands, <500m west of the proposed development site. The location has also been used for pupping. Seals that are on land are usually resting to conserve energy or may be nursing young. Disturbing seals into the water costs them energy, creates stress and can lead to impacts on health[5]. Stampeding adults can also injure pups. The disturbance arising from the deeper dredge will be temporary and therefore will not result in long term disturbance. Disturbance during construction will be minimised by adherence to the mitigation outlined in the MMPP and section 9 of this report.

The dredge works are not predicated to affect the integrity of the site or its contribution to maintaining the favourable conservation status of harbour seal in UK waters. No processes of habitats supporting the species or alterations to the long-term distribution of the species within the site are therefore anticipated.

7.2 Appropriate Assessment Conclusion

If the mitigation presented in the MMPP and section 9 of this report are adhered to then no significant effects on the integrity of Dornoch Firth and Morrich More SAC are predicted in relation to the conservation objectives for harbour seal.

[4] MF001 - Ardersier: Intertidal sandbanks west of Whiteness Head and north of Kirkton within the MoD Danger Area.
[5] Scottish Natural Heritage: A Guide to Best Practice for Watching Marine Wildlife available online at: https://www.nature.scot/sites/default/files/2017-06/Publication%202017%20-%20A%20Guide%20to%20Best%20Practice%20for%20Watching%20Marine%20Wildlife%20SMWWC%20-%20Part%202%20-%20April%202017%20%28A2263517%29.pdf last accessed 13/06/2018

8 APPROPRIATE ASSESSMENT CROMARTY FIRTH SPA

Conservation Objectives:

To ensure for the qualifying species that the following are maintained in the long term:

1. Population of the species as a viable component of the site
2. Distribution of the species within site
3. Distribution and extent of habitats supporting the species
4. Structure, function and supporting processes of habitats supporting the species

8.1 Common Tern

Cromarty Firth SPA qualifies under Article 4.1 by regularly supporting populations of European importance of the species Common Tern (1989 to 1993 mean of 294 pairs; 2% of the GB population).

At Ardersier/Whiteness Head, Common Terns no longer breed, but post-breeding tern flocks (including Common Tern) do roost at Whiteness Head during late summer (July-August).

8.1.1 Assessment of Potential Impacts on Conservation Objectives

They could be impacted directly, or indirectly via pollution of food source in the short term if pollutants are released into the water during dredging. A suction cutter dredger is to be used to limit suspended sediments in the water during dredging. It is predicted that the risk of such an event occurring is minimal if the mitigation and relevant Guidance for Pollution Prevention (GPP), detailed in section 9 of this report, are adhered to.

Permanent loss of roosting habitat and temporary disturbance during dredging is also a potential impact. It is considered that the birds have access to alternative roosting and feeding habitat and the loss of the habitat proposed during the deeper dredge will not impact on the conservation status of the wider population. There will be an overall reduction of habitat available for roosting within the development area and so the effects will be significant at a site level. It is considered that the existing Habitat Management Plan which sets out compensatory and enhancement actions for the site will be updated to reflect the loss of habitat within the spit/ island.

The population and distribution of the species should be maintained, and the overall distribution and function of supporting habitat should not be adversely impacted.

8.2 Appropriate Assessment Conclusion

Assuming GPP are in place and the site Habitat Management Plan is implemented then no adverse effects on the integrity of the Cromarty Firth SPA are predicted in relation to the conservation objectives for Common Tern.

9 MITIGATION.

The following mitigation will be employed to avoid and minimise any impacts occurring both during the dredging works:

- Adherence to the site-specific Marine Mammal Protect Plan (MMPP);
- Adherence to the site-specific Construction Environmental Management Document (CEMD) detailing pollution prevention measures.
- The following good practice guidelines will be adhered to and incorporated into the CEMD:
    - GGP5: Works and maintenance in or near water;
    - PPG 6: Working at construction and demolition sites;
    - PPG 7: Safe Storage – The safe operation of refuelling facilities;
    - GPP21: Pollution and incident response planning; and
    - PPG22: Incident response – dealing with spills.
- An Ecological Clerk of Works (ECoW) will be employed throughout the construction phase to audit adherence to the mitigation outlined in the CEMD.
- The existing Habitat Management Plan which sets out compensatory and enhancement actions for the site should be updated to reflect the loss of bird nesting and roosting habitat on the spit.

APPENDICES

A THE LOCATION OF DESIGNATED SITES IN RELATION TO THE PROPOSED DEVELOPMENT

D SEAL HAULOUT NOTE

Document Reference: HCGF/2023/002

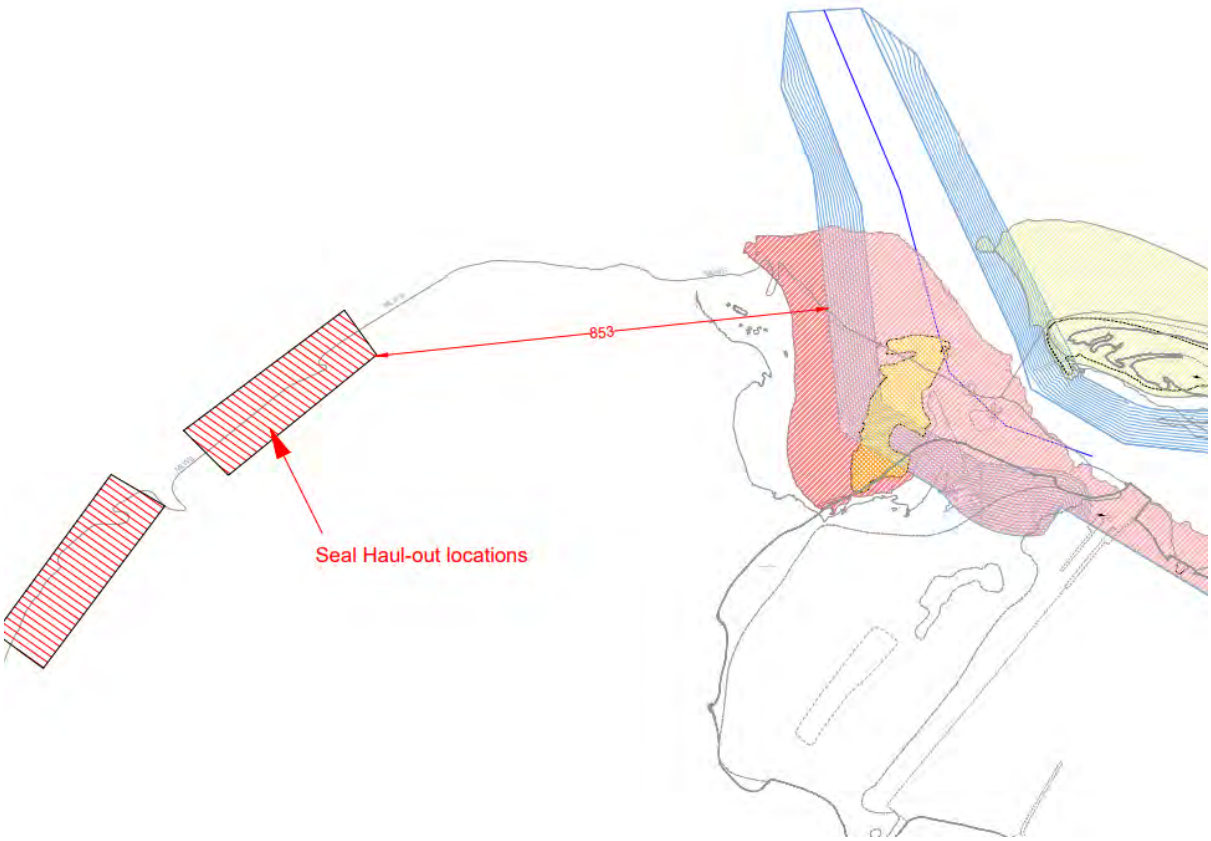
Document Issued: 21/08/2023

Haventus – Ardersier Seal Haul Out Locations

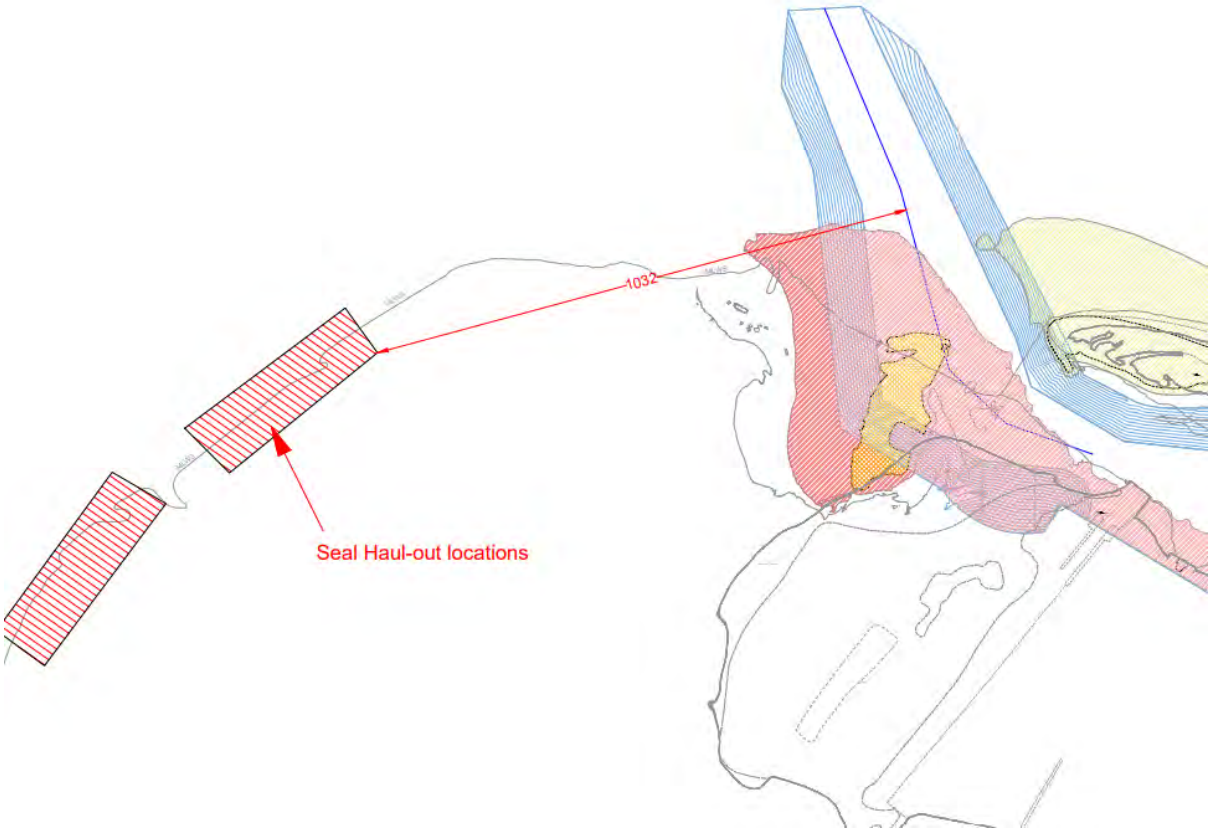
Following issue of the Note of Site Meeting on 15 August 2023 NatureScot requested additional information on the seal haul out locations on Whiteness Sands.

When carrying out bird surveys at the site Roy Dennis also records the location and number of seals on the intertidal areas to the west/northwest of the operational site area.

The areas where seals haul out monitored by Roy Dennis are shown on the images below along with the closest distance from the edge of the proposed dredge channel and centreline of the new approach to the port.



Seal Haul-out locations and closest distance to Edge of Proposed Dredge (853m).



Seal Haul-out locations and closest distance to Proposed Channel Centreline (1032m).

Bauer Method Statement

BAUER TECHNOLOGIES

Project Name:

Ardersier Port

Method Statement Title:

Diaphragm Wall Construction

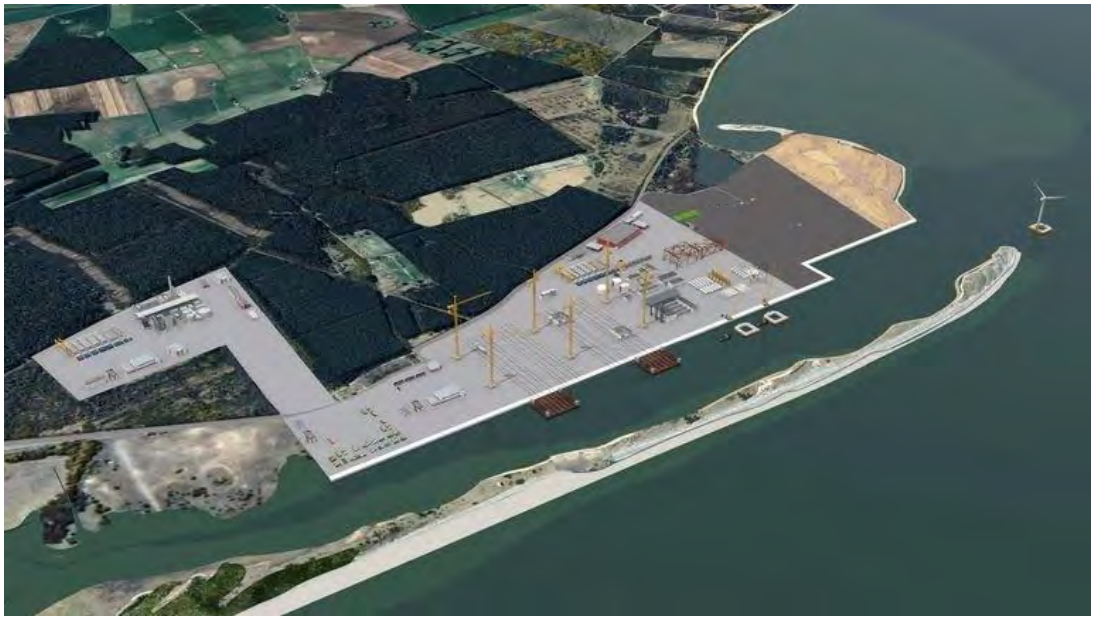
Document Number: **BAU-MS-001 rev 03**

View Point Number: **ArdPhase1-BAU-WP1-D WALL-MS-W-0007**

Rev	Date	Description	Author	Reviewer	Signed
00	15/05/23	Pre-construction version Designer	Chris Dobson		
01	18/09/23	Updated for first issue	Dien Nackaerts James Taylor		
02	21/03/24	For Construction	Emmanuel Dengu		
03	27/03/24	For Construction	Emmanuel Dengu Dan Hatcher		

Approval

Date	Approval by	Name	Signed



List of Contents

1. PURPOSE OF DOCUMENT

The purpose of this method statement is to provide a description of the works and how they will be undertaken in a safe & controlled manner. It details the main tasks and describes the outline methodology for the undertaking of these tasks.
Individual tasks will be broken down into ***Task Briefings*** which will provide specific and detailed methodologies. These Task briefings will support this method statement.

2. RESPONSIBILITIES

The responsibility for ensuring that the contents of this method statement are briefed to and understood by the workforce and is held by the BTL Project Manager.
The responsibility for ensuring the day-to-day management of the controls detailed within this method statement rests with the BTL Site Superintendent.

Name	Designation	Contact number
Brandon Ferreira	Project Director	[Redacted]
Emmanuel Dengu	Senior Project Manager	[Redacted]
Pete Lewis	Project Manager	[Redacted]
Dien Nackaerts	Project Manager	[Redacted]
Stefan Sengespeik	Project Superintendent	[Redacted]
Mark Graham	Site Shift Superintendent	[Redacted]
Leon Ferreira	Site Shift Superintendent	[Redacted]
Daniel Hatcher	HSEQ Manager	[Redacted]

3. LOCATION OF PROJECT

The project is located within the existing Ardersier Port facility, located on the southern side of the Moray Firth, approximately 14 miles east of Inverness.

The postcode is IV2 7QX

4. SCOPE OF WORK

BT-UK's scope of work comprises:

- Installation of diaphragm walls for the front quay wall and rear anchor wall.
- Installation of reinforced concrete guide walls

5. PERSONAL PROTECTIVE EQUIPMENT

The minimum Personal protective equipment required is: -

- Orange high visibility top (EN 471)
- Orange high visibility trousers. (EN 471)
- Light eye protection (EN 166F)
- Safety helmet (EN 397)
- Gloves (task specific)
- Safety footwear (EN 345, No rigger boots, toe and mid-sole protection)
- Additional PPE may be required, this will be detailed within the individual task briefing.

6. SIGNIFICANT HAZARDS

The specific, significant hazards which have been identified are;

- Excavations (including panel excavation)
- Lifting operations
- Use of Bentonite (Uncontrolled release)
- People and plant interface
- Work at height
- Stored energy
- General operation of Plant
- Fatigue

All individual work processes will be detailed within a specific task briefings and lift plans. These will give a more detailed methodology of the activity and the control measures associated with the activity.

Document Title	Document Number
Task Briefing Mobilisation and Demobilisation	BAU_TB_001
Task Briefing Mechanical Maintenance	BAU_TB_002
Task Briefing Hot Works	BAU_TB_003
Task Briefing Refuelling	BAU_TB_004
Task Briefing MEWP Use & Rescue	BAU_TB_005
Task Briefing Use of Jet Wash	BAU_TB_008
Task Briefing Tremie Technique	BAU_TB_009
Task Briefing Deliveries & Collections	BAU_TB_010
Task Briefing Concrete Sampling	BAU_TB_011
Task Briefing Integrity Testing	BAU_TB_012
Task Briefing Lifting Operations	BAU_TB_013
Task Briefing Use of Tele Handler	BAU_TB_015
Task Briefing Use of Support Fluid	BAU_TB_018
Task Briefing Setting Out and As Built	BAU_TB_006
Task Briefing D Wall Construction	BAU_TB_007
Task Briefing Cage installation	BAU_TB_014
Task Briefing Spoil Handling and Removal	BAU_TB_016
Task Briefing Concrete placement	BAU_TB_017
Task Briefing – Transfer of cages from Laydown to the D. Wall	BAU_TB_027
Task Briefing Installation and removal of Stop ends	BAU_TB_028

7. RESOURCES

Work force identification / description

BTL's workforce will comprise approximately 130 staff, operatives and subcontractors, working 24/7 in shifts over the duration of the project.

Those engaged on the above shift pattern will be monitored for fatigue as the project progresses.

First aiders will be provided throughout BTL's staff & operatives. Nominated First Aiders will be identified by a helmet sticker. A list of First Aiders will be displayed on notice boards in the site welfare.

All on site staff will hold the correct category of training for their role. CSCS, CPCS or equivalent cards will be evidenced on site.

8. PLANT / MAIN EQUIPMENT

Base Carrier

BAUER crawler crane types MC96 and MC86 will be deployed as a grab. The rigs, equipped with a rope grab or a hydraulic grab, provide sufficient power to excavate to the required depths.

Main parts of a BAUER crawler crane:

1. Under carriage
2. Upper carriage
3. Main winch
4. Mast
5. Masthead
6. Hose drum system grab (HDSG)
7. Hydraulic grab/mechanical Grab

Figure 1: Hydraulic Grab DHG:

Service Cranes

A maximum of two service cranes per D-Wall unit will be required for the duration of the works, depending on the activity to be executed. The service cranes will be used to install steel stop ends, reinforcement cages and tremie pipes. They will also be used to transport plant and equipment around the site as necessary and offload materials.

All crane movements will be directed by trained, competent and qualified Slinger/signallers, and all lifts will be risk assessed and included within the lift plans. Equipment and accessories will be thoroughly examined in line with LOLER.

Hydraulic and Rope Grab

(a)

(b)

Figure 2 BAUER hydraulic grab-DHG/C (a) and Figure 3: Rope grab-K1210/K1010 HD (b)

The DHG/C is a hydraulic grab unit which is rope suspended and operates the jaws hydraulically. The closing forces are activated by a cylinder which is installed vertically inside of the base frame.

Necessary chiseling operation can be performed by using additional chisel teeth sitting inside the grab buckets.

The verticality of the grab and thus the panel alignment will be measured in (y-axis) and perpendicular to the panel axis (x-axis) by means of two independent inclinometers within the grab body. The data provided by these inclinometers will be processed by the crane's onboard computer and displayed in real time, such that the operator will continuously monitor and, if necessary, correct the verticality of the grab.

The onboard computer records excavation parameters to provide an "as-built" record for each panel excavated.

The grab is equipped with a tool to hook into temporary steel stop-ends which allows removing possible concrete adhesions and for loosening the stop-ends.

The K-1210 / K-1010 HD is a rope operated grab unit which is rope suspended and is achieving its closing force by cable pulls inside the frame.

The rope grab has similar abilities compared to the hydraulic grab. The clamshells of both grabs have a nominal 'bite' of 3200mm and a width of 1500mm & 1200mm (front wall) & 1000mm (rear wall). The thickness of the excavation shall not be less than the specified width dimensions.

Stop-ends

Figure 4: Steel stop-end

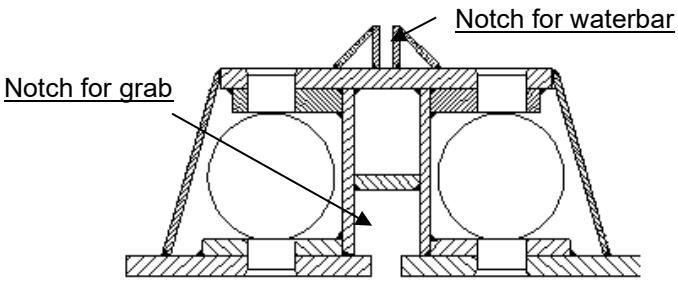


Figure 5: Cross section through stop-end

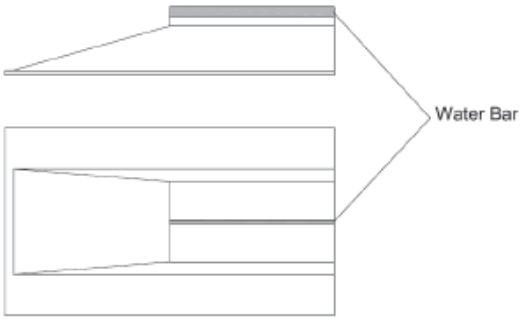


Figure 6: Side and top view bottom section

Temporary BAUER steel stop-ends will be used in order to create a provisional joint between the single panels of the diaphragm wall to allow the construction of the Diaphragm Wall in sections. The shape of the stop-end creates a mechanical connection between the concreted panels. It also helps the grab to maintain its verticality while excavating.

The stop-end exists of different sections to be assembled prior to the start of the works. The shape of the bottom section has a slope to form a smooth transition between steel stop-end and concrete.

The notch for the waterbar is constructed along the entire length of the stop-end and therefore, the waterbar can be installed to the bottom of the stop-end.

At the rear wall, stop-ends will be installed over a length of approximately 22m from the top of the guide wall. At the front wall, stop-ends will be installed approximately 34m below the top of the guide wall.

The different length stop-ends allow the installation of the water bar to the required depth below ground level. Water bars are installed over a depth of 11,5m and 33m below to the top of the guide wall for the rear and front wall respectively.

Brush

Figure 7: Bauer brush

Prior concreting a brush will be used to clean the joint to the previously constructed panel. The brush will be moved up and down to remove possible bentonite cake deposits.

The layout of the single brushes will be adjusted to the applied stop-ends.

Tremie Pipes

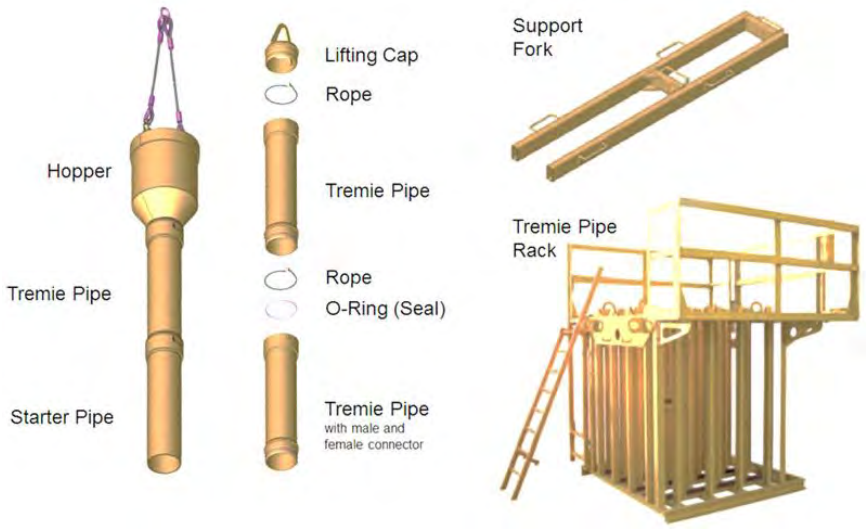


Figure 8: Tremie Equipment

Tremie pipes are used for pouring the concrete. A tremie pipe string consists of distinct tremie pipe sections (with individual section lengths of between 0.5 m and 6.0 m) connected to each other via wire ropes to reach the required panel toe level. The number of tremie pipe strings used per panel depends on the length and layout of the panel. At the bottom a starter tremie will be added to the pipe string. All joints will be provided with seals to prevent cement grout losses and to avoid segregation of the concrete. A hopper will be connected on the top of the tremie string to direct the concrete during discharge from the concrete truck.

Support Fluids, Mixing-Treatment Plant and Storage

To provide the required panel stability excavation can only be carried out by using a support fluid. Therefore, setup and operation of a mixing, treatment and storage plant is necessary.

The support fluid used is a bentonite slurry. The properties of the support fluid are checked regularly to achieve the necessary panel stability and excavation progress.

All bentonite slurry (new, used, waste) will be stored in storage tanks which will be located within a bunded concrete platform. Bentonite slurry is pumped from the storage tanks to the open panel while drilling activities are ongoing. Vice versa, the slurry is pumped back into the storage tank, passing through the desander, upon completion of excavation of each panel and prior to placement of concrete. De-sanders are used to remove small gravel, sand and silt from the bentonite suspension to allow it to be reused.

9. METHOD OF WORK

Operation of Bentonite Plant

The bentonite plant is set up on a (100mx100m) platform stabilized to allow for construction plant movement by the client Haventus. L&A designed and constructed the ground bearing slabs for the bentonite plant units. Wernick will support with the electrical layout and installation. Storth will supply method statements and lift plans for the erection of the bentonite storage tanks.

A 45m x 20m slab will house the slurry mixing plant including bentonite silos and slurry mixers, desanding units, interconnecting pumps, generators and the bentonite laboratory. Adjacent, a 65m x 45m slab will house the slurry storage tanks, containing either working bentonite slurry, concreting / fresh bentonite slurry, waste bentonite slurry or water.

Mohnopumps/Selwood pumps will be used to transport bentonite slurry between the mixing plant, storage tanks and desanders. MAT desanding units BE250 and BE300 are deployed. Connections are mainly made with HDPE and Victaulic lines and couplings of 4-6 inch.

Most bentonite plant units have maximum dimensions of a 40-foot container and will be delivered to site as a complete module following the heavy plant routes. The storage tanks will be brought in sections and assembled on the designated ground bearing slab in line with the manufacturer's instructions and lift plans.

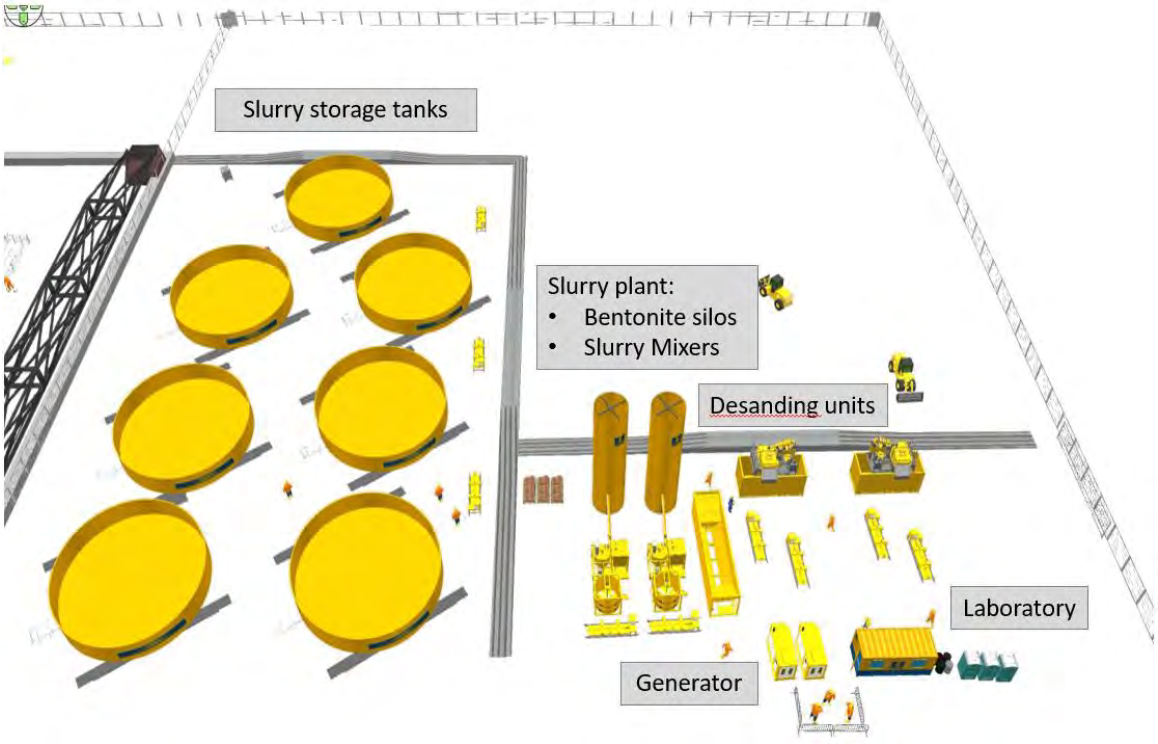


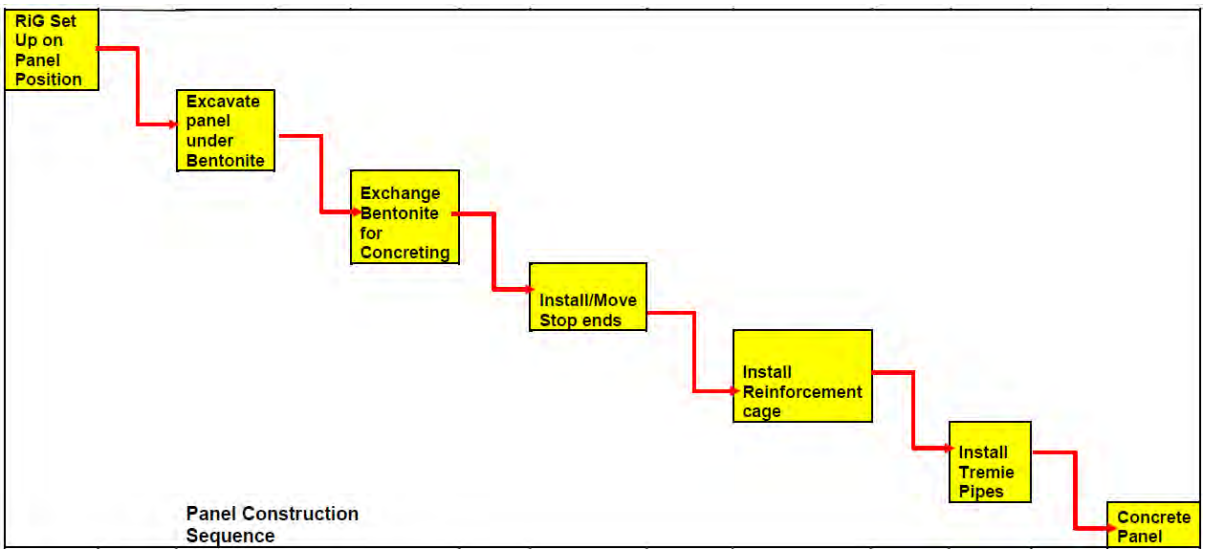
Figure 9: Bentonite plant setup

Operation of Grabs

BAUER crawler crane types BAUER MC96 and MC86 with rope grabs K-1010 HD, K-1210 HD and hydraulic grabs DHG/B and DHG/C will be mobilised as the diaphragm wall excavation units. The cranes and grab units will be transported to site in sections, following the heavy plant route, and assembled in the working area on the working platform after the platform has been tested and is adequate for the required bearing capacity. A platform certificate will be in place for the platform section stretching from the place of rigging and the location of the panels.

The MC units and grabs will be assembled in line with the manufacturer's instructions and lift plans. Typically as included in appendix C.

Installation of Diaphragm Wall



General

This method statement describes the procedure for the construction of approximately 3,000 linear meters of reinforced concrete Diaphragm Wall to depths of 27.0m & 42.0m (rear and front walls respectively). The diaphragm walls are to be installed to provide a quay wall of 1500m length split into phase 1 and phase 2. The diaphragm wall, at its closest, is within 10m of the existing sheet pile wall. The general arrangement is shown on the sketch section below (not to scale).

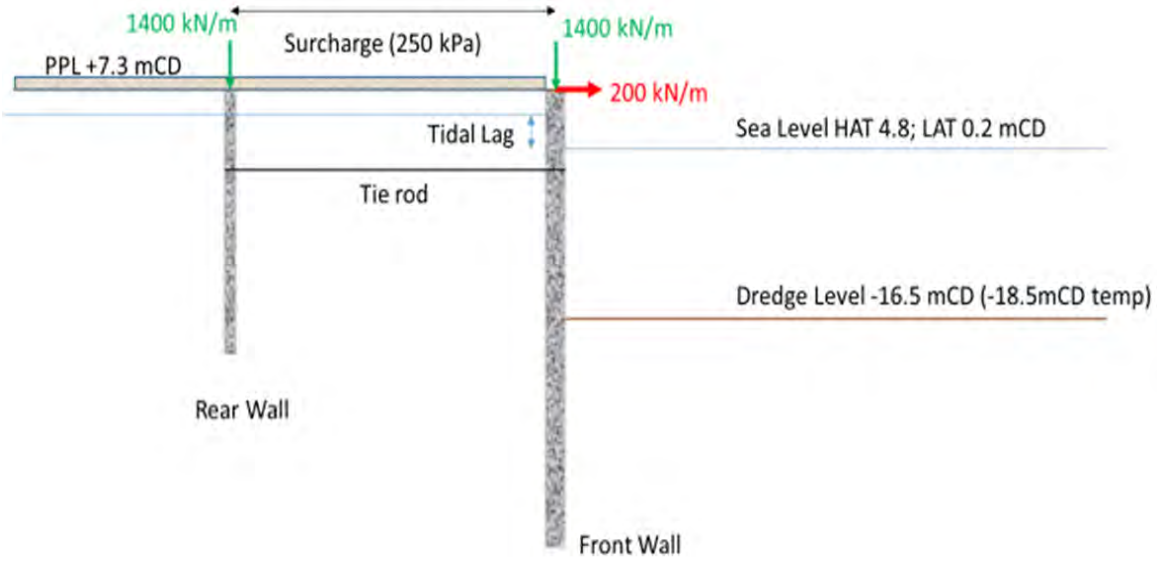


Figure 10: General Arrangement section through Diaphragm Walls

A Piling Platform Certificate is to be in place, confirming that the platform has been constructed & tested in accordance with Federation of Piling Specialist's Working Platform Initiative. BTL is responsible for the design of the working platform, in accordance with BRE470.The certificate is to be issued prior to diaphragm wall installation commencing and will cover not only the working platform but also any access/ haul routes and areas for the reinforcement fabrication and concrete batch plant.

A new platform certificate will be required if the platform is significantly altered or disturbed. All personnel involved in the activities will be briefed on the relevant Method Statements, Risk Assessments and the scope of works scheduled.

Diaphragm wall tolerances and corresponding inspections are stipulated in the Inspection Test Plan (ITP).

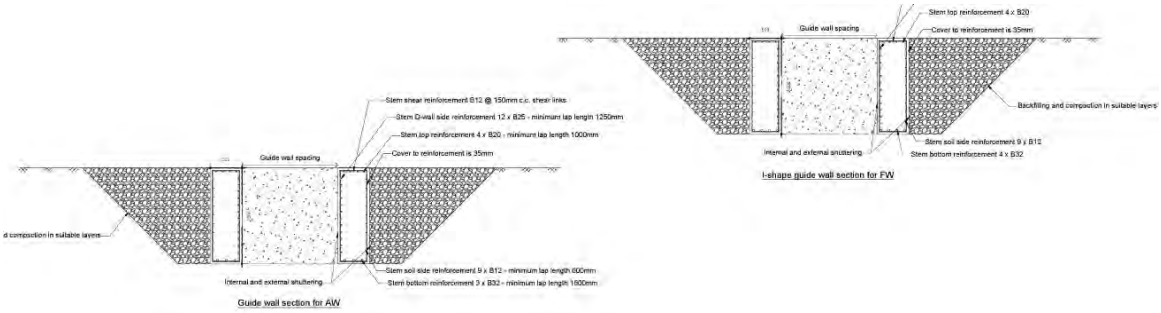
Quay wall (Diaphragm Wall) Construction Tolerances		
Plan Position from top of Guide wall	Verticality	Protrusions at Exposed Face
+/-25mm	1:150	<100mm

Guide Wall

Prior to the construction of the D-wall the reinforced guide wall will be constructed along the excavation line of the D-wall. The guide wall will act to ensure the accurate positioning and guidance of the grab during excavation. It will also provide a designed platform capable of supporting the weights of stop-ends and reinforcement cages during installation.

The guide wall will also provide the panel stability sufficient to counteract forces caused by the close proximity of heavy equipment to the open panel, high ground water table, unstable topsoil and fluctuating slurry levels. The gap/panel between the guide wall elements has to be backfilled with material of the same properties as the proposed platform material to avoid overconsumption of slurry and concrete into adjacent panels during

excavation/concreting. The guide wall will be designed and installed by L&A , a competent subcontractor.



Sequencing of works

The individual panels will be constructed using a continuous panel sequence. Adjacent panels are excavated as soon as the previously constructed panel reaches the required strength. Several “Starter Panels” will be produced to have multiple locations for the excavation works. Followed by “Follower Panels” which will be constructed continuously adjacent to each other. “Follower Panels” coming from different directions will end in a “Closer Panel”. The excavation process with Starter, Follower and Closer panel using Stop ends are done according to the panel layout

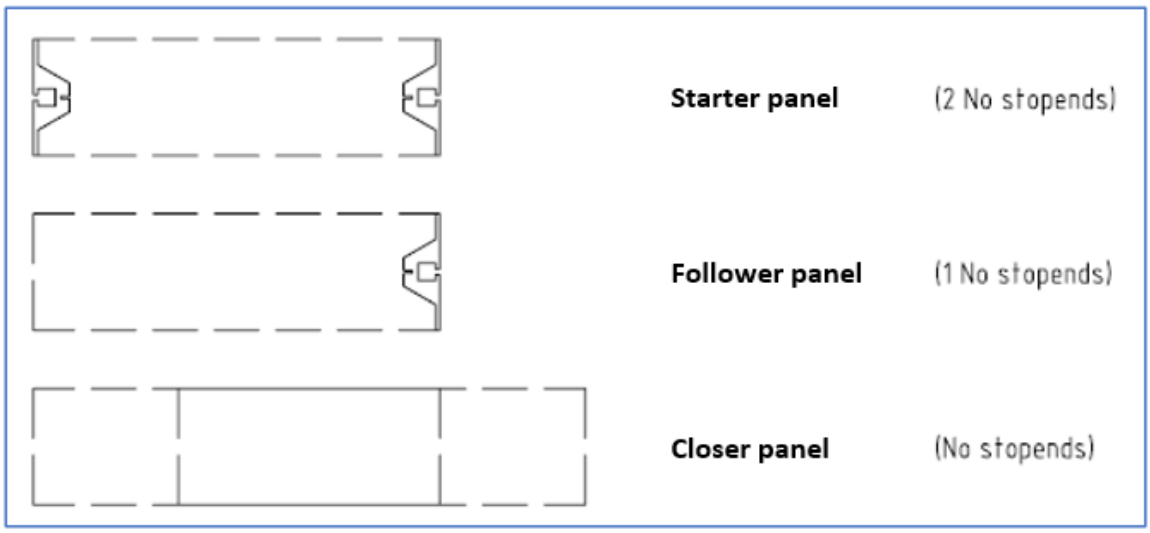


Figure 11: Panel types

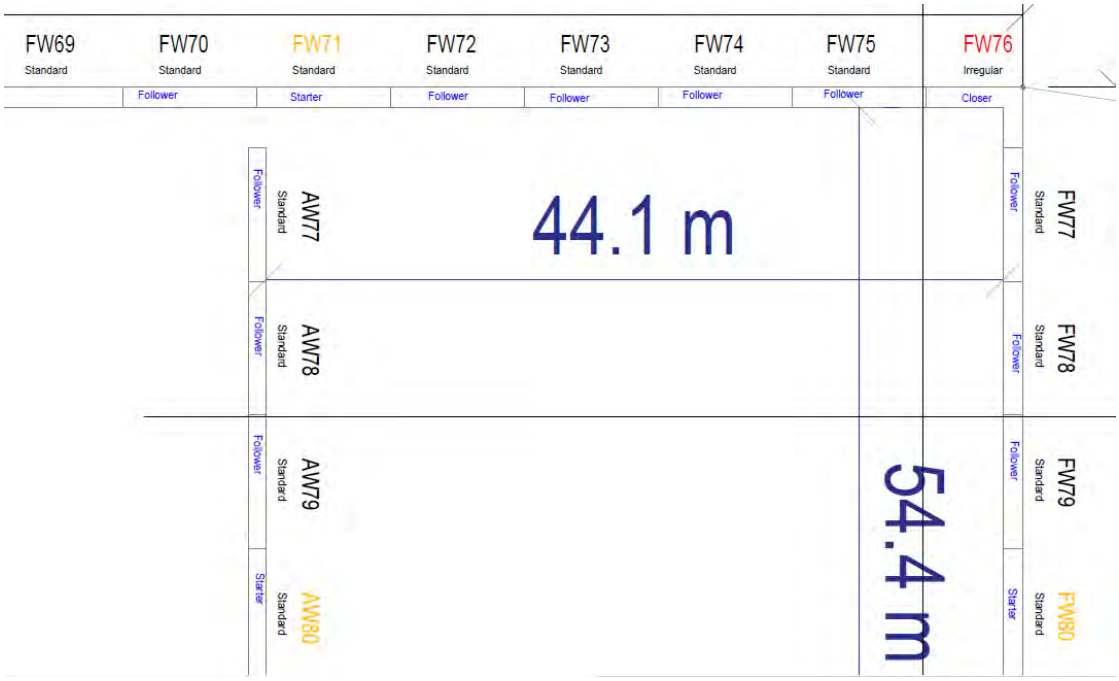


Figure 12: General Panel Sequence Dog leg

Below table provides an overview of all typical cage and panel sizes.

Panel type	Panel dimension	Cage dimension	Concrete cover
Anchor Wall Starter Panel	8000x1000x27000 mm	6900x800x27000 mm	100 mm
Anchor Wall Follower Panel	8000x1000x27000 mm	7250x800x27000 mm	100 mm
Anchor Wall Closure Panel	8000x1000x27000 mm	7600x800x27000 mm	100 mm
Front Wall Starter Panel	8000x1500x42000 mm	6900x1270x42000 mm	115 mm
Front Wall Follower Panel(Western Flank)	8000x1500x42000 mm	7250x1270x42000 mm	115 mm
Front Wall Closure Panel(Western Flank)	8000x1500x42000 mm	7600x1270x42000 mm	115 mm

The planned panel layout, assigning panel number and colour coding to starter, follower or closer panel, can be found in Appendix B.

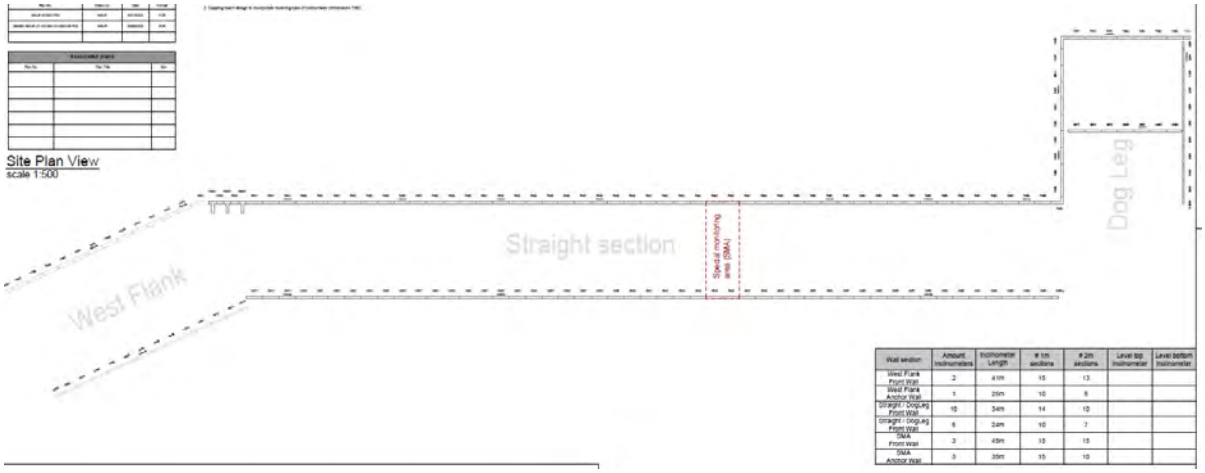


Figure 13: Panel layout Phase 1

The Diaphragm Wall works has been programmed based on continuous working 24hrs per days 7 days per week (excluding public holidays and Bauer site closures i.e., Christmas shutdown).

Panels will not be left open when there is a planned holiday/site closure.

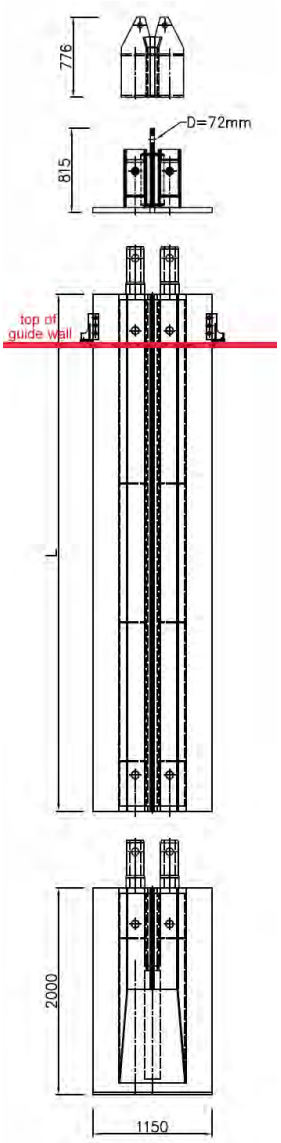
Wall elements shall not be constructed so close to other wall elements which have been recently formed so that no damage or impairment is caused to the recently constructed wall elements.

Assembly of the stop-end

Initial assembly within the excavated panel of the starter panel:

- Where required, each section of the stop-end will be greased / coated on the concreted side to allow easy removal of the stop-end after excavating the adjacent panel.
- Attach the top lifting cap to a bottom section in horizontal orientation and fix the connection bolts with safety pins.
- Lift the assembled sections from horizontal to vertical by attaching the crane to the designated lifting point located on the top section. All lifting operations must be under the control of the slinger in accordance with the lift plans in place.
- Once the stop-end section has been lowered down sufficiently within the panel so the top of the bottom section can be accessed from ground level, the clamps can be attached to the top of the bottom section by inserting the screws and tightening them by use of a torque key. The section can now be lowered further and trapped off on the guide wall using the clamps.
- Once the bottom section is safely trapped off, the safety pins can be removed from the bolts connecting the two sections and the bolts removed. The top lifting cap will remain attached to the crane as it is to be used to construct the remainder to the stop-end.
- The first three steps will be repeated for each of the middle sections.
- Using tag lines, align the section attached to the crane with the section trapped off on the guide wall. Once aligned, the section can be lowered to the trapped of section and connected using bolts with safety pins. Where necessary, a welded seal shall be made around the joint connecting the two stop-end sections and preventing ingress of concrete into the pin connections.
- When securely connected, lift the complete stop-end slightly and remove the clamps used to trap the stop-end off. The stop-end can now be lower down the panel and trapped of as described for the bottom section above.
- Once the last middle sections has been connected, the clamps are attached approximately 500mm from the top to trap the completed stop-end in its final position and the lifting section can be removed and used to install the remaining stop-ends.

Figure 14: Stop-end



The dismantling process of the steel stop-end will be in accordance with the sequence shown above but in reverse.

Positioning of the rig

The ends of individual panel locations will be set out accurately by a surveyor using suitable surveying techniques. The surveyed location will be permanently marked by cutting a small groove with an angel grinder into the concrete of the guide wall.

All setting out and survey works shall be done in a timely manner, not obstructing the work sequence and progress. Survey records and protocols are prepared by the surveyor.

Steel pins beside the guide wall will be hit into the ground to provide positioning guidance for the grab operator when setting out the grab over the panel. The rig will be finally positioned under the direction of the rig banksman.

Excavation of Panel

- The grab will be lowered into the guide wall with the jaws open, to take the first bite. The jaws will be closed and a “bite” of soil is taken.
- Suitable and sufficient barriers will be erected around the work area to prevent any unauthorised persons from entering the area. A banksman will ensure that this area is kept clear. Wherever possible items such as bentonite valves will be positioned outside of this area to avoid persons entering the area unnecessarily.
- A small bund around the edge of the guide wall will be constructed to contain any bentonite spills as panel excavation progresses.
- As the panel excavation progresses bentonite slurry will be pumped into the excavation. The bentonite level will be constantly monitored to maintain the average level at just below (< 500mm) the top of the guide wall. Should the bentonite level drop, then excavation will cease until the level has been increased by adding additional bentonite slurry.
- Each “bite” taken by the rig will be raised to a point just above the top of the guide wall and allowed to drain off residual bentonite.
- Muck away attendance will be set up so that the rig does not need to jib in or out to discharge excavated material. The grab is fitted with a mechanical turning device (rotator) which controls the orientation of the grab and is set at the start of the excavation. The grab will then be lifted by the rig and slewed over a waiting articulated dump truck where it will be emptied.
- The rig will slew the grab back over the panel using the rotator to position itself accurately over the panel before taking the next bite.
- Upon reaching the panel toe level, exclusion zones will be in place.
- A final level check will be carried out using measuring equipment. The stop-end can now be removed.

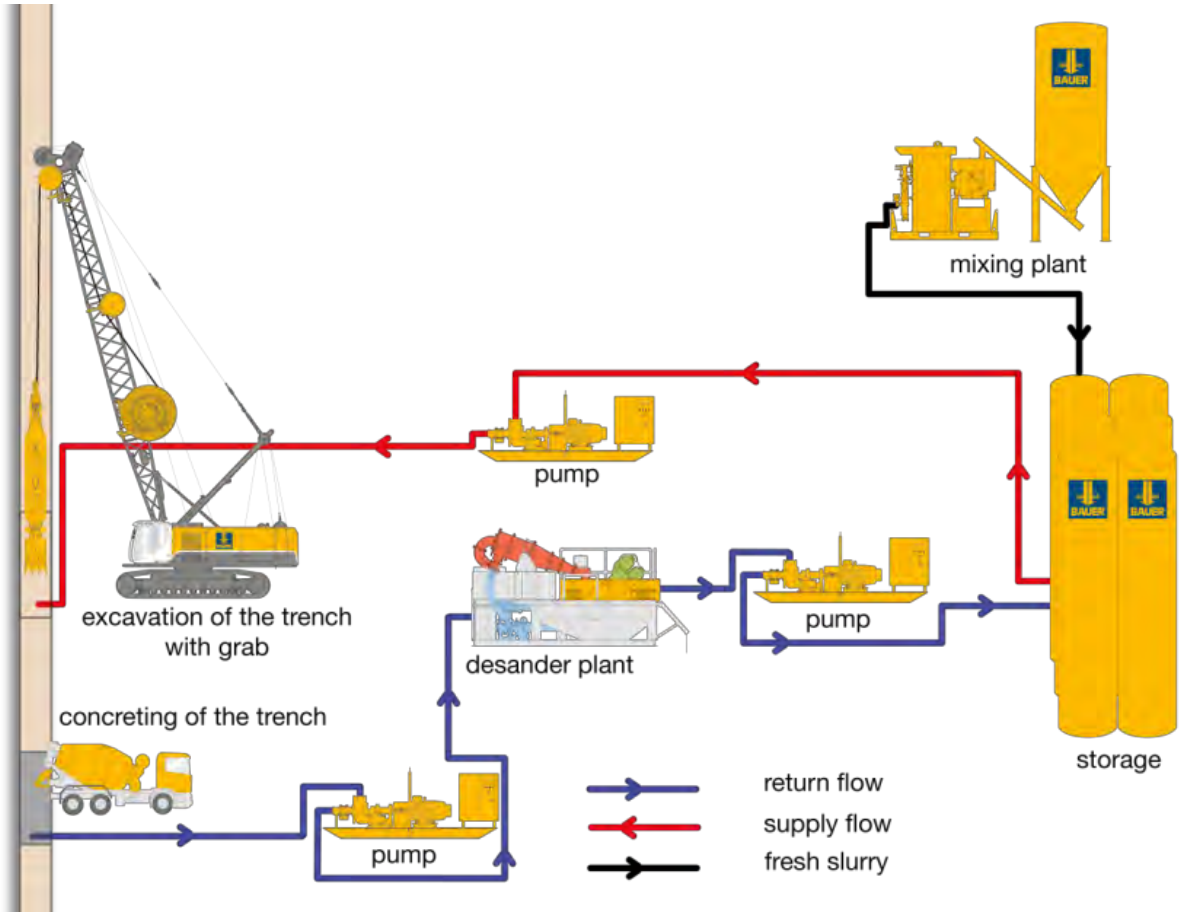


Figure 15: Support fluid cycle for grab excavation

Removing the steel stop-end

After excavating a follower or end panel and before placing concrete, the stop-end needs to be removed from the concrete of the previously cast panel. Due to impact on the stop-end caused by the grab during excavation, it is likely that the steel stop-end is already hanging loose after completion of the excavation process. Regardless of this, the steel stop-end requires to be cleaned before re-use.

- Attach the top guide and lifting section to the steel stop-end which needs to be removed. The crane stays attached with its rigging equipment. This is only to prevent the stop-end sliding back down the panel. The crane does not extract the stop-end until the grab is removed from the panel. The crane must be under the direction of the slinger/signaller at all times.
- Attach the removal tool to the grab. The additional tool is used to hook the grab into the steel stop-end. This tool is sometimes also used while digging to assist the grab to keep its verticality.
- The removal tool is then hooked into the grab notch of the top guide section. The grab notch runs along the middle of the base plate of the steel stop-end from top to bottom.
- The grab is now moved, with the jaws open, up and down in the guiding notch to remove any concrete sticking to the steel stop-end.
- After cleaning the stop-end, the frame of the grab will be tilted away from the steel stop-end to peel away the stop-end from the concrete. The peeling process is started at the top of the stop-end and will be executed in small increments until the grab reaches the bottom of the stop-end. This way the stop-end is peeled off in smaller sections and will avoid damaging the stop-end. This process is carried out in a smooth way. If the stop-end does not come loose, the grab will hit the bottom of the notch to release the stop-end before peeling it off.
- After loosening the stop-end from the panel the grab will be lifted out of the notch.
- The crane will remove the stop end out of the panel, while being jet washed.
- The grab will go down the panel and clean the bottom of the panel.

Bentonite Exchange

After excavation of the panel, clean bentonite properties shall be ensured within the panel. Hence, the working bentonite is exchanged with concrete bentonite, containing a maximum sand content of 2%.

Following steps describe the exchanging procedure:

- Ensure the submersible pump has been placed next to the panel prior to assembling the tremmie string.
- The tremmie string is built by a slinger, assisted by one of the service cranes, following the lift plan in place. All joints (male and female) are cleaned, sealing rubbers are installed on the male joints and grease is applied before making the connection using tremmie wires. The lead tremmie section is a normal section with a joint on either end to connect the pump.
- When the desired number of tremmie sections have been assembled, the string is lifted to the submersible pump where it is connected to the tremmie string by use of a tremmie wire.
- Connect the submersible pump to the bottom of the string and lower the pump into the panel. As the string is lowered down the panel, the submersible pump's power supply cable is attached by duct tape to the tremmie pipe approximately 6m apart. This avoids unnecessary strain on the connection points on either end of the cable and also reduces the manual handling required for installation and removal of the pump.
- Trap off the tremmie string using the purpose built tremmie trap, releasing the tremmie lifting equipment and allowing the rest of the string to be built, if required.
- If the tremmie string is incomplete and requires extending, the extension will be assembled in the same manner as detailed above, lifted to the string already trapped in the panel and connected over the panel by using a tremmie wire.
- Having the submersible pump in place at about 500mm above the bottom of the panel, the bentonite return line is connected to the tremmie outlet. On the other end, the return line is connected to the desanding units, where the working bentonite slurry is cleaned before being transferred back into the storage tank. In case additional cleaning is required, a separate loop can be created between a desanding unit and the storage tank.
- Simultaneously, a bentonite feed line is installed, supplying concreting bentonite into the top of the panel directly from the corresponding storage tank.
- Pumps at supply and return line are activated with similar flows, while monitoring the bentonite level in the panel. The level of bentonite shall be maintained maximum 500mm from ground level.
- While exchanging, the position of the submersible pump shall be changed in the panel at least twice, so the bottom of the panel is cleaned from smaller particle sizes at the sides and in the middle of the panel.
- The exchange operation will continue until all the contaminated bentonite is removed and replaced.
- Ensure that the submersible pump is switched off and the bentonite return pipe is disconnected from the tremmie pipe prior to the tremmie and pump being removed from the panel.
- The submersible pump and tremmie pipe sections must be thoroughly cleaned and prepared for the next use.

Stop-end Installation

The water bar is required to be installed from bottom to top of the stop end. The installation of the water bar sequence is below:

- Attach the top lift section to the stop-end trapped off in the panel.
- Lift the stop-end to expose a working surface.
- The water bar is stored beside the steel stop-end and will be fed into the water bar notch as the stop-end is progressively lowered into the panel.
- The water bar is aligned with the notch and driven into the notch.
- Once the water bar is installed as achievable from ground level, repeat previous 2 steps until the water bar is installed in the stop-end. Ref. section 8

Placing the steel stop-end with the water bar installed:

- Ensure a mark is created at the surveyed side of the panel on the guide wall
- The stop-end is lowered into the excavated panel at the side of the panel where the next panel, to be constructed, is adjoining. The base plate of the stop-end is facing the outside of the excavated panel. The insertion of the stop-end shall not be resisted.
- The stop-end is trapped off on the guide wall by means of the clamps one either side of the stop-end. The clamps are secured to the guide wall to avoid any unwanted movement in the stop-end by means of a rebar.
- Remove the top lifting section and insert the reservation tube fitting within the stop-end notch for the grab
- .

Placing Reinforcement

The reinforcement cages are produced by F Brazil in the steel fabrication yard on site from loose bars that are cut and bent offsite. The reinforcement fabrication facility is to be located adjacent to the working area and will comprise:

- Gantry cranes
- Reinforcement fixing beds
- Storage areas
- Welding tents

After the acceptance test, the reinforcement cage will be loaded on a multiaxial specialist trailer, SPMT or similar, and transported to the designated panel. The cages will be pre-fitted with de-bonding foam, spacers and void formers as indicated on the approved reinforcement fabrication drawings. Inclinometer access tubes will also be fitted by the cage fabricator during cage fabrication.

Each cage is made up of sections, which will be spliced using the proprietary Superlatch system from Reinforcement Consultants ltd. The sections will be lifted into the panels, as per the task specific lift plans, and 'trapped' off on the guide wall. For lowering the cage into the panel, to the required final position, the hanging chains are attached to the hanging hoops and cage lowered into the panel to be trapped off at the required final level. The anchor wall cages are made up of two sections, the front wall cages consists of three sections.

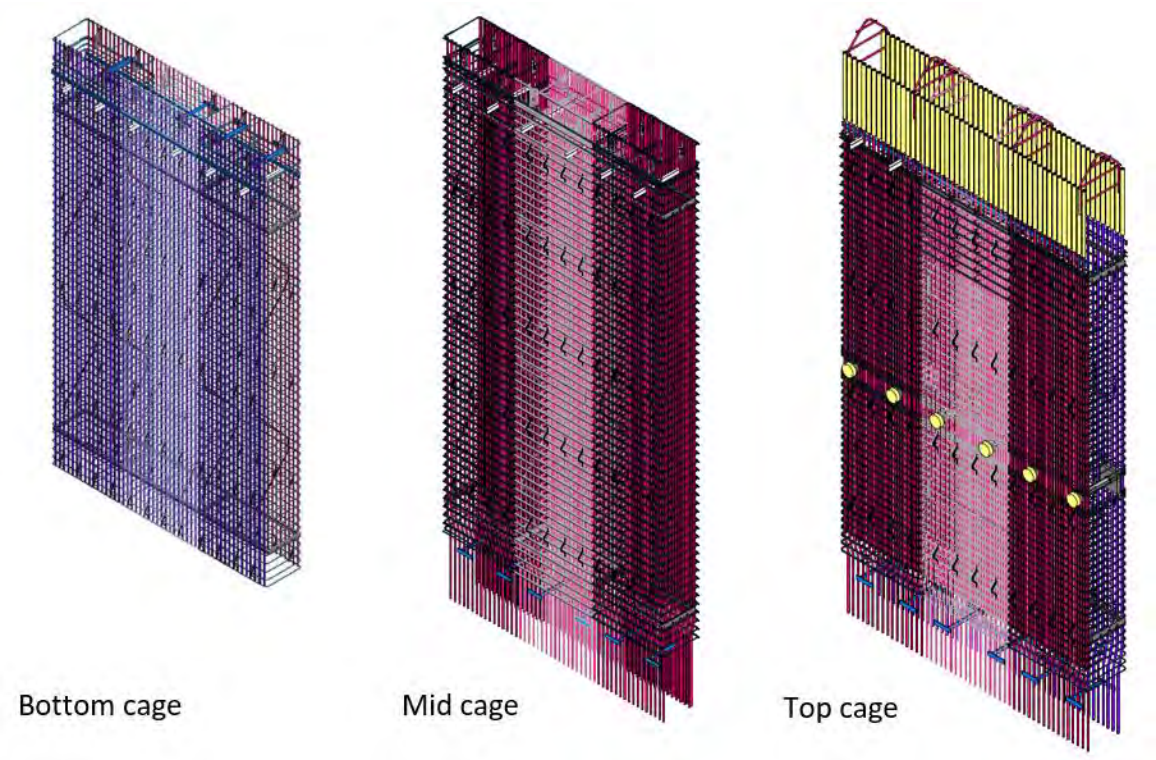


Figure 16: Cage sections for a starter panel on the front wall

The final position of the cage inside the panel will be thoroughly checked prior to concreting.

Placing Concrete

Concrete is to be provided by a batch plant established on site and operated by Breedon Mobile Concrete Solutions. The plant will be capable of producing concrete at the required volume demands to support two rigs working concurrently. The plant will be supplemented by a back-up plant and also by Breedon's Inverness plant such that a pour will be completed once commenced, if the site batch plant suffers a breakdown.

The tremie pipe method ensures that the concrete is placed uniformly from the bottom of the panel to the top and displaces the bentonite support fluid from the panel as the concrete volume is increased. The displaced concrete bentonite is pumped back to the de-sanding unit from the top of the panel and into the storage tank.

Our multiple bite panels will be concreted using 3 tremies. The concrete will be placed into the hopper from the back of a concrete lorry. Prior to the commencement of concrete pouring, the installed tremie pipe(s) shall be fitted with a temporary plug (concreting ball or vermiculite) in order to avoid contamination of the concrete by the slurry contained in the tremie pipe during the initial charging of the tremie pipe. The initial concrete charge within the full length of the tremie pipe will force the temporary plug ahead of the concrete and prevent any back contamination of the concrete by the bentonite. After concreting commencement, the base of the tremie pipe(s) shall maintain a minimum 3m embedment and a maximum of 8m. This will be worked based upon known lengths of the tremie pipes.

Figure 17: Tremie pipe & hopper assembly in trap over panel

To ensure an approximate horizontal level of the poured concrete in the larger panels at all times, the three tremie pipe sets in each panel shall be charged simultaneously. After each concrete truck has discharged its load into the tremie pipe a weighted tape will be dropped down in the panel to check and record the concrete level. One shall aim to keep the maximum difference between the highest and lowest measurement of the concrete level below 0.25m.

Concrete shall be placed with minimal interruption, allowing no foreign matter to contaminate the concrete. Concrete shall be self-compacting and vibrators shall not be used.

Excavation of the follower panels will be carried out after the poured concrete in the previous panel has gained sufficient strength to be freestanding. The required curing period shall be determined on site for the particular properties of the concrete produced under mass production on site.

The cut-off level of the wall is below the guide wall level to allow solid concrete up to the cut-off level. The empty panel between top of guide wall down to the final concrete level will be backfilled. This backfill will to be done with inert material the day after the concreting.

Following concreting, the reservation tube shall be lifted to a limited extend to ensure it is free. When the concrete is set, the reservation tube is removed from the stop-end.

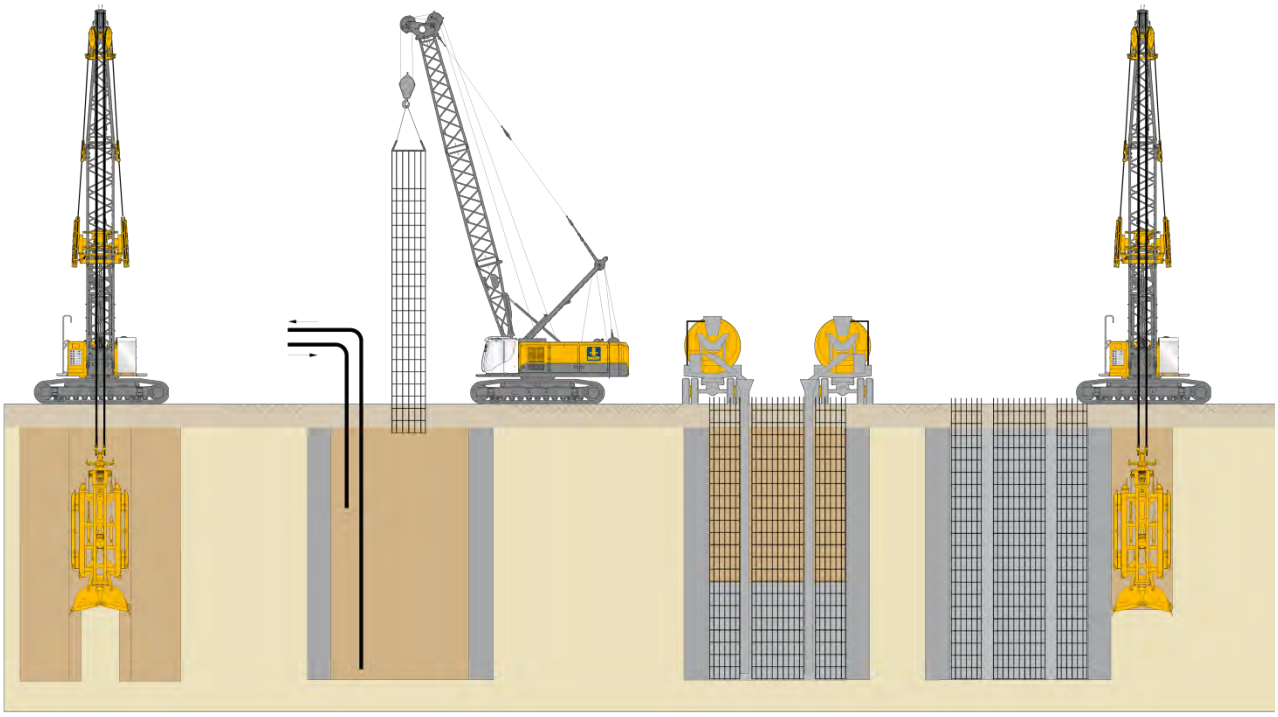


Figure 18: Construction sequence of diaphragm wall with cast in situ concrete and reinforcement

Excavation of panel	Exchange of support fluid. Installation of temporary stop-ends and reinforcement	Installation of concrete via tremie	Excavation of adjacent panel

Figure 19: Construction sequence of a 2 phase diaphragm wall

Trial Panel

The trial panel AW65 will be installed as a 1200 panel to represent the front wall panels specifications. The trial panel will be installed prior to the installation of the front wall panels. Following installation of the trial panel. It will be exumed to expose the surface and the joints with the panels on either side. The panel will be exposed to a depth of 9.3m from top of the guide wall by utilising a Cofferdam formed of sheet pile wall on three sides with the ground being supported on the fourth side by the anchor wall diaphragm wall and with an overall plan area of approximately . 11.7 x 11.2 m. The procedure and sequence of exposing the trial panel is covered by a separate Method statement

10. CONTROL OF SUBSTANCES HAZARD TO HEALTH

All substances will be subject to a CoSHH assessment before transported or used on site. CoSHH assessments will be made available to any person using the substance.

All substances hazardous to health will be stored in accordance with the safety data sheet applicable for that material.

Identified spillages of any substance will be contained and cleared in accordance with the CoSHH assessment. Spill kits will be readily available at key points around site and on all plant. All CoSHH will be disposed of in accordance with the safety data sheet.

11. GENERAL WORK CONTROLS

Restricted areas
Any restricted areas will be clearly defined by exclusion zones and signage identifying the hazard. Resticted areas will be communicated on site via the daily activity briefings.

Exclusion zones
An exclusion zone will be maintained around plant and excavations during Diaphragm Wall operations. Open panels will have independent edge protection installed.

Communication
Various forms of communication will be used throughout the project. These will include but not limited to;

- Site induction
- Daily activity briefings (DABS)

- Weekly toolbox talks
- Site observation reporting possess (SOR's)

Permits

Permits required for this work to take place will be the following;

- Permit to Break Ground
- Hot Works

12. ENVIRONMENTAL CONTROLS AND MONITORING

BTL works will be in accordance with the Construction Environmental Management Plan (CEMP)

Control and Use of Bentonite

Bentonite is used as a support fluid throughout the excavation process. The bentonite shall be stored, mixed and processed within a bentonite plant which will be within a suitably bunded area made of concrete.

The bentonite will be transported to the panels via a 4/5 inch hose delivery system. The hoses will be routed in a manner to avoid water courses. Where required additional bunding will be formed utilising sandbags.

All bentonite spills will be, contained and cleared. Spills above $1m^3$ shall be reported to the BTL HSEQ team.

Spills to be controlled and managed in accordance with the Emergency Preparedness Plan

Daily inspections of the bentonite lines and plant shall be conducted. Replacement hoses and parts will be available on site should there be signs of wear.

Bentonite loss within the panel may occur. This will be due to natural openings within the ground. All losses of bentonite within panels will be recorded and monitored.

Water resources

Water usage will be minimised by ensuring that taps are turned off when not in use, bowsers will not be left unattended while they are being filled unless there is an automatic shut off valve to prevent overflow.

Air Quality

All plant used in the works will be well maintained to reduce air pollution and will not be left to idle when not in use.

Contaminated Land

There has been no contaminated land identified in the ground investigation report. Personnel will be briefed on how to identify potentially contaminated spoil (smell, greasy/oily appearance, darker colour than natural). Any potentially contaminated spoil, Haventus will be informed, and they will advise disposal in accordance with relevant regulations. Any unidentified contaminants will be tested and the appropriate precautions put in place by Haventus/Ardersier Port.

Archaeology & Heritage

No areas of the site have been identified as being of significant interest.

Activities generating significant noise
All plant used for the works will be well maintained to reduce unnecessary noise and will not be left to idle when not in use.
Acoustic covers will be closed when plant is in use.

Housekeeping and waste management
Good housekeeping will be maintained by BTL staff at all times. This will be monitored by site supervision. Designated walkways will be kept clear at all times. Where there is a requirement to close a walkway, a diversion will be put in place.

All waste generated throughout the project will be placed in the correct, labelled skip. Skips will comprise of;

- General waste
- Metal
- Wood
- CoSHH

13. EMERGENCY PROCEDURES

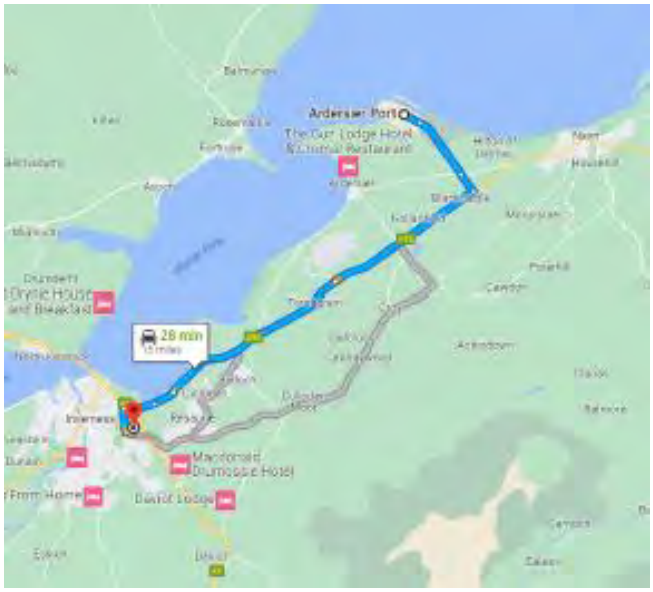
Emergency procedures

Contact should be made directly with 999 Emergency Services by the 1st Responder should they be required
Stop works and assess if the area is to be evacuated
The Supervisor to make contact with Bauer Site Management to attend site and escalate the response to the Project Manager

Emergency Preparedness Plan (EPP) which shall be developed and maintained by Bauer Technologies Site Management.

Organisation	Number	Contact / Detail
Emergency Services (Police / Fire / Ambulance)	999	
Bauer – Construction Manager	[Redacted]	Brian Watson
Project HSE Lead		George McLaughlin

Nearest Accident and Emergency Hospital
Raigmore Hospital
Old Perth Road
Inverness
IV2 3UJ



First Aid
A minimum ratio of one first aider to twenty workers is required. First aid personnel shall be in place on the commencement of the works. Contractors shall ensure that sufficient fully trained first aid personnel are available on site at all times.
First aiders shall be identified by a badge on their helmet.

Location	Type
Bauer Welfare/Offices	First aid facilities - 1st aid including eye wash
Welfare unit Stations (Steel Fabrication yard, Bentonite plant, Batching lant Storage area, Piling Platform)	Welfare unit will include a first aid kit, burns kit and eye wash available; all operatives are at least 1day first aid trained, works supervisor 3-day first aid.
AED	An AED will be located in the Bauer Offices

Fire and Emergency

Hot works will be required for the following tasks:

- Maintenance and repair of piling tooling, including welding, grinding, cutting, burning and abrasive wheel use
- Cutting of temporary reinforcement cage stiffening bars during installation.

A hot works permit must be issued by Bauer prior to undertaking any hot works activities with the exact works location and plant/equipment to be used and stated on the permit. A fire marshal must be on site throughout the duration of the hot works.
Ensure additional controls stated on the permit are in place and being monitored including appropriate size, type, quantity of fire extinguishers at the immediate point of works. These must be in addition to the existing site fire extinguisher provisions. Hot works to stop at the time stated on the permit to allow for fire watch duration stated on the Bauer Hot Works permit to allow materials to cool down before leaving site. All subcontractors will have fire extinguisher in their stores and equipment. Site fire extinguishers, fire safety plan, assembly point to be provided by Bauer.

14. ACCESS AND EGRESS

All vehicles are to access the site through the main access. Traffic routes to the site will be managed by Bauer Logistics Team and will be booked in using the M Sites once set up.
All persons who are not a visitor or delivery driver must undertake a full Bauer Technologies Site HSE induction. A full induction must be taken when first arriving at site or after an absence of 3 months or more. Following the site induction, the person will be given the electronic site access cards.
Visitors will be booked via the Bauer reception, 24hrs in advance.

The site will be operating 24hrs seven days a week and deliveries will only be during the day and will be as per the Traffic management Plan.

.
Site working hours will be:

Main Production Works (24/7 working)
0630 – 1900 (day shift)
1830 – 0700 (night shift)

Daily Activity Briefings conducted at start of shift. All to attend
0630 (day shift)
1830 (night shift)

15. LOGISTICS & INSPECTION (DELIVERIES/EQUIPMENTS)

The main deliveries that we anticipate for the mobilisation works are as follows:

All deliveries will be managed in line with the Traffic Management Plan and associated task briefing. Deliveries will be booked in advance and will access and egress the site using the authorised access routes.

Wherever possible, loads will be pre-slung to eliminate the need to access truck load beds and work at height. Where access to truck trailers is necessary, edge protection must be fitted.

Appendix A – GENERAL DIAPHRAGM WALL RISK ASSESSMENT

Risk Assessment Title:	General Diaphragm Wall RA	**Revision No.:**	00
Specific Location of Works:	Inverness	**Date of Risk Assessment**	27/03/24
Scope & Description of the Works:	Diaphragm Wall Installation, Piling Activities		
Risk Assessment Completed by:	Name:	Signed:	Date:

Likelihood Rating Key:		**Severity Rating Key:**	
5	Frequent [1 or more per week]	5	Multiple or Single Fatality or Collapse of Structure
4	Probable [1 per month]	4	Major Injury or Major Damage to Property
3	Occasional [1 per year]	3	Reportable Lost Time Injury or Significant Damage to Property
2	Remote [1 in 10 years]	2	Other Lost Time Injury or Damage to Property
1	Improbable [1 in 100 years]	1	Minor Injury

		Severity Rating				
		5	**4**	**3**	**2**	**1**
Likelihood Rating	5	**25**	**20**	**15**	**10**	**5**
	4	**20**	**16**	**12**	**8**	**4**
	3	**15**	**12**	**9**	**6**	**3**
	2	**10**	**8**	**6**	**4**	**2**
	1	**5**	**4**	**3**	**2**	**1**

Residual Risk Rating Matrix Key:

12 – 25:	Unacceptable level of risk. Risk level MUST be reduced. Operations WILL NOT proceed until the level of risk is reduced to an acceptable level. Requirement for the works need to be reviewed and alternative methodologies investigated where risk cannot be reduced to an acceptable level.
5 – 11:	Risks acceptable where principles of prevention have been applied and control measures implemented to reduce risk so far as is reasonably practicable. Activity, operation or works creating the hazard and risk must be managed and supervised to ensure continued effectiveness and compliance with the control measures.
1 – 4:	Acceptable level of risk. Risk associated with the hazard is considered to be of an acceptable level. Continual reviews to confirm hazards and risks remain adequately controlled.

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 × 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 × 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Mobilisation									
Operator inexperience	4	5	20	All operators and banksman are CPCS trained, rig specific trained and regularly assessed in house. Site specific inductions, TBTs and daily briefings are carried out.	1	5	5	Contract Supervisor	Daily
Platform failure from inadequate design and construction leading to rig instability and potential for overturning	5	5	25	All Weather working platform designed, constructed, tested and maintained to suit specific rig / plant loadings Platform certificate in place – detailing plant and exact perimeter of platform edge. Plant movement / piling position in relation to any embankments should be clearly identified on site & briefed to all mobile plant operators.) Daily Platform inspections to be undertaken to check integrity of platforms during piling operations. All ramps to be of suitable gradient; generally: 1:10 Rigged, 1:5 derigged. Ramps to be 1.5m to 2m greater in width on either side of the machine minimum.	1	5	5	Engineer	Daily
Services	2	4	8	Services to be made known on a drawings. These should be located with marked signage on site Permit to dig to be issued (and briefed to all operatives).	1	4	4	Principal Contractor / Contract Supervisor	On contract start
Risk of electrocution from electrical connections	3	5	15	All electrical work to be carried out by qualified and competent electricians. Works to be carried out in accordance to manufactures specifications. Electrical Permit to be obtained, if applicable.	1	5	5	Contract Supervisor	On Delivery or modification of electric connections
Access and moving on site avoiding slips , trips and falls	3	2	6	Employees to use only designated pedestrian routes to access the work area. Routes to be kept clear form obstructions at all times Work area to be kept tidy	1	2		All operatives	Daily
Unloading Assembling Rig									

Toppling over of rig when unloading / loading causing personal injury or damage	5	5	25	Plan and brief procedure. Implement a traffic management plan. Stable ramp for rig to use to/ from trailer. Implement an exclusion zone. Rig attendant to maintain track alignment with all edges. Use standard / approved signals.	1	5	5	Rig Operator	Loading / unloading
Equipment collapse due to failure of mechanical parts due to wear and tear or incorrect fitting	5	5	25	Planned preventative maintenance programme in place for all rigs, carried out by competent personnel and external LOLER inspectors. Effective reporting procedure and prompt response to defect reports. Competent personnel to carryout installation, commissioning and decommissioning in line with manufacturer's instructions. Predetermined functional checks after every new installation at location. (Rigging sheet). Daily and weekly operator maintenance checks specific to the rig type.	1	5	5	Plant Dept Rig Operator	Daily
Falls from working at height whilst fitting out rig	5	5	25	MEWPs provided for work on the rig when laid down. Competent fitter using a harness and lanyard whilst erecting handrails atop of rig base unit. MEWP's are standard issue for every project to be operated by competent operative in accordance with the specific control measures required for the task.	1	5	5	Contract Supervisor	Daily
Falling drilling tools due to incorrect fitting	5	4	20	Drilling tool connected by competent person during rigging up.	1	4	4	Contract Supervisor	Daily
Attendant plant / excavators	3	4	12	Site supervisor to check competence of plant operators – CPCS and observations. Regular monitoring to check competence taking into account feedback from experienced site operatives. Supervisor to review and sign plant operator's weekly maintenance reports. Attendant plant to be under direct control of the Cementation banksman. Keep clear from working area of machine. Excavator operators to inspect quick hitch mechanism daily and on every change of bucket/attachment to ensure mechanism is fully compliant, locked and secured. No semi auto quick hitch will be permitted on site. Operatives not to work under quick hitch bucket under any circumstances.	1	4	4	Contract Supervisor	Daily

HAZARD	1 Factors of Harm Likelihood	2 Factors of Harm Severity	3 Risk Multiple of columns 1 ´ 2	4 CONTROL MEASURES	5 Factors of Harm Likelihood	6 Factors of Harm Severity	7 Residual risk Multiple of columns 5 ´ 6	8 Control measures implemented by (name)	9 Control Frequency Check Rate
Installation of Reinforcement Cage									
Crush injuries due to poorly stored cages	3	4	12	• Chocks and sleepers will be placed underneath cages to securely fix them • A maximum of a two layer stack system • Cages storage area to be completely barriered off from all sides. • Access from all sides within the cage storage area	1	4	4	All operatives	Daily
Lifting a reinforcement cage – falling components, dropped or collapsed cages	4	5	20	• Comply with any specific lifting plans • Ensure cage has been designed to be lifted and lifting points are communicated to operatives. • Check for loose cage bars / spacers etc. before lifting the cage. Attach tag lines to control the load if moving long distances or high lifts. • Use of a red vest to identify the specific slinger/signaller involved in the lifting operations	1	4	4	All operatives	Daily
Strike by Bucket of excavator	3	5	15	• Never stand beneath the excavator bucket, when inserting cage. • Keep clear of slew zone. • Bucket fastened and checked in accordance with manufacturer's instructions. Clear line of vision between operator and personnel.	1	5	5	All operatives Excavator operator	Daily
Insertion of cages into wet concrete avoiding over exertion and slipping	4	4	16	• Identify and expose the full diameter of pile by removing any spoil contamination using a graft. • Clear spoil water & debris from immediate vicinity. • Insert into wet concrete using mechanical devices (single line/crane/excavator). • Excavator to remove the bucket at all times when lifting.	1	4	4	Banksman	Daily

				Operatives may push cage in with their feet only if cage insertion is easy, use mechanical means at all other times with purpose-designed placing bar.					
Protruding Steel /and fresh concrete - impaling on steel and falling in bores.	5	3	15	• Cover projecting reinforcement with Cemcaps. Unset piles to be covered or suitably protected.	2	3	6	Banksman	Daily

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 × 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 × 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Tremie Technique									
Trapped fingers from: connecting tremie tubes using tremie forks assembling concrete chutes	3	4	12	Use correct tools for wire extraction Keep hands free of all joint areas when connecting Experienced piling operatives to position the trapping beams and tremie fork	1	4	4	Concrete Ganger	Daily
Slips due to wash water present in cleaning area	3	3	9	Good housekeeping of wash area Drainage system in use for keeping wash area water to a minimum Tremie rack to have a tray built into the bottom to stop wash out mixing with the ground	1	3	3	Concrete Ganger	Daily
Unsecured / incorrect connection allowing tube to fall	3	5	15	Check joining wires and rubber seals correctly installed and in position Inspect condition of wires and seals and replace as necessary	1	5	5	Concrete Ganger	Daily
Tremie tubes falling over falling over causing injury	2	4	8	Only use supplied tremie racks or lay tubes flat on the ground Tremie pipes to be washed out in the tremie rack Correct joining with tremie wires	1	4	4	Concrete Ganger	Daily
Trips or falls from tremmie racks	2	5	10	Integral steps used for access Handrail barrier locked into position at all times with chained pin when in use Good housekeeping around and at the top of rack	1	5	5	Concrete Ganger	Daily
Manual handling causing muscle strains	2	3	6	The lightest piece of tremie equipment is 35kg – no equipment to be manually lifted Use mechanical devices at all times	1	3	3	Concrete Ganger	Daily
Falling Objects when moving tremie equipment	3	5	15	Plan lift when using a Handling Crane with Banksman to control area and signal to the crane / rig operator Banksman to control area and signal to the crane / rig operator Tremie rack to be placed adjacent to work area to avoid moving the tremie pipes long distances by crane. Avoid using placing tremie in racks on very windy days Avoid stress on joints in bending by not laying long lengths of tremie on the ground. Stack vertically in racks	1	4	4	Contract Supervisor/ Ganger	Daily
Entrapment by tremie tube while pacing tubes in rack	3	4	12	Stand in a position to be able to deflect the tubes rather than become trapped Steady load when appropriate	1	4	4	Concrete Ganger	Daily

HAZARD	1	2	3	4	5	6	7	8	9
	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 × 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 × 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Concrete Sampling									
General site working	2	2	4	Good housekeeping to be maintained at all times. Site working area to be kept clean and tidy with the surrounding areas kept clear at all times. All site personnel to wear suitable PPE. Site specific briefings to be given to all site staff prior to commencement on site. First aid kits shall be supplied and available at all times.	1	2	2	Site personnel	Daily
Access, egress & site movements	2	3	6	Only use approved access and egress routes as explained at site induction Always observe speed limits and directions whilst on site. Use double flashing beacons situated on the highest point of the vehicle.	1	3	3	Site personnel	Daily
General testing activities	2	3	6	Ensure others are aware of your movements Never work in un-lit areas where site movements are taking place without the cover of your vehicle or portable lighting. Be aware of other activities in your surrounding area. Be aware of unprotected protruding steel. Never walk between vehicles.	1	3	3	Site personnel	Daily
Manual Handling	3	2	6	Use trolley or wheelbarrow, if necessary, to transport samples to and from van. Park as near as possible to the working area to reduce the distance carrying samples. Everyone has their own safe limit. Assess you own, ask for assistance and *never exceed your own safe limit.* Do not overfill buckets with concrete. Use multiple buckets to sample concrete. Manual handling training.	1	2	2	Site personnel	Daily
Use of Data Recording Tablets	3	3	9	Adhere to site rules regarding use of Tablets – use designated “Safe Zones” when inputting test data if the site rules require this Inform the site supervisor that the tablet is part of your site equipment and is not being used for personnel entertainment to avoid anyone raising a “near miss” against you	1	2	2	Site personnel	Daily

				If possible, input test data when either inside or adjacent to your vehicle – your vehicle can provide additional physical protection When inputting test data only use the tablet in a “Safe Zone” be aware of other activities, plant and workers in your immediate vicinity to avoid collision and/or damage Do not walk around when using the tablet. Concentrate on correct data entry and the surrounding environment - avoid slips & trips Be aware of risks and hazards from local conditions, such as working near water of at height to avoid damage to the tablets DO NOT OPERATE THE TABLETS WHILST DRIVING OR OPERATING PLANT – make sure your full concentration is on the task at hand					
Concrete delivery causing crushing to personnel	3	5	15	Always bank from a safe position Ensure an unbroken line of sight Do not go behind any reversing vehicle	1	5	5	Banksman	Daily
Sampling and vehicle discharge	3	3	9	Wear correct gauntlets, position yourself Safely when taking samples from the chute. Subdivide the sample for carrying if required.	1	3	3	Technician	Daily
Cement burns, dermatitis, concrete splashes, eye damage, noise.	3	3	9	Avoid direct contact with wet concrete, wear waterproof clothing and gloves, keep arms and legs covered. Wear eye protection. Wear ear defenders when necessary. Review COSHH Data Remove clothing if contaminated to avoid prolonged skin contact.	1	3	3	Technician	Daily

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 × 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 × 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Lifting Operations									
Access / Egress on site causing risk of pedestrian / vehicle collision	3	3	9	Principal Contractor to provide safe access / egress onto site to work area for equipment and pedestrians. Access / egress to be defined in traffic management plan with access /egress gates controlled by gateman/ marshal. Routes to be suitably competent and appropriate platform certificates in place. Pedestrian routes segregated from traffic All movement controlled by plant vehicle marshal.	1	3	3	Contract Supervisor	Daily
Suitability of lifting equipment to prevent instability leading to overturning or dropped loads	3	5	15	Competent person has selected appropriate lifting equipment and the lift plan prepared around this selection. Temporary works arrangements in place, 'permit to load'. Lifting equipment operator to have up to date certification. Equipment rigged in accordance with lift plan Rated Capacity Indicator to be in good working order. Equipment used within manufacturer's specifications and rigged capacity. Daily / weekly Inspection registers and maintenance regime to be in place	1	5	5	Contract Supervisor	On arrival at site
Collapse of platform during rigging or lifting	3	3	9	Firm level hard standing - Platform designed to suit crane loadings; certificate in place for lifting position(s) and designed for outrigger loads/ lifting equipment Platform maintained to certificated standard – weekly signed off by temporary works coordinator. Set down / rigging areas identified prior to use Rigging area to be free from traffic movements, overhead services, and structures and buried services. Visual inspection of lifting / rigging area checking for site weak spots and potential hazards.	1	3	3	Contract Supervisor	Daily
Lift plan suitable for the tasked work	3	5	15	Lift Plan in place prepared by a competent Appointed Person. Lift plan checked & countersigned by another Appointed Person. Known weight, characteristics, stability, lift points detailed Correct lifting accessories, SWL (listed in Lift plan) Lift plan briefed to the site lifting team	1	5	5	Contract Supervisor	Review during lifting ops.

Uncertificated or defective lifting accessories compromising the lift. This could cause a lift to fall.	3	3	9	Inspection and colour code identification scheme. Weekly (recorded) and Pre-use visual inspections by a competent person. Correct type (chain / nylon strop / shackles) SWL, length, physical size. Single-use slings to be destroyed immediately after use; reusable to be collected and returned to supplier. De-rating factors considered during planning. Competent trained slinger/ signaller. Provide protection against sharp edges. Any defects in lifting accessories to be reported immediately and items removed from use.	1	3	3	Slinger / Contract Supervisor	Each lift
Collapse / damage to underground services from outriggers or crane wheels	2	5	10	PC to identify all underground services at surface and the load-bearing capabilities of ground. Avoid siting and trafficking lifting plant over service runs- All services should have been diverted in advance of our operations.	1	5	5	Contract Supervisor / PC	Daily
Lifting operations over sailing / impacting on other contractors' activities	2	3	6	Effective site communication channels established to inform others of our intended lift and duration. Co-ordination of site activities. No cross hiring to other contractors on site – (lifting items will not have been planned or risk assessed).	1	3	3	Contract Supervisor	Daily
Lack of awareness / training in the preparation of a lift causing misunderstanding. This could cause a lift to fall.	3	5	15	Appropriate PPE- hard hat, laced protective footwear, hi-vis clothing, gloves and eye protection Trained competent banksman slinger controlling all lifting movements. Competent trained supervisor Signalling using industry understood signal system Good personal safe positioning during lift Good communication, visual line of sight. Lifting operation controlled by slinger/signaller alone, except emergency stop signal which can be given by anyone.	1	3	5	Banksman Slinger	At commencement of lifting
Lack of control when moving the load – causing potential instability	3	5	15	Use of tag lines to control loads. Keep load within site boundary at as low a level as practicable to clear obstacles. Never leave loads suspended, rest onto platform. Load to be set down slowly taking care not to damage slings or equipment. Never use the force of the line to pull slings out from under the load, use timbers to set the load on but ensure they are stable. No one to walk or stand beneath suspended loads	1	5	5	Banksman Slinger	At commencement of lifting
Incorrect slinging causing instability of loads	3	5	15	Check slewing radius for clearance before lifting. Carry out test lift to determine centre of gravity if not known.	1	5	5	Banksman Slinger	At commencement of lifting

				Correct slinging techniques, check load before lifting including for loose items Check lifting points for deformation etc. Correct colour-coded accessories checked prior to use.					
Injury or fatality to Third party personnel during lifting	3	5	15	Define and maintain exclusion and safe working zones using plastic barriers. Non-essential personnel cleared from area. Clear away personnel from the intended travel route.	1	5	5	Banksman Slinger / Supervisor	At commence ment of lifting
Adjacent structures / equipment /	2	3	6	Supervisor to communicate and coordinate with Principal Contractor re activities / location of equipment on site. Minimum clearance between rear extent of crane in its slew radius and any other fixed/moving structure/plant is 1m. no over sailing of loads, neighbouring property or roads Work in accordance with the ALO plan	1	3	3	Contract Supervisor / PC	Daily
Adverse weather conditions e.g. wind impacting on lifted load	2	3	6	Operator to understand anemometer readings and action trigger. (Where fitted). Ensure wind monitoring equipment installed on the boom is fully functional. (Where fitted) Depending on Make/Model – Crane may need to be downrated upon wind speed limits. Crane / Rig shall stop operating in wind speeds greater than those laid down by the manufacturer or sooner at the discretion of the lifting team. Wind speeds to be taken from crane boom anemometer, if anemometer is not fitted. lifting operations to be suspended during lightning/thunderstorms.	1	3	3	Contract Supervisor / Operator	Daily

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 ´ 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 ´ 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Use of Jet Wash									
Manoeuvring / Handling Machine and Equipment	3	4	12	Avoid manual handling by manoeuvring jet wash with FLT / Crane Hitch jet wash to tow bar and move away from the area Team manoeuvre jet wash into its final position if required All personnel trained in manual handling lifting techniques	1	4	4	Supervisor / Chargehand	Daily
Defected equipment	3	4	12	All jet washers to be maintained and used in accordance with manufacturers instruction Pre use inspection of equipment before use to be carried out Any defected equipment to be tagged as defected and removed from service. Do not use defective equipment.	1	4	4	Supervisor / Chargehand	Daily
Operation of pressure washer High pressure water injuries - Wounds - Projectiles - Eye Injuries	3	4	12	Ensure you have the right length lance for the task. Long lance over 1.2m for general use Short lance to be used on tremie rack Direct the nozzle towards the equipment to be cleaned, only then you can squeeze the trigger Do not override trigger with use of wire or cable ties for example to maintain pressure Do no point lance in any body's direction regardless of distance Full face visor to be worn when operating jet wash Turn off the pressure washer after using it. Direct lance away from persons and squeeze the trigger so that you can release the excess pressure	2	4	8	Supervisor / Chargehand	Daily
Use of Power Tools. HAVS	1	1	1	Assessment has been conducted on the jet wash and is assessed that the use of jet wash will not exceed permissible trigger times and as such does not pose a hand arm vibration risk	1	1	1	Supervision / Chargehand	
Unsafe Storage - Slips trips and falls	3	3	9	Maintain a good standard of housekeeping in work area. Ensure hose is coiled and lance is stowed correctly after use	1	3	3	Supervision / Chargehand	Daily
Prevention of spills from refuelling plant	4	3	12	Use 'plant nappy' type drip trays during refuelling activities. Ensure sensitive receptors are protected and refuelling activities are away from any watercourse. Ensure refuelling in safe area clear of traffic and other hazards.	1	3	3	Supervision / Chargehand	Daily

				Ensure there is a spill kit in close proximity					
Noise pollution from works operations	4	4	16	Plant maintenance carried out regularly. Shut down plant when not in use Where practicable locate noisy plant away from receptors. Limit plant movements to normal working hours. Hearing protection to be worn when using the jet wash. Minimum of ear plugs.	1	4	4	All operatives	Daily

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 × 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 × 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Site Deliveries and Collections									
Movement									
Pedestrians Impact with vehicles	5	4	20	Site traffic routes to be established by PC to segregate vehicles and pedestrians and briefed to our operatives. Clearly defined routes.	1	4	4	All Operatives	Job start or on any change
Impact with reversing vehicles	5	5	25	No vehicles allowed to reverse without a vehicle plant marshal or banksman managing the manoeuvre. Banksman (Vehicle/Plant Marshall) to hold CPCS Vehicle/Plant Marshal certification. Line of sight to be maintained between the driver and designated banksman during reversing operations - otherwise vehicle to STOP. Clear hand signals to be used.	1	5	5	Vehicle Plant Marshal or Banksman	Daily
Site Access / Egress for vehicles to prevent accidents with other personnel	5	5	25	In accordance with designated routes. In accordance with gate man / marshal's instructions. Site induction/ briefing for driver. Designated area for unloading.	1	5	5	All Operatives	Daily
Collision with Vulnerable Road Users causing incident, accident or fatality	5	5	25	Delivery vehicles to be selected based upon the accessibility, Manoeuvrability and the amount of Vulnerable Road Users on the route (e.g. Schools, Cycle routes, Parks) Vehicles to use Planned delivery access route set from 2.5 miles radius from the site	2	5	10	Delivery company and Site Team	Daily
Crushing from concrete trucks discharging	4	3	12	Pumpman/Concrete Ganger to make himself known to the concrete delivery vehicle driver. Vehicle to be stationary before adjusting chutes. Pumpman's position of safety whilst reversing is within the agitator working platform or concrete ganger in position of safety while reversing onto a pile..	1	3	6	Concrete Gangwer /Pumpman	Daily
Unloading									
Fall from delivery vehicle - Working at height whist unloading	5	5	25	Loads to be pre slung where practicable. No person to access the vehicle without edge protection system in place. Use purpose-designed access points where available Ensure all ladders fixed or footed. Access / egress only by the standard step ladder issued to every project. Footed by second operative.	1	5	5	All operatives	Daily

Plant falling off vehicle	3	5	15	Use competent driver or plant operator. Maintain an exclusion zone around lorry whilst unloading or loading. Use remote control where available.	1	5	5	Operator	Daily
Single-use / Certified slings could fail and cause load to drop	3	5	15	Material pre-slung with one trip or webbing slings – must cut immediately once offloaded. Pre slung materials using certificated slings to have slings removed once stacked and stored in a 1T material bag for collection and reuse by supplier.	1	5	5	Contract Supervisor	Daily
Excessive weight or radius of lifting causing load to drop	4	5	20	Comply with specific lift plan / risk assessment.	1	5	5	All Operatives	Daily
Impact whilst guiding the load	3	5	15	Loads to be guided from ground level using tag lines. Do not position yourself at a potential pinch point. Be aware of the blind side to any loading e.g. forklifts inadvertently pushing loads forward whilst loading.	1	5	5	Slinger	Daily
General									
Weather conditions causing loads to be unstable	3	4	12	Don't unload in high winds (>13m/s). Check operating conditions for safe working in winds for the unloading device.	1	4	4	Contract Supervisor	Daily
Failure of platform causing instability to vehicles	3	4	12	Platform to be designed for vehicle access and crane /rig loading.	2	4	8	Contract Supervisor	Daily
Unstable load causing tipping	3	5	15	Load straps only to be fastened or removed by lorry driver For any vehicle movement the load should be appropriately fastened. Load to be inspected before leaving site.	1	5	5	Contract Supervisor and Driver	Daily
Mud on Public Highways	3	4	12	A wheel wash station will be set up at the site exit to reduce the impact of mud on the surrounding public highways.	1	2	2	Client	

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 ´ 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 ´ 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Use of MEWPs									
Exclusion Zone	3	5	15	Supervisor to ensure Exclusion Zone is set up around the piling area. Anyone not involved with the operation will be asked to leave. Exclusion Zone demarcated by barriers – no person to enter – banksman to marshal area and maintain access	1	5	5	Contract Supervisor	During Operation
Mechanical Failure Operator Error	3	2	6	MEWP's to be operated by suitably trained persons only (IPAF). MEWP to be operated as stated within the manufacturer's instructions. Operators to familiarise themselves with the MEWP. Size & type of MEWP to be assessed with supervisor, utilizing BTL MEWP assessment document MEWP to hold a valid in date thorough examination. (6month) Pre-use checks to be conducted daily, defects to be reported immediately and MEWP quarantined. Coordinate with supplier to ensure maintenance regime followed Safe working load not to be exceeded.	1	2	2	Operator	Before use
Persons Falling from Basket	3	5	15	All persons using MEWP to ensure they are wearing a full body harness with suitable length lanyard. Harness and lanyard to have thorough examination and be colour coded. Lanyard to be clipped onto to anchor point within the basket. No loose equipment to be stored within the basket. Double lanyards to be utilised during rescue operations. All persons transitioning from 1 MEWP to another to ensure they are "clipped on" at all times to designated anchor points. Additional lanyards to be taken in the recue MEWP to ensure suitable fall protection is provided when transitioning the stranded operator / casualty to rescue MEWP.	1	5	5	Contract Supervisor/operator	
Failure of personal fall protective equipment (PFPE)	3	5	15	All PFPE to be supplied by BTL and signed out from the stores. All PFPE to be pre-use checked by the user, any defects to be reported to the supervisor and equipment and	1	5	5	Contract Supervisor	Before Use

				quarantined. Harnesses to be fitted correctly by the user (2 finger rule) Only fall restraint lanyards to be used when operating MEWPS All lanyards to be of twin tailed (Double) type when conducting mid-air MEWP to MEWP Rescues. Only designated anchor points to be used. **100% clip on at all times.** Do not clip onto handrails off the MEWP Baskets					
Using base controls to operate MEWP	2	5	10	MEWP to be positioned and operated so that base controls remain accessible at all times. Spotter / Banksman to ensure they continually monitor the position of the base controls. MEWP key to remain in base controls at all times during use. The key is the only option for switching between control units. When using base controls, do not use slew function where possible. If slew function is to be used, it may be necessary to seek further assistance for the spotter / banksman to assist in moving with the base unit.	1	5	5	Contract Supervisor	

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 ´ 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 ´ 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Bentonite Plant									
Noise	3	3	9	Use of ear protection to be encouraged when not mandatory. Wherever possible, noise suppressant equipment shall be used on plant Once operational a sound level check will be performed on the plant to ensure the noise levels are safe. If any loud noise sources are located, localised noise protection will be installed. If any plant or equipment has high vibration through the bentonite concrete slab a rubber mat will be installed under it.	1	3	3	Contract Supervisor/Bentonite Plant Operator	
Manual Handling	3	5	15	All personnel to have been trained in manual handling techniques. Operatives to be trained and competent in using equipment. All lifting operations to be undertaken by mechanical means wherever possible. Individuals to make assessment of weight prior to manual handling. Where weight exceeds individual capacity, team lifting should be considered. Loads are not to be carried over excessive distances.	1	5	5	All operatives	
Electrocution	2	5	10	All electrical installations must be carried out by qualified and competent electrician. A copy of the electrical installation certificate must be held in the site file, and this must be kept up to date. No modifications to installations by unqualified persons. Cables must be routed such that they are protected from damage by other site operations. If any faults are evident, the equipment must be isolated and reported to site management. Operation of equipment by trained persons only. All electrical installations to be properly earthed.	1	5	5	Contract Supervisor/Electrician	
Slips, trips, falls	3	4	12	All areas to be kept free from obstructions. Good standards of housekeeping to be maintained at all times. Pedestrian routes to be kept level. Suitable footwear (company standard) to be worn at all times.	1	4	4	All operatives	

				No loose material or debris to be evidenced within the works area. Where possible, the plant must be set up on a level concrete platform with bund and means of collecting wash down and rainwater. Ensure all work areas, platforms and access ladders are kept clear of any wet product. Use jet washer to keep area clean.					
Hazardous materials and chemicals	3	3	9	Ensure COSHH assessments on site and relevant PPE is provided. Chemicals must be kept in closed containers No eating or drinking without first washing hands Ensure appropriate and sufficient spill kits are available	1	3	3	Contract Supervisor	
Unexpected Silo Leakage	3	4	12	Bentonite plant to be maintained and inspected on a daily basis i.e., Checking pipe fittings, valve fittings etc. Bentonite Plant supervisor to be trained and competent The bentonite plant has a bund which can hold 110% of the capacity of the largest silo in the plant. Bund to be constructed around the entire perimeter of the bentonite plant	1	4	4	Bentonite Plant Operator	Daily
Handling of bentonite (Mixing)	3	3	9	All bentonite plant staff to be trained and competent Full PPE to be worn during bentonite handling, including the use of goggles/dust mask when mixing bentonite	1	3	3	Bentonite Plant Operator	Daily
Bentonite discharge	3	3	9	Bentonite Plant supervisor to be trained and competent Bund to be constructed around the entire perimeter of the bentonite plant Waste bentonite to be disposed of utilising a specialist waste treatment contractor	1	3	3	Contract Supervisor	

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 ´ 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 ´ 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Mechanical Maintenance									
General Access to site. Working in high risk environment.	5	4	20	All personnel to have attended Site induction. Access to site through vehicle routes as shown in the traffic management plan or pedestrian access routes. Walkways to be used at all times when transiting site. Only cross main traffic routes at the identified pedestrian crossings. Adhere to all signage displayed on site. Minimum site standard PPE to be worn as stated within the Method Statement. Do not access other contractor working areas. Ensure you have been briefed on the Daily Activity Briefing	1	4	4	Management Supervision Chief Mechanic	
Manual handling Operations	4	3	12	All manual handling operations to be assessed using T.I.L.E. Task: Assess the task to be carried out Individual: Do not lift above your capabilities. Ensure suitable rest periods throughout the operation. Load: Assess the load for sharp edges, weight size, hot or cold. Environment: Walk the route ensure no trip hazards present, lighting is adequate, changes in level are identified. Where possible use mechanical lifting aids, Tele-handler, Crane, pallet truck etc. Ensure suitable gloves are worn aiding in grip and cut protection.	2	3	6	Supervision Chief Mechanic	
General noise emissions from various equipment	4	4	16	Noise levels to be assessed during the selection of tools and equipment. Reduce noise emissions at source where practicable. Power tools to be in serviceable condition to reduce noise emissions. Routine noise assessments to be conducted at source of tools and general working areas. Where applicable hearing protection areas to be established, signed and all operatives briefed on the requirements. • Hearing protection recommended at	1	4	4	Management Supervision Chief Mechanic HSEQ	

				80db(A) • Ear plugs suitable up to 100db(A) • Ear defence to be worn in excess of 100db(A) Where applicable work to Section 61 timings					
Work at Height. General	5	5	25	Take only the tools and equipment required for the task, ensure tools are stored in tool bags, boxes and equipment is secured. High standard of housekeeping to be maintained at all times. Exclusions zones to be identified as required below the working areas. Where harnesses are to be worn then suitable anchor points are to be utilised.	1	5	5	Supervision Chief Mechanic	
Work at Height, Use of podium steps.	4	5	20	Pre-use inspection to be conducted by the user, any defects to be raised with the supervisor and podium taken out of service. Ensure ground is firm and level. Do not overreach, move podium steps as required. Ensure gates are closed. Only use trailer access podium steps as a means of access onto equipment.	1	5	5	Supervision Chief Mechanic	
Work at Height, Use of harness	5	5	25	Operatives to be trained in the safe use of harnesses, working at height and familiarised with ancillary equipment. All PFPE to be supplied by BAUER Technologies and have a current thorough examination (6 monthly) All PFPE to be pre-use checked by the user, any defects to be reported to the supervisor and equipment and quarantined. Harnesses to be fitted correctly by the user (2 finger rule) Assessment to be carried out on site with the aid of supervision for the type of lanyard to be used. Fall restrain or fall arrest. Fall restraint to be used in the first instance to stop the person accessing the fall area. Fall arrest to be used when the user may be subject to a fall, considerations to be given to distance of fall allowing room for the fall arrest to deploy. Only approved/purpose built anchor points to be used. **100% clip on at all times.**	2	5	10	Supervision Chief Mechanic	
Work at Height. Use of life line	5	5	25	Lifeline to have in date thorough examination (6 monthly) Pre-use inspection to be conducted on lifeline. Lifeline to be installed by competent person only Lifeline to be adjusted so the life line is taught Anchor points to be established above the cab and on	2	5	10	Supervision Chief Mechanic	

				mast section Adjustable fall restraint lanyard to be used Restraint lanyard to be adjusted to allow only the length required Pre-use checks to be conducted on inertia block before each use.					
Work at Height. Use of cherry picker (MEWP)	4	5	20	MEWP to have an in-date thorough examination (6 monthly) Ground to be firm and stable Trained operative to operate the MEWP only Pre-use inspection to be completed and recorded Harness with restraint lanyard to be used at all times whilst in the MEWP basket. Hook on to manufacturers anchor points only, do not hook on to the handrail Carry only the tools that are required for the task Work from within the MEWO basket, do not overstretch or stand on the kick guard Do not operate outside of manufacturers maximum permissible wind speeds. Never work alone, ensure 2nd person at ground level can operate base controls in the event of break down	2	5	10	Supervision Chief Mechanic	
Use of Power Tools. HAVS	4	4	16	Operatives of vibration emitting tools to be briefed on the permissible trigger time of that equipment. Operatives are not to exceed the permissible trigger time. Work force rotation to be used to mitigate the effects of vibrations. Operatives to keep hands warm by using suitable gloves, take frequent breaks. Tools to be maintained as stated by the manufacturer and defective tools quarantined.	1	4	4	Supervision HSEQ Chief Mechanic	
Use of hand tools	3	3	9	All hand tools to be inspected prior to use for serviceability, faulty tools to be quarantined Tools shall be correct for the task Tools only to be used for their intended purpose	1	3	3	Supervisor Chief Mechanic	
Contact with hazardous substances.	3	2	6	Refer to CoSHH assessment before handling any substances. Ensure you follow the precautions stated within the CoSHH assessment. Spillages to be reported immediately, use suitable spill kits to contain the spillage. Drip trays to be used where there is a foreseeable risk of spillage. CoSHH items to be only stored in their original containers with correct labelling. Decanting of CoSHH Substances to be completed on a drip tray or similar device to collect any spillages. Waste CoSHH to be correctly stored in suitable	2	2	4	Supervision Chief Mechanic	

				containment ready for collection					
Contact with moving equipment, machinery and parts.	3	4	12	Rig to be isolated (keys removed) when working in areas with moving machinery & equipment. Loose fitting clothing to be removed. Maintain clear, concise communication with the rig operator at all times When testing equipment, fitters are to remove their selves away from the line of fire and any moving machinery.	2	4	8	Supervisor Chief Mechanic	

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 ´ 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 ´ 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Hot Works and Tool Maintenance									
Unfamiliar with site hazards causing bodily injury	4	5	20	Attend PC and Company site induction. Briefed on task specific risk assessment. Assess required site activities before proceeding onto site and again once at work area – report any risk issues to supervisor for correction. Competent certified operative for the task	1	5	5	Operative / Contract Supervisor	Site arrival
Crushing , Impact from vehicles / plant during access and egress to and from the work area	4	4	16	Access routes to be clearly identified and kept clear at all times. Signs and physical barriers to be in place around work area. Ensure work area is safe - clear of traffic and pedestrian routes with no other contractors working in the same vicinity.	1	4	4	Operative	Daily
Fire from hot working process causing burns and loss of property	4	4	16	If possible avoid Hot works and select a safer and less high risk alternative Hot work permit to be in place Warning signage to be posted Area to be kept free of combustible materials, paper, oils, rags, etc Area to be sheeted prevent sparks travelling Fire Extinguishers to be positioned adjacent to the work area Fire watch to be implemented Emergency procedure and action to be known by users	1	4	4	Operative / Construction Supervisor	Start of task
Explosion, fire or escape from handling and storage of hazardous gases.	3	4	12	Operators briefed on task and to work in accordance with good practice, COSHH assessments and safety data sheets available. Cylinders / equipment used in accordance with manufacturer's instructions Cylinder valves to be closed when not in use and the key removed. Vent torch, hoses, and regulator when not in use Regular inspection and maintenance regime. Flashback arresters fitted to bottles Check for leaks Daily visual inspections by users Cylinders stored upright, secure, safe area. No smoking in vicinity Fuels and oils to be stored away from the work area	1	4	4	Operative	Start of Task

				Area to be kept clear – rubbish and debris free					
Malfunctioning of (Welding) plant causing injury	4	3	12	All welding plant and equipment must have current test and calibration certificate Operator to inspect welding plant and ancillary equipment daily before use Operator to maintain welding plant daily	1	3	3	Welder	Start of Task
The use of Hand Tools / Grinding and disc cutting operations causing lacerations or electrocution	4	5	20	Only trained and competent persons to operate hand tools / grinders / STIHL saws in accordance with manufacturer's instructions and their training. Inspect equipment guards, discs before use. Any defective parts must stop the task and be reported. All tools to be maintained in accordance with manufacturer's instructions Only 110v electrical tools All electrical tools must be PAT tested and in date Operator to inspect compressed air tools before use. Loose fitting clothing NOT to be worn. Personnel with long hair must wear a hair net Discs to be changed by a certified person. Blade cover must be engaged in place before use Equipment to be fuelled up in the site compound Provision of first aid kit and eye wash station in work area. Works only to proceed with Hot Works permit Non-essential persons will be kept away from the Hot Works area All rubbish and debris cleared from area prior to cutting Appropriate PPE to be worn at all times i.e. glasses, anti-vibration gloves and hearing protection	2	5	10	Trained Operative	Daily
Manual Handling	3	3	9	Manual handling to be eliminated wherever possible. Use bottle carrier and telehandler to transport gas cylinders Carry out manual handling assessment and know the weights of all materials Cylinders are heavy, move with a suitable trolley where practicable. Never leave cylinders free standing – secure. Use mechanical means where practicable to position work piece.	1	3	3	All Operatives	Daily
Poor Lighting Levels	2	3	6	Background lighting provided by PC Personal task lighting to be provided where required	1	3	3	Operative	Daily
Flash into eyes of third parties causing blindness	3	4	12	Protective screens deployed and in use Warning signs in place when welding is in progress Adequate masks to be worn by welders Welding shields to be used by welders while welding	1	4	4	Welder	Start of Task

Protection to users from hot liquid metal causing severe burns	4	4	16	PPE, to include flame retardant coveralls, goggles, gloves and hearing protection Use of fire blankets to other surfaces / materials	2	4	8	Welder	Start of Task
Poisoning from exposure to hot working fumes	3	4	12	Ensure adequate ventilation or use fume extractor Flexible exhaust extensions to be used , if appropriate Care must be taken as these flexi pipes will get hot. Do not allow to come into contact with exposed skin, use gloves when altering the direction of their emissions.	1	4	4	Operative	Start of Task
Repetitive Strain	2	3	6	Avoid long periods of welding, grinding, gouging Low vibration tools to be used Record vibrating tool usage	1	3	3	Operative	Daily
Tool Maintenance									
Sensitisation of skin & development of dermatitis	4	4	16	Gloves to be worn Ensure there are sufficient hygiene/washing facilities available nearby.	1	4	4	Operative	Daily
Damage to eyes / skin from flying particles	4	4	16	Ensure a minimum 2m exclusion zone is established Use only tools identified in the task briefing above for the designated purpose Adequate storage facilities to be made available and used for all tools Inspect tools and teeth/pins prior to use to ensure they are damage-free and serviceable Eye protection to be worn at all times. Use of malleable hammers to avoid hard metal-metal contact Ensure there are sufficient eye wash facilities available nearby	1	4	4	Operative	Daily
Cuts to hands from sharp edges	4	3	12	Visually inspect for sharp edges, remove where possible Wear cut resistant gloves	1	3	3	Operative	Daily
Striking hand with hammer	4	3	12	Tools to have hand guards Use correct tools	1	3	3	Operative	Daily
Manual handling	3	3	9	Assessment to be carried out using Task Individual Load Environment	1	3	3	Operative	Daily
Slips, trips and falls due to untidy work area or walkway	4	3	12	Designated walkways to be provided around the site. Housekeeping to be continuously maintained and monitored Provision of well-planned waste removal facilities. Steps and ramps to be clearly marked to ensure they are visible.	1	3	3	Operative	Daily

HAZARD	1	2	3	4	5	6	7	8	9
	Factors of Harm		Risk Multiple of columns 1 ´ 2	CONTROL MEASURES	Factors of Harm		Residual risk Multiple of columns 5 ´ 6	Control measures implemented by (name)	Control Frequency Check Rate
	Likelihood	Severity			Likelihood	Severity			
Heavy equipment tracking and operating within a compact site									
Access / Egress on site causing risk of pedestrian / vehicle collision.	3	5	15	- Traffic Plan to be generated and agreed that provides adequate segregation of pedestrians and vehicles. - Access/ Egress points to be kept clear and Main entrances to site should be manned and access monitored to mitigate against unsolicited access.	2	3	6	BTL	Before BAUER enter site
Injury or fatality to Third party personnel during operation.	2	5	10	- Adequate site security must be established via segregation barriers and manned access routes when there is a potential to mix with the public. Taking measure to reasonably limit potential access from vulnerable people i.e children. - Any visitors to site must have an induction and made aware of site risks. -Slewing over third party areas will not be permitted unless coordinated discussions are involved clearing the area before slew. - Traffic plan in place to ensure vehicles and plant have safe routes throughout site.	1	5	5	BTL	
Risk of overturning	3	4	12	- Driver to have sufficient training and competency, this includes the relevant experience. - Daily and weekly checks to be conducted on the vehicle to ensure there is no mechanical failings. - The site to be set up to adequately deal with the movement of the machine. Speed to be adjusted for different loads.	2	4	8	Plant Operator	
Heavy equipment tracking and operating and colliding	3	5	15	-Equipment and material positions have been simulated in site layout drawings prior to mobilisation to site to	2	4	8	Plant Operator/ Banksmen	

with personnel/plant or structures				confirm their suitability. During the construction phase, the arrangement of heavy equipment on site will be constantly controlled by the BAUER Site Supervisor. -Pedestrians and plant will be physically segregated by use of yellow pedestrian crowd barriers with suitable signage. Walkways will be formed with yellow pedestrian barriers to allow safe access to work areas. -All movement of heavy equipment will be closely controlled by Banksmen, as directed by the Site Supervisor. All persons on site will be briefed during pre-start briefings on how to move and work safely on site. -Rigs and cranes only: all movements controlled by Banksman and a second banksman acting as a spotter when transiting around site.					

Hand Arm Vibration Syndrome (HAVS)

1: Activity & Hazard Description	2: Person[s] at Risk	3: Potential Consequence	4 – 6: Initial Risk Rating			7: Control Measure[s]	8: Person[s] Responsible for Implementation & Monitoring	9 – 11: Residual Risk Rating		
			L	S	IRR			L	S	RRR
Use of Power Tools.	Operator	Electrocution, Entrapment. Flying particles	3	4	12	All power tools to be 110v, be with in current PAT testing date or battery powered. Pre-use checks to be conducted by the user, any defects to be reported immediately to supervision and equipment quarantined. Operatives to use the tools as stated within the manufacturers instruction. Hearing protection to be worn Tools to be maintained and serviced as required. All guards and handles to be fitted to equipment. Tool tethers to be used when working at height. Loose clothing to be removed when operating tools to prevent entanglement. “Line of fire” pinch points to be identified, where practicable they are to be removed before works commence. Light eye protection (EN166) to be used at all times during drilling operations.	Supervision	1	4	4

Use of Power Tools. HAVS	Operator	Hand arm vibration syndrome, Musculoskeletal disorders.	4	4	16	Operatives of vibration emitting tools to be briefed on the permissible trigger time of that equipment. Operatives are not to exceed the permissible trigger time. Work force rotation to be used to mitigate the effects of vibrations. Operatives to keep hands warm by using suitable gloves, take frequent breaks. Tools to be maintained as stated by the manufacturer and defective tools quarantined. Do not use excessive grip on the tool. All hand-held power tools must be equipped with constant pressure switches that will automatically shut off power when pressure (worker's grip) is released. Hand-held power tools with on/off or lock on switches are not permitted.	Supervision	1	4	4
Use of CP77 pneumatic tool Screwing / unscrewing casing bolts. 10.4 ms^2 EAV – 24mins ELV – 1hr 51mins	Operator	Hand arm vibration syndrome, Musculoskeletal disorders. Exceeding exposure limit value	4	3	12	No more than 825 bolts per shift are to be screwed or unscrewed by any one operative In both cases the supervisor should ensure that there are: breaks between the operations, that the tool is well maintained, that dry gloves are worn to keep the hands warm. And that the operatives are rotated.	Supervision	1	3	3
Use of Milwaukee impact gun Screwing / unscrewing casing bolts. 10.4 ms^2 EAV – 24mins ELV – 1hr 51mins	Operator	Hand arm vibration syndrome, Musculoskeletal disorders. Exceeding exposure limit value	4	3	12	Based on 4 minutes per casing joint with 10 studs per joint. No more than 160 studs per shift are to be screwed in or unscrewed by any one operative In both cases the supervisor should ensure that there are: breaks between the operations, that the tool is well maintained, that dry gloves are worn to keep the hands warm. And that the operatives are rotated during the task	Supervision	1	3	3

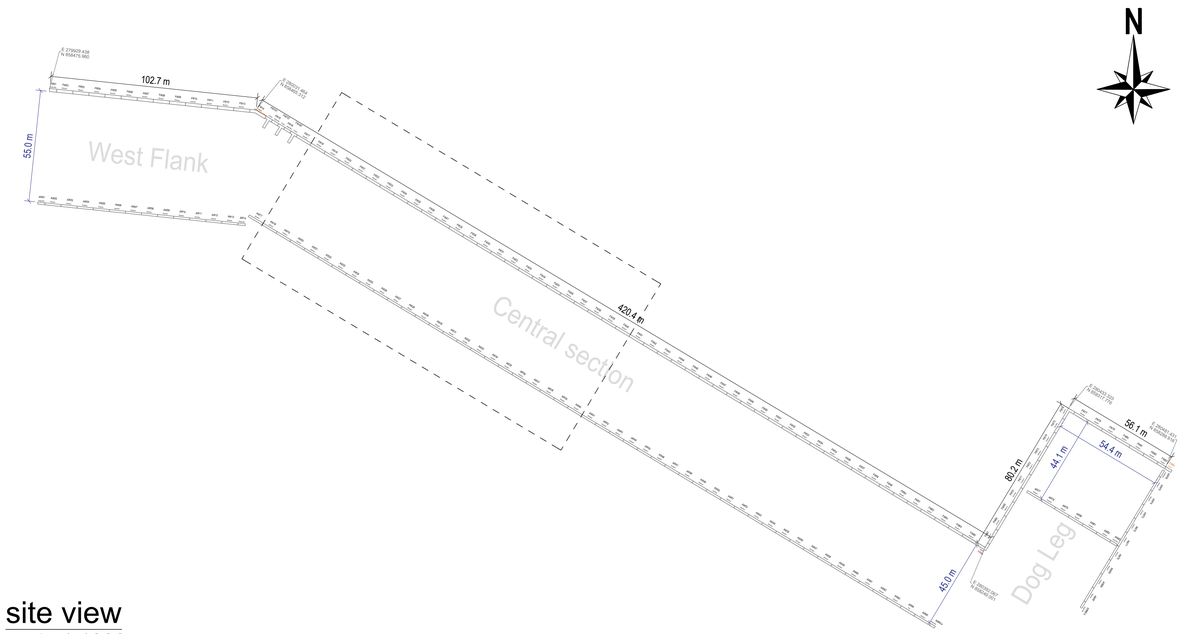
Tool Type	Make & Model	Vibration Magnitude (M/S^2)	Exposure Points per Hour	Permissible Trigger Time (hh:mm)
Air Chisel	Milwaukee Fitter	15.15	459	00:13
Impact Gun	CP77 Series	10.4	216	00:28
SDS Drill	Milwaukee PH26	10.37	215	00:28
9” Grinder	Makita GA9020	10.33	213	00:28
9” Grinder	Makita GA9020	9.86	194	00:31
SDS Drill	ATC Hilti 64163	5.94	71	01:25
Stihl Saw	Stihl TS280	4.84	47	02:08
3” Grinder	Hitachi G125R4	4.62	43	02:21
Chop Saw	Milwaukee CHs355	4.17	35	02:53
4” Grinder	Bosch GWS12 – 125	4.15	34	02:54
Battery Impact Wrench	Milwaukee M18 CH1WF12	3.91	31	03:16
Battery Impact Wrench	Milwaukee M18 CH1WF12	13.5	365	00:16
5” Grinder	Makita GA5021 (Surface Grinding)	13.5	365	00:16
5” Grinder	Makita GA5021 (Disc Sanding)	2.5	13	08:00
Die Grinder	Makita GD0600/2	3.5	25	04:05

Use of Telehandler

HAZARD	1 Factors of Harm: Likelihood	2 Factors of Harm: Severity	3 Risk (Multiple of columns 1 ´ 2)	4 CONTROL MEASURES	5 Factors of Harm: Likelihood	6 Factors of Harm: Severity	7 Residual risk (Multiple of columns 5 ´ 6)	8 Control measures implemented by (name)	9 Control Frequency Check Rate
Attendant plant / excavators	3	4	12	Site supervisor to check competence of plant operators – CPCS and observations. Regular monitoring to check competence considering feedback from experienced site operatives. Supervisor to review and sign plant operator's weekly maintenance reports. Attendant plant to be under direct control of the banksman using hand signals. Machine to work inside a controlled exclusion zone Excavator operators to inspect quick hitch mechanism daily and on every change of bucket/attachment to ensure mechanism is fully compliant, locked and secured. No semi auto quick hitch will be permitted on site. Operatives not to work under quick hitch bucket under any circumstances.	1	4	4	Contractor supervisor	Daily
Crush injuries due to working adjacent to structures	3	5	15	When working adjacent to structures/ plant operations an additional banksman will be in place to monitor the distance between the telehandler and the structure/ activity during	1	5	5	Contractor Supervisor	Daily

				set up if deemed to be necessary by the supervisor					
Lifting Operations / Single Line Working -	5	5	25	Comply with specific lifting plan /risk assessment. Secure single line when not in use and at end of shift. Material pre slung with webbing slings – must be removed after use .no over sailing of loads exclusion zones in place whilst lifting. Use correct fork lift lifting attachments. Qualified slinger signaller in attendance at all times. Tag lines to be used where required	1	5	5	Contractor Supervisor	Daily
Noise	5	3	15	Pre employment medicals carried out by competent occupational health practitioner, with regular employee reviews. Exclusion zone in place Rig attendant in situ preventing unauthorised access Hearing protection signage in place All operatives briefed on the need for hearing protection Mandatory Hearing protection to be worn within 7mtrs of drilling	1	3	3	All operatives	Daily
Other Site Traffic Collisions	3	3	9	Utilises mirrors and cameras for full 360 awareness. Do not exceed site speed limits Adhere to one way systems. Only enter a piling area when guided by banksman Adhere to all “Stop” and “Give Way” signs as required by the highway code.	1	3	3	Tele-handler Operative	Daily
Loss of Load	2	4	8	Loads to have designated lifting points for forks. (Except cages due to design) Loads without lifting points to be secured with ratchet straps.	1	4	4	Operator	Daily

				All lifts conducted as per lift plan. Maintain speed limit and drive to ground conditions. Do not lift above persons.					
Overturning of Plant	3	5	15	Keep loads as low as possible to ground. Operate to the ground conditions. Adhere to site speed limits, reduce speed depending on load. Report platform concerns to Supervisor. (Repairs will be made). Lifts to be conducted as per lift plans. Do not overload the machine.	1	5	5	Operator Supervisor	Daily
Pedestrians. Collisions/ crushing.	4	5	20	"Thumbs up" to be used by operator and pedestrians. Be aware of all pedestrian crossing points and stop as required. Operator to be trained and competent Adhere to site speed limits, Ensure rear of tele-handler free from persons prior to reversing. Do not enter the direct piling area without instruction from the banksman. Do not pick up a load where a person is stood directly behind.	2	5	10	Operator	Daily.



site view
scale 1:1000

2-2
Diaphragm Wall Sections

420.4 m

FW18	FW19	FW20	FW21	FW22	FW23	FW24	FW25	FW26	FW27	FW28	FW29	FW30	FW31	FW32	FW33	FW34	FW35	FW36	FW37	FW38	FW39	FW40
Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard

AW18	AW19	AW20	AW21	AW22	AW23	AW24	AW25	AW26	AW27	AW28	AW29	AW30	AW31	AW32	AW33	AW34	AW35	AW36	AW37	AW38	AW39	AW40
Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard

site view
scale 1:200

Basics			
Plan-No.	Drawn by	Date	Format
ARUP-S1002 P03	ARUP	6/21/2023	PDF
294067-ARUP-Z1-XX-SK-CG-000108 P02	ARUP	9/28/2023	PDF

Associated plans		
Plan-No.	Plan Title	
	Quay Wall - Cross Sections	1

NOTES:

1. Starter panels indicated in Yellow
2. Follower panels indicated in Black
3. Closure panels indicated in Red

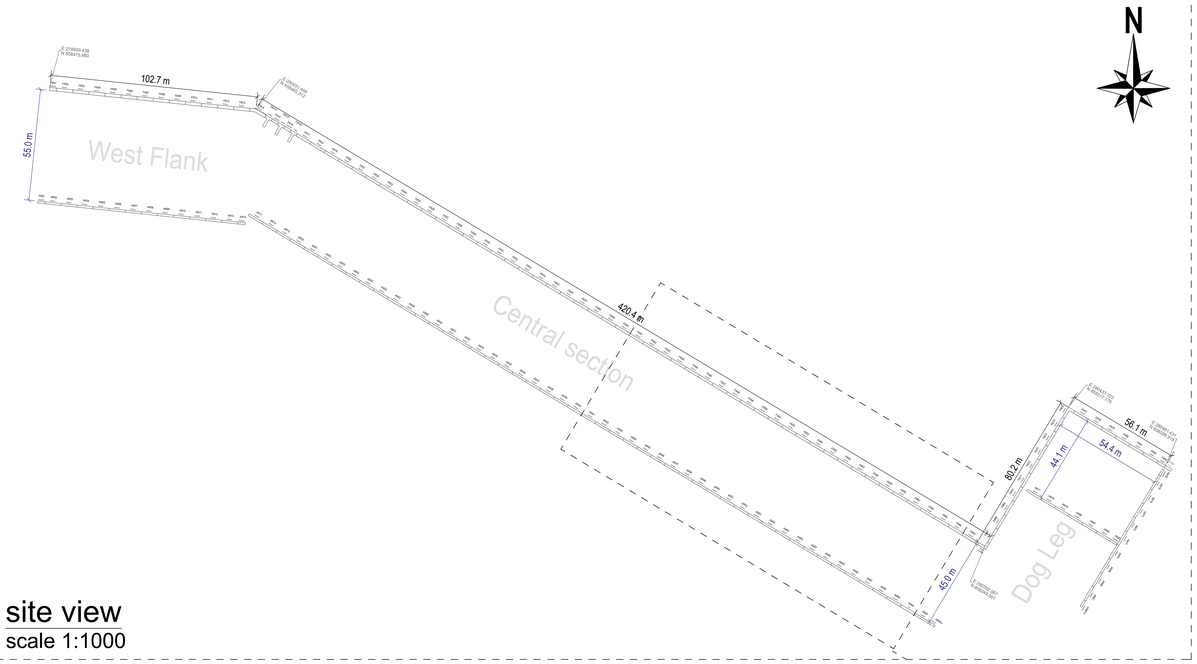
Panel Layout Size		
Panel Type	Length	Width
Standard FW Straight / dogleg	8,0m	1,2m
Standard FW Western Flank	8,0m	1,5m
Standard AW	8,0 m	1,0m
Single Bite FW Straight / dogleg	3,6m	1,2m
Single Bite FW West Flank	3,6m	1,5m
Single Bite AW	3,6m	1,0m
T-Panel	3,6m // 5,6m	1,2m
Irregular FW 14	8,5m	1,5m
Irregular FW 66&76	7,8m	1,2m
Irregular FW 83	4,5m	1,0m

CHANGE	DESIGNED BY	SITE ENGINEER	DATE	INDEX
0. Preliminar Version	Alexander Metka David Puller	Dien Nackaerts	07/02/2024	A
1. First Issue	Alexander Metka David Puller	Dien Nackaerts	12/02/2024	B

BAUER Technologies Ltd.
10 Ducketts Wharf, South Street
Bishops Stortford, Hertfordshire, CM23 3AR
United Kingdom
Tel: +49 8252 97-0
www.bauer.de

CLIENT	Haventus Ltd.
MAIN CONTRACTOR	Bauer Technologies Ltd.
PROJECT	Ardersier Port
DRAWING	Quay wall - Panel Layout Central Section

SCALE : Var.	DRAWN : Dien Nackaerts	DATE : 12.02.2024	
	CHECKED : Brandon Ferreira	DATE : 12.02.2024	
PLAN SIZE: A0	DESIGNED BY: David Puller, Alexander Metka	DATE : 12.02.2024	
PROJECT NO.: 1531	DRAWING NO.: BAU-WP1-D-WALL-CA-X-000003		



site view
scale 1:1000

Basics			
Plan-No.	Drawn by	Date	Format
ARUP-S1002 P03	ARUP	6/21/2023	PDF
294067-ARUP-Z1-XX-SK-CG-000108 P02	ARUP	9/28/2023	PDF

Associated plans		
Plan-No.	Plan Title	
	Quay Wall - Cross Sections	1

NOTES:

1. Starter panels indicated in Yellow
2. Follower panels indicated in Black
3. Closure panels indicated in Red

Panel Layout Size		
Panel Type	Length	Width
Standard FW Straight / dogleg	8,0m	1,2m
Standard FW Western Flank	8,0m	1,5m
Standard AW	8,0 m	1,0m
Single Bite FW Straight / dogleg	3,6m	1,2m
Single Bite FW West Flank	3,6m	1,5m
Single Bite AW	3,6m	1,0m
T-Panel	3,6m // 5,6m	1,2m
Irregular FW 14	8,5m	1,5m
Irregular FW 66&76	7,8m	1,2m
Irregular FW 83	4,5m	1,0m

FW42	FW43	FW44	FW45	FW46	FW47	FW48	FW49	FW50	FW51	FW52	FW53	FW54	FW55	FW56	FW57	FW58	FW59	FW60	FW61	FW62	FW63	FW64
Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard

AW42	AW43	AW44	AW45	AW46	AW47	AW48	AW49	AW50	AW51	AW52	AW53	AW54	AW55	AW56	AW57	AW58	AW59	AW60	AW61	AW62	AW63	AW64
Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Trial

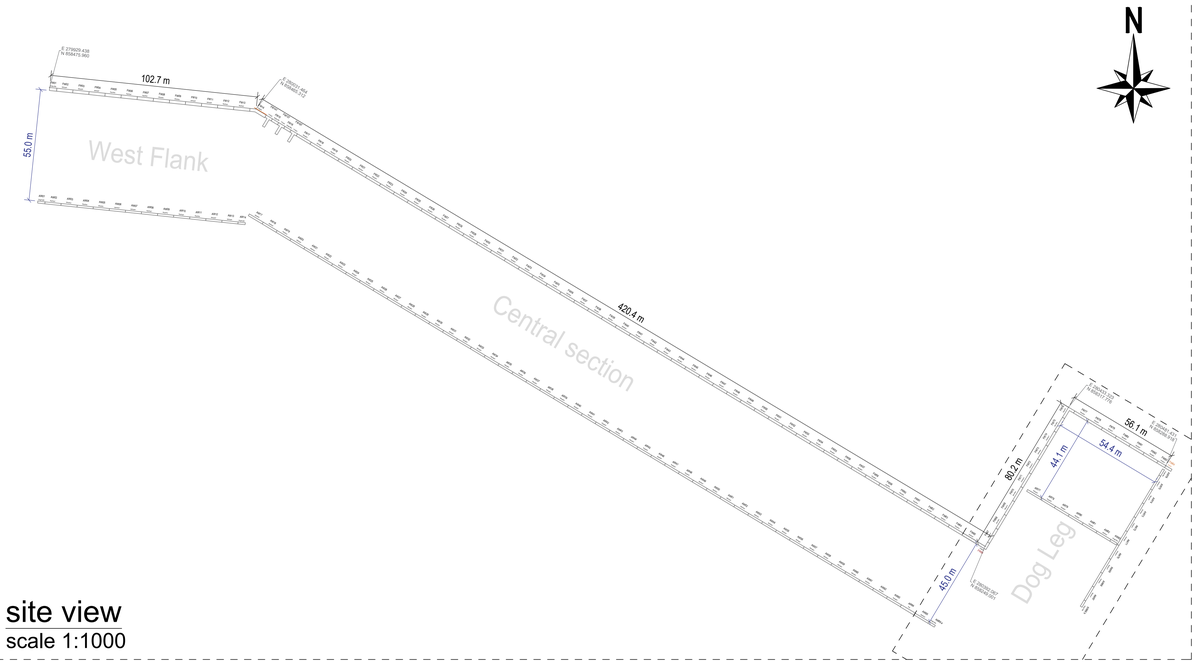
site view
scale 1:200

CHANGE	DESIGNED BY	SITE ENGINEER	DATE	INDEX
0. Preliminar Version	Alexander Metka David Puller	Dien Nackaerts	07/02/2024	A
1. First Issue	Alexander Metka David Puller	Dien Nackaerts	12/02/2024	B

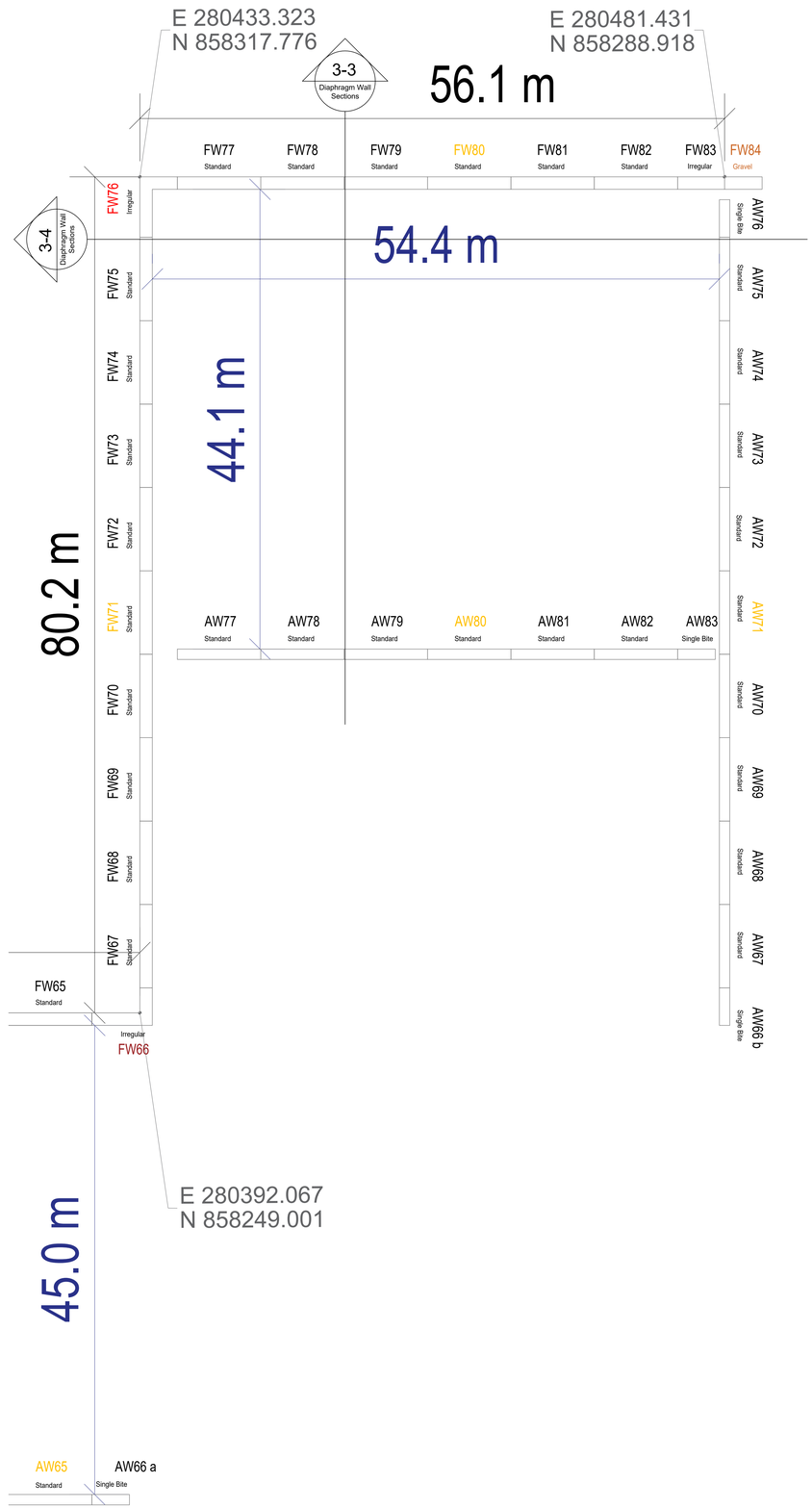
BAUER Technologies Ltd.
10 Ducketts Wharf, South Street
Bishops Stortford, Hertfordshire, CM23 3AR
United Kingdom
Tel: +49 8252 97-0
www.bauer.de

CLIENT	Haventus Ltd.
MAIN CONTRACTOR	Bauer Technologies Ltd.
PROJECT	Ardersier Port, Scotland
DRAWING	Quay wall - Panel Layout Central Section (2)

SCALE : Var.	DRAWN : Dien Nackaerts	DATE : 11.02.2024	
	CHECKED : Brandon Ferreira	DATE : 11.02.2024	
PLAN SIZE: A0	DESIGNED BY: David Puller Alexander Metka	DATE : 11.02.2024	
PROJECT NO.: 1531	DRAWING NO.:	BAU-WP1-D-WALL-CA-X-000004	



site view
scale 1:1000



site view
scale 1:200

Basics			
Plan-No.	Drawn by	Date	Format
ARUP-S1002 P03	ARUP	6/21/2023	PDF
294067-ARUP-Z1-XX-SK-CG-000108 P02	ARUP	9/28/2023	PDF

Associated plans		
Plan-No.	Plan Title	
	Quay Wall - Cross Sections	1

NOTES:

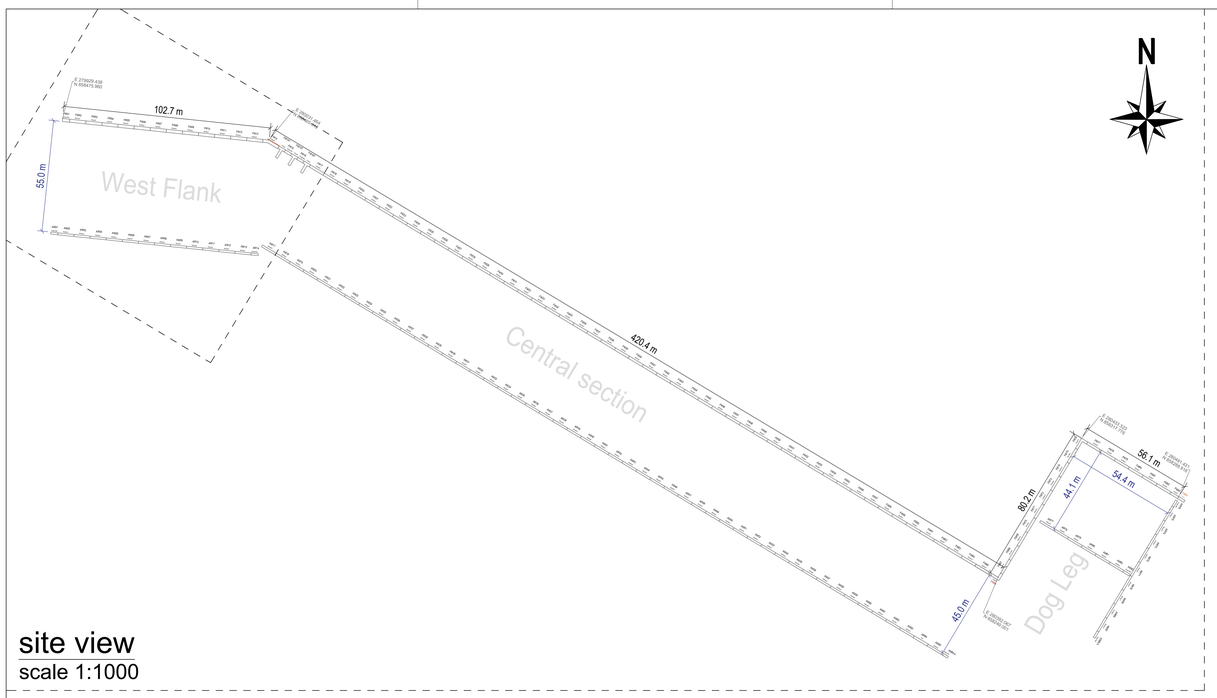
1. Starter panels indicated in Yellow
2. Follower panels indicated in Black
3. Closure panels indicated in Red
4. Design to verify panels - dimensions susceptible to change
   FW76, FW66, AW66 a&b, AW76, AW83, FW83

Panel Layout Size		
Panel Type	Length	Width
Standard FW Straight / dogleg	8,0m	1,2m
Standard FW Western Flank	8,0m	1,5m
Standard AW	8,0 m	1,0m
Single Bite FW Straight / dogleg	3,6m	1,2m
Single Bite FW West Flank	3,6m	1,5m
Single Bite AW	3,6m	1,0m
T-Panel	3,6m // 5,6m	1,2m
Irregular FW 14	8,5m	1,5m
Irregular FW 66&76	7,8m	1,2m
Irregular FW 83	4,5m	1,0m

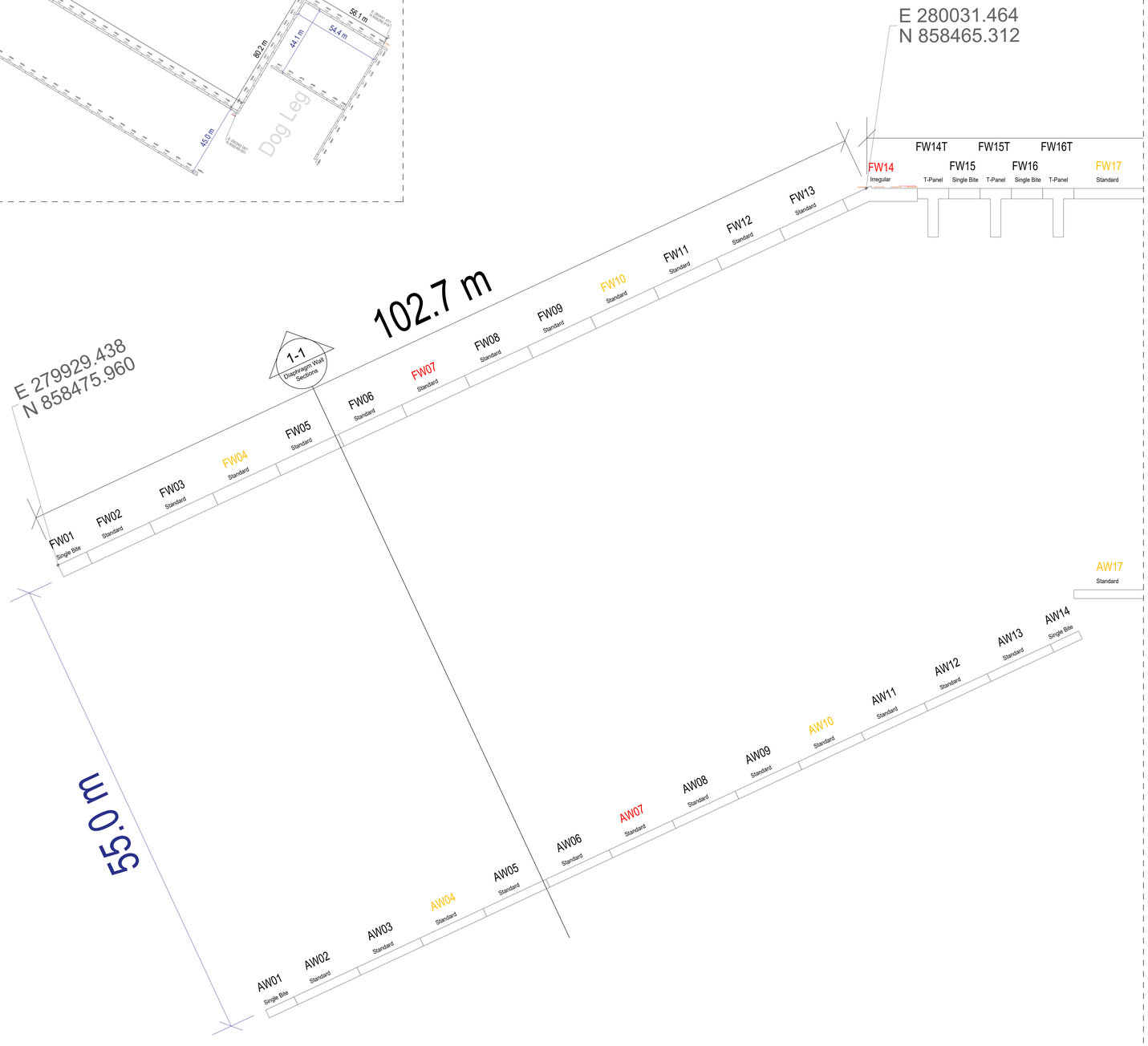
CHANGE	DESIGNED BY	SITE ENGINEER	DATE	INDEX
0. Preliminar Version	Alexander Metka David Puller	Dien Nackaerts	07/02/2024	A
1. First Issue	Alexander Metka David Puller	Dien Nackaerts	12/02/2024	B

BAUER Technologies Ltd.
10 Ducketts Wharf, South Street
Bishops Stortford, Hertfordshire, CM23 3AR
United Kingdom
Tel: +49 8252 97-0
www.bauer.de

CLIENT	Haventus Ltd.
MAIN CONTRACTOR	Bauer Technologies Ltd.
PROJECT	Ardersier Port
DRAWING	Quay wall - Panel Layout Dogleg
SCALE : Var.	DRAWN : Dien Nackaerts DATE : 12.02.2024
	CHECKED : Brandon Ferreira DATE : 12.02.2024
PLAN SIZE: A0	DESIGNED BY: David Puller, Alexander Metka DATE : 12.02.2024
PROJECT NO.: 1531	DRAWING NO.: BAU-WP1-D-WALL-CA-X-000002



site view
scale 1:1000



site view
scale 1:200

Basics			
Plan-No.	Drawn by	Date	Format
ARUP-S1002 P03	ARUP	6/21/2023	PDF
294067-ARUP-Z1-XX-SK-CG-000108 P02	ARUP	9/28/2023	PDF

Associated plans		
Plan-No.	Plan Title	
	Quay Wall - Cross Sections	1

NOTES:

1. Starter panels indicated in Yellow
2. Follower panels indicated in Black
3. Closure panels indicated in Red
4. Design to verify panels - dimensions susceptible to change
   AW01, FW01, FW14 (T), FW15 (T), FW16 (T)

Panel Layout Size		
Panel Type	Length	Width
Standard FW Straight / dogleg	8,0m	1,2m
Standard FW Western Flank	8,0m	1,5m
Standard AW	8,0 m	1,0m
Single Bite FW Straight / dogleg	3,6m	1,2m
Single Bite FW West Flank	3,6m	1,5m
Single Bite AW	3,6m	1,0m
T-Panel	3,6m // 5,6m	1,2m
Irregular FW 14	8,5m	1,5m
Irregular FW 66&76	7,8m	1,2m
Irregular FW 83	4,5m	1,0m

CHANGE	DESIGNED BY	SITE ENGINEER	DATE	INDEX
0. Preliminar Version	Alexander Medka David Puller	Dien Nackaerts	07/02/2024	A
1. First Issue	Alexander Medka David Puller	Dien Nackaerts	12/02/2024	B

BAUER Technologies Ltd.
10 Ducketts Wharf, South Street
Bishops Stortford, Hertfordshire, CM23 3AR
United Kingdom
Tel: +49 8252 97-0
www.bauer.de

CLIENT	Haventus Ltd.
MAIN CONTRACTOR	Bauer Technologies Ltd.
PROJECT	Ardersier Port
DRAWING	Quay wall - Panel Layout Western Flank

SCALE : Var.	DRAWN : Dien Nackaerts	DATE : 12.02.2024	
	CHECKED : Brandon Ferreira	DATE : 12.02.2024	
PLAN SIZE: A0	DESIGNED BY: David Puller, Alexander Medka	DATE : 12.02.2024	
PROJECT NO.: 1531	DRAWING NO.: BAU-WP1-D-WALL-CA-X-000001		

Appendix A – Panel Layout

https://bauergroup.sharepoint.com/:u:/r/sites/P-BST-BCP-1531-ArdersierPort-C2023000507/Shared%20Documents/2_Execution/11_HSE/11_02%20RAMS/11_02_02%20Method%20Statements/11_02_02_01%20Construction%20of%20Diaphragm%20Wall/Appendix%20B%20Panel%20Layout%20Rev%20C02_OneDrive_1_21-03-2024.zip?csf=1&web=1&e=yANRLJ

Coastal Modelling Assessment Report

Ardersier Port - Deeper Dredge
Coastal Model and Assessment Update

July 2024

CONTROL SHEET

Client: Ardersier Port (Scotland) Limited
Project Title: Ardersier Port - Deeper Dredge
Report Title: Coastal Model and Assessment Update
Document number: 13845
Project number: 678420

Issue Record

Issue	Status	Author	Reviewer	Approver	Issue Date
1	Issue	MN	KMD	MN	15/12/2023
2	Issue	MN	KMD	MN	12/01/2024
3	Issue	MN	CCAS	MN	12/07/2024

EnviroCentre Limited Office Locations:

Glasgow **Edinburgh** **Inverness** **Banchory**

Registered Office: Craighall Business Park 8 Eagle Street Glasgow G4 9XA
Tel 0141 341 5040 info@envirocentre.co.uk www.envirocentre.co.uk

EnviroCentre Limited is registered in Scotland under no. SC161777.

VAT no. GB 348 6770 57.

Contents

Appendices

Figures

Tables

1 INTRODUCTION

1.1 Terms of Reference

EnviroCentre Ltd has been appointed by Ardersier Port (Scotland) Limited to undertake a Coastal Model and Assessment Update Study to assess the impact of a proposed revised dredge design and harbour arrangement at Ardersier Port.

1.2 Scope of Report

This study aims to update existing coastal Hydrodynamic (HD), Spectral Wave (SW) and Sand Transport (ST) models of conditions at Ardersier Port, to reflect existing pre-development (baseline) conditions, and proposed post-development conditions with the revised dredge channel and harbour complete. The updated HD model will enable simulation and characterisation of tidal flow under pre-development (baseline) and post-development conditions. The updated SW model will enable simulation and characterisation of wave climate under pre-development (baseline) and post-development conditions. The updated ST model will enable simulation and characterisation of sand transport under pre-development (baseline) and post-development conditions.

This report will present details of the baseline coastal conditions at the development site, outline the HD, SW and ST model development, and describe the model simulations and results. The baseline and post-development model results will be compared to model results for the previously consented dredge channel arrangement, in order to assess the relative impact of proposed design changes. This assessment builds on the 2018 Ardersier Port Coastal Processes Assessment (EnviroCentre Report No. 8364) and represents an update to the recent July 2023 Ardersier Port Coastal Processes Assessment (EnviroCentre Report No. 13546) and should be read with reference to those reports.

1.3 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre Limited.

If this report is to be submitted for regulatory approval more than 12 months following the report date, it is recommended that it is referred to EnviroCentre Limited for review to ensure that any relevant changes in data, best practice, guidance or legislation in the intervening period are integrated into an updated version of the report.

Whilst the Client has a right to use the information as appropriate, EnviroCentre Limited retains ownership of the copyright and intellectual content of this report. EnviroCentre Limited does not accept liability to any third party for the contents of this report unless written agreement is secured in advance, stating the intended use of the information.

EnviroCentre Limited accepts no liability for use of the report for purposes other than those for which it was originally provided, or where EnviroCentre Limited has confirmed it is appropriate for the new context.

2 CONTEXT

2.1 Site Location, Historic Development and Operations

The development site is located on the former McDermott Fabrication Yard, which lies some 7.5 km to the west of Nairn, 18 km northeast of Inverness and 3 km northeast of the village of Ardersier, centred on grid reference NH812 576.

The site is bounded by Whiteness Spit and the Moray Firth to the north; extensive undeveloped sand and mudflats, known as the Carse of Delnies to the east; Carse Wood to the south; and Whiteness Head tidal sands and mudflats to the west. To the southwest of the site lies the boundary of Fort George owned by the Ministry of Defence (MoD).

The site extends to some 307 hectares, and includes a 1,000 metre long quay and associated berth which is protected by the naturally occurring sand and shingle spit, salt marsh and dunes.

The majority of the site was historically reclaimed using dredged sand that was levelled behind a steel pile retaining wall at approximately 4.5 m above ordnance datum (OD). Following reclamation, the site was developed for industrial use as the McDermott Fabrication Yard, which specialised in the fabrication and construction of offshore platforms used in the development of the North Sea oil and gas industry. Fabrication activities ceased at the site in 2001 and the site has subsequently been cleared. It is proposed to dredge the port entrance and reinstate the site for this industrial use.

Figure 2-1: Historic Aerial Photograph of Operational McDermott Yard

2.2 Dredging Activity to Date

The original fabrication yard at Ardersier was developed in 1972. Initial construction of the yard area saw the formation of the navigation channel and harbour with the dredged material being pumped ashore for land reclamation purposes to create the main yard area. Subsequent maintenance dredging operations were carried out at typically 18-24 month intervals up until 2001. No further dredging took place until 2022, when the present harbour and navigation dredging operations commenced.

The original navigation channel width was nominally 100 m with the dredge depth taking account of the particular vessels using the channel. Admiralty Chart 1077 indicates a dredge depth to -4.7 m Chart Datum (CD).

A dredging licence was consented as part of plans to re-open Ardersier Port in 2014, which included a navigation channel width of 120 m and a dredge to -8.5 mCD. The planned dredging did not take place at that time and a subsequent dredging licence was consented in 2018 which included a navigation channel width of 120 m and a dredge to -6.5 mCD. Dredging of the harbour and navigation channel commenced under this consent in 2022, but the full dredge has not been completed.

2.3 Proposed Dredge Activity

The consented dredge activity, as per licence reference MS-00010583, is provided in Drawing 676693-GIS006 (Appendix A), with the details of the outer channel design provided in ARUP Drawing 294067-ARUP-XX-XX-DR-CG-002001 (Appendix A), where the proposed increase to the dredge versus the previous design iteration is as follows:

1. Depth from the approved -6.5 mCD to -12.9 mCD in the navigation channel and harbour approach; and
2. Increased dredge amount from the approved 5,000,000 wet tonnes (wt) by 3,600,000 wt to 8,600,000 wt.

The licenced dredge activity increases the previously consented dredge depth in 2018 by 6.4 m and the previously consented dredge depth in 2014 by 4.4 m. The navigation channel width now varies (130 – 160 m at the outer approach, 160 – 278 m in the mid-channel and 102 – 168 m in the harbour approach), compared to the previously consented 120m width (dimensions from ARUP Drawing 294067-ARUP-XX-XX-DR-CG-002001). Within the inner harbour to the eastern end of the quay, two dredge pockets at -6.5 and -3 mCD are to be retained from the previously consented 2018 dredge design.

2.4 Overview of Previous Coastal Studies

Assessment and modelling were undertaken in support of reinstating the navigation channel and harbour as part of an Environmental Impact Assessment for a capital dredge licence issued by Marine Scotland in 2014, however no dredging was undertaken through this licence. Subsequent to this, the coastal processes were assessed and modelled again in 2018 in support of reinstating the navigation channel and harbour as part of an Environmental Impact Assessment Report in support of the dredge licence that was consented. Previous investigations undertaken into the coastal processes around Whiteness Head that are relevant to the proposed dredge activities include:

- Geological Conservation Review: Whiteness Head, J.D. Hansom © JNCC 1980–2007. Volume 28: Coastal Geomorphology of Great Britain, Chapter 6: Gravel and ‘shingle' beaches – GCR site reports (GCR ID: 1442) (http://www.jncc.gov.uk/page-2731).

- Port of Ardersier: Whiteness Head Coastal Assessment, May 2013. EnviroCentre Report No 5474 to Port of Ardersier.
- Coastal Processes Assessment, September 2018. EnviroCentre Report No 8364 to Ardersier Port Ltd.
- The coastline at Whiteness Head is also included in the National Coastal Change Assessment (NCCA) led by the Scottish Government (Hansom, Rennie & Fitton, 2017; The Scottish Government, 2017).

The 2018 coastal assessment built upon the 2013 assessment through continued assessment of bathymetry change in the period between assessments and adoption of more detailed sediment modelling techniques. A conceptual understanding of sediment transport and coastal morphology within the local coastal system was developed through review of observed and historic changes, supplemented by hydraulic modelling, as presented in Figure 2-2 below.

The conceptual model includes the longshore transport of sand and gravel along the eastern shore of Whiteness Head spit resulting in continued spit extension to the north-west, with recurves to the south-west. A continuity of this north-western transport pathway is highlighted, both offshore to the deeper waters of the main channel, and further west to the north-eastern intertidal and subtidal margin of Whiteness Sands.

The conceptual model includes the offshore movement of sand from the northern margin of Whiteness Sands, and a returning eastern transport pathway further offshore. This eastern pathway is considered to also contribute sediment to the tidal inlet, and the southern coastline of Whiteness Sands. Central areas of Whiteness Sands are considered to be generally stable within the local context of Whiteness Head. This local coastal system has been subject to modification in the form of dredging for the McDermott Construction Yard from the early 1970’s until around 2001. This site history was noted to remain an influence on present day processes, particularly on the extent and direction of spit head recurve, and on the volume of water exchanged within the tidal inlet. These have resultant localised impacts on currents and associated sediment transport processes, while the wider scale processes continue uninterrupted.

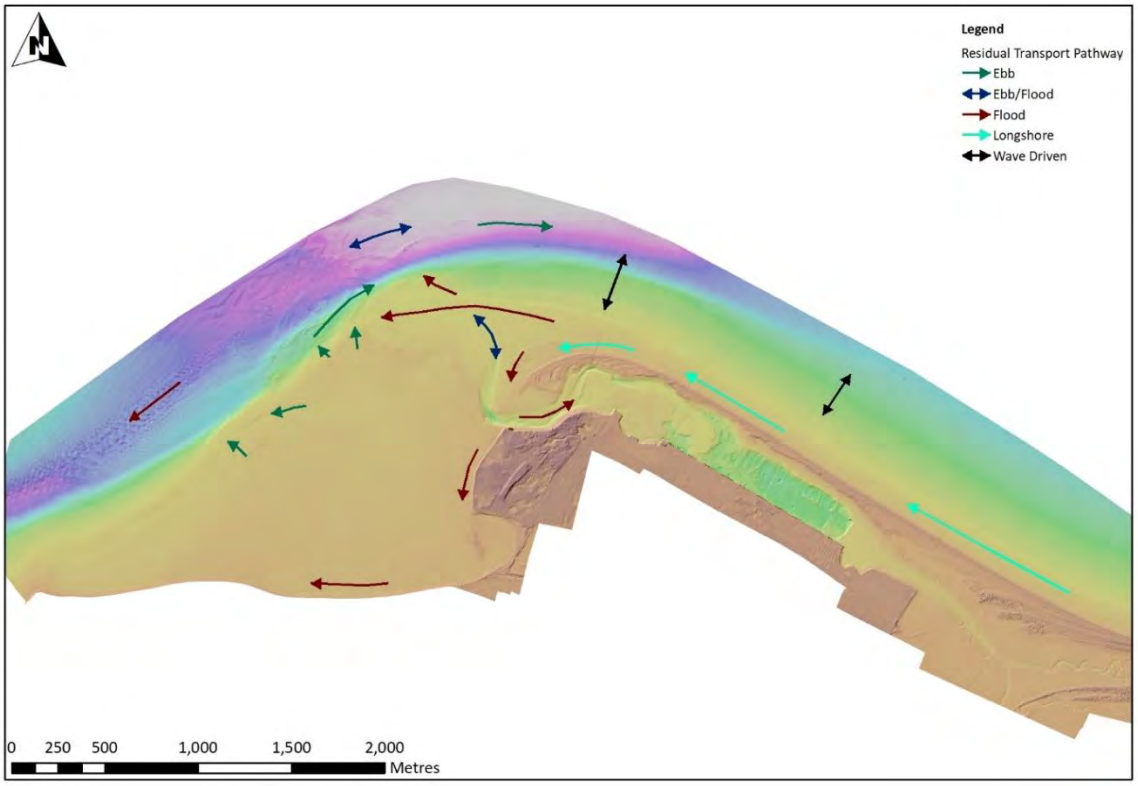


Figure 2-2: Conceptual Model of Sediment Transport Pathways (EnviroCentre, 2018)

3 BASELINE CONDITIONS

3.1 Topography and Bathymetry

The adjacent wider bathymetry of the Inner Moray Firth includes the presence of a number of important features to the local hydrodynamic regime, including the channels (north and south) around the Riff Bank sand bank opposite Ardersier Port, and to the west, the narrows between Fort George and Chanonry Point. The wider bathymetry of the Inner Moray Firth is discussed further in section 4.3.1.

The local bathymetry within the harbour and navigation channel has been subject to active change over recent years, particularly in response to recent localised dredging operations. An updated bathymetric and topographic survey was completed by CainTech in June 2023. A Digital Surface Model (DSM) has been generated using the 2023 survey data for the site and immediate surrounds, as shown in Figure 3-1 below.

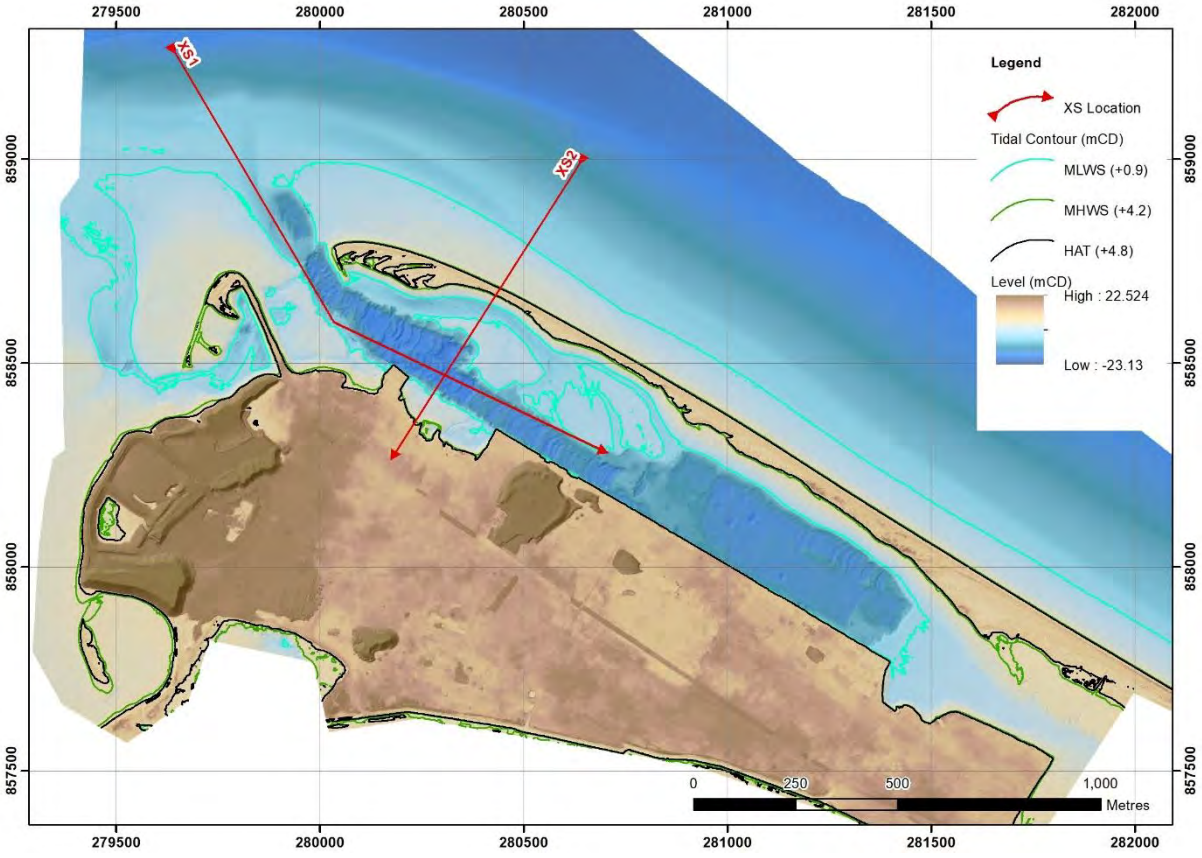


Figure 3-1: Digital Surface Model (DSM) Ardersier Port - CainTech 2023 Survey

3.1.1 Comparison of 2023 Bathymetry Versus 2018 Bathymetry

A comparison has been undertaken between the recent 2023 bathymetry data, and the corresponding 2018 data. Where available 2021 bathymetry data, surveyed by FC Geomatics, has also been considered. Figure 3-2 presents a plot of bathymetry differential between the 2023 and 2018 datasets, red colours indicating areas of increased bed level, and blue colours indicating decreased bed level. Areas shown in white are considered to have no significant change in level (<0.1 m change). Review of this figure highlights the areas (darker blues) dredged since 2018 within the outer harbour, and through the spit recurve, and also the areas (darker reds) of deposition within the harbour and previous navigation channel. Also noticeable are the areas of intertidal spit extension, highlighting the ongoing north-westward extension of the sand spit, and the recurve of the spit head towards the west. Further offshore the bathymetric differentials highlight other sand transport features, including sand waves.

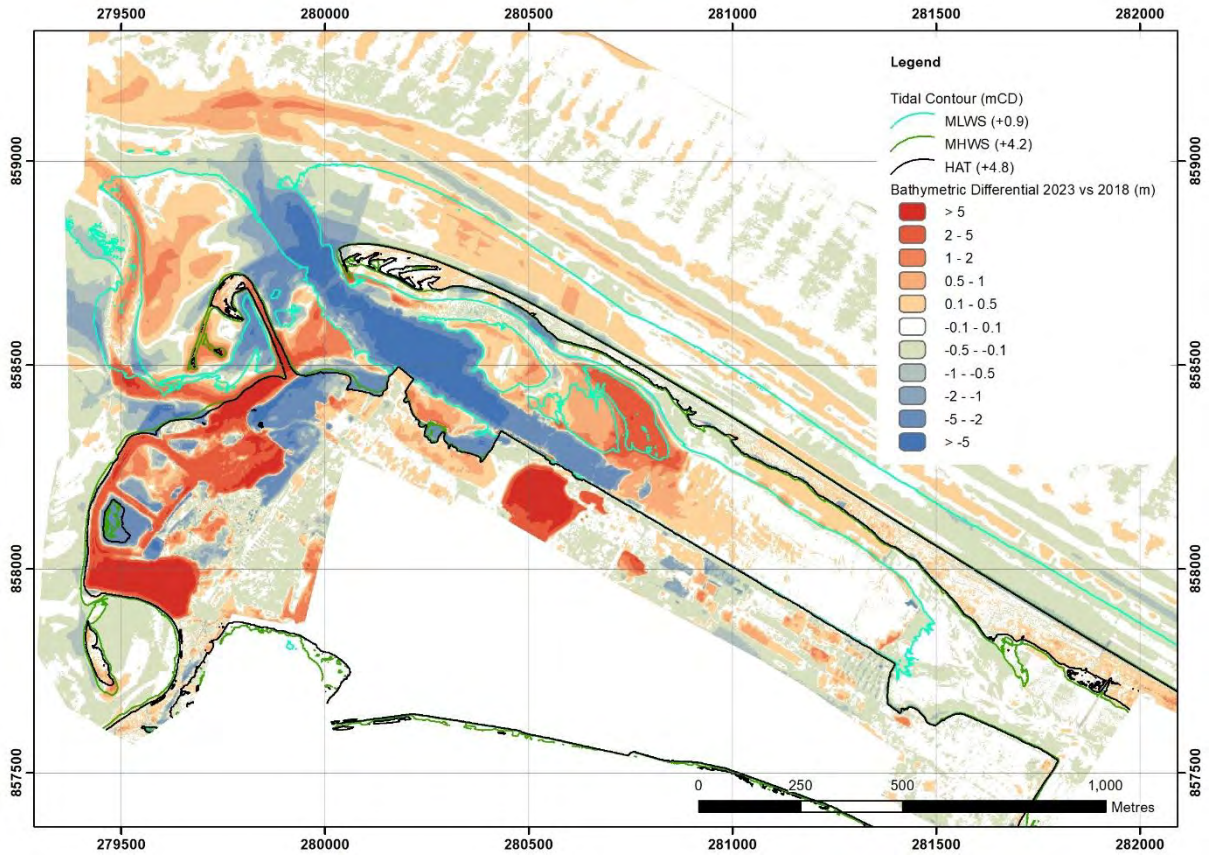


Figure 3-2: Bathymetric Survey Differential (2023 Levels minus 2018 Levels)

As shown in Figure 3-3 and Figure 3-4, cross-sectional comparison has also been undertaken for XS1 and XS2, the locations of which are presented in Figure 3-1. The XS1 comparisons includes 2021 data captured for limited areas within the harbour and approach. Review of the figures highlights similar changes to those captured in the differential plot above. The observed changes are broadly consistent with the conceptual model developed in 2018 (see Figure 2-2), noting that some dredging has taken place.

Figure 3-3: XS1 Comparison of 2018, 2021 and 2023 Levels

Figure 3-4: XS2 Comparison of 2018, 2021 and 2023 Levels

3.2 Sediment

Several phases of sediment sampling have been undertaken over recent years in the vicinity of Ardersier Port. The site investigations to date have found that Whiteness Sands, spit and associated channel are essentially formed in mobile sand deposits. Four sand types can be identified based on lognormal particle size populations. The spatial distributions of the following sand fractions at the time of survey (2013) are shown in Figure 3-5:

- **Medium-coarse sand** – Mode 0.355 mm. Normally present forming a secondary bimodal grain population with a dominant medium-fine sand. Indicative of bedload transport.
- **Medium sand** – Mode 0.250 mm. Normally present forming a bimodal grain population with a dominant medium-fine sand. Indicative of bedload transport.
- **Medium-fine well-sorted sand** - Mode 0.180 mm. Almost ubiquitous outside the zone immediately offshore from the spit. The sand population most easily set in motion by flowing water, typically moving as near-bed suspension.
- **Fine sand** – Mode 0.150 – 0.125 mm. Dominates the seabed offshore from the spit, typically unimodal. Indicative of suspended load transport processes.

Gravel deposits are present to the surface of the spit, predominantly along and above the high water mark, and are present in lower quantities within the immediate vicinity of the spit. Sediment within the immediate vicinity of the dredging activity is generally associated with present day processes, however, chart annotations of seabed conditions highlight adjacent areas of drift deposit exposure. These annotations indicate there are two eroding Holocene or Pleistocene deposits in the area, the foreshore and offshore area to the east of the spit, and the Fort George narrows area. In these two zones recent deposits are probably thin or absent, with erosion providing an important source of gravel to be reworked by present day processes.

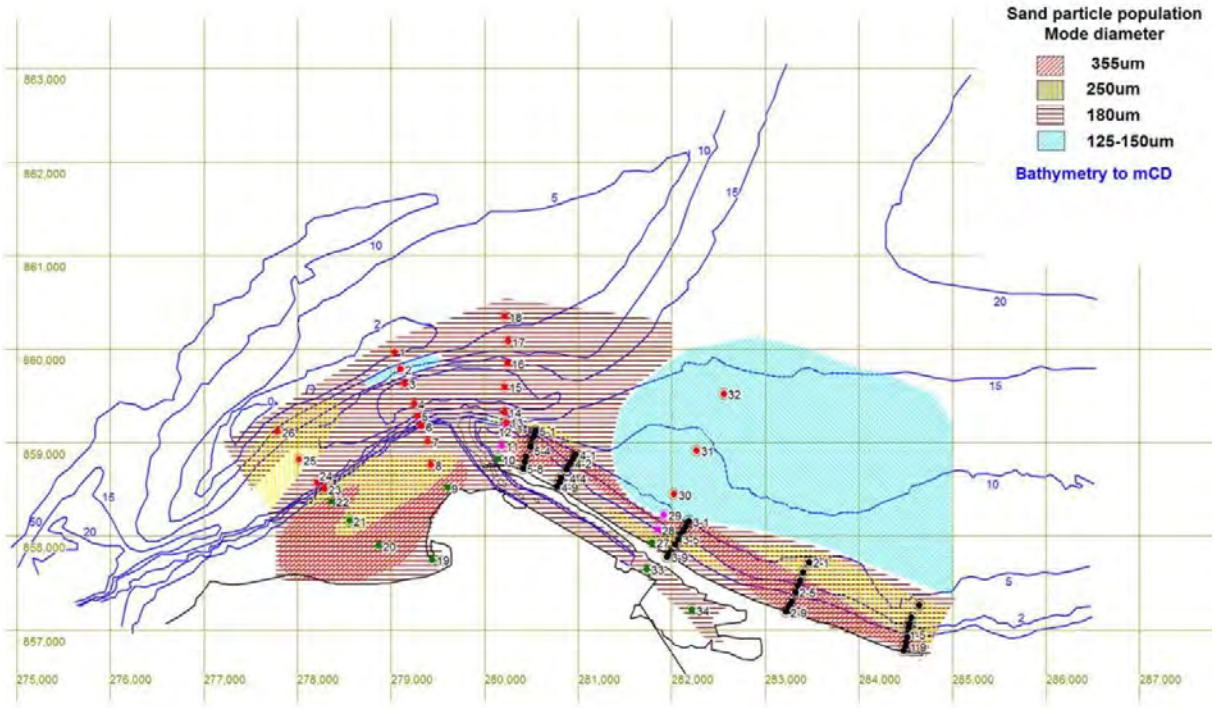


Figure 3-5: Distribution of Sand Particle Populations and Grab Sample Locations (2013)

3.3 Tidal Regime – Levels and Currents

Tidal levels at Ardersier Port (formerly McDermott Base) as presented within the Admiralty Tide Tables show a maximum astronomical tidal range of 4.6 m, a mean tidal range of 3.3 m during spring tides and 1.6 m during neap tides (Table 3-1). More extreme event offshore water levels nearby from SEPA predictions include a 1 in 200 year return period event of 3.51 mAOD (Table 3-2).

Table 3-1: Tidal Water Levels – Ardersier Port

Tide Condition	Chart Datum (mCD)*	Ordnance Datum (mOD)
Highest Astronomical Tide (HAT)	4.8	+2.66
Mean High Water Spring (MHWS)	4.2	+2.06
Mean High Water Neap (MHWN)	3.3	+1.16
Mean Sea Level (MSL)	2.5	+0.36
Mean Low Water Neap (MLWN)	1.7	-0.44
Mean Low Water Spring (MLWS)	0.9	-1.24
Lowest Astronomical Tide (LAT)	0.2	-1.94

*Chart Datum correction for Ordnance Datum is -2.14m (relative to OD at Newlyn)

Table 3-2: Ardersier Port Extreme Sea Levels (SEPA Dataset)

Return Period (Years)	Water Level (mCD)	Water Level (mAOD)
2	5.05	2.91
5	5.14	3.00
10	5.21	3.07
50	5.36	3.22
100	5.43	3.29
200	5.49	3.35
1000	5.65	3.51

4 HYDRODYNAMIC MODEL

4.1 MIKE 21 Flow Model FM – Hydrodynamic (HD) Module

MIKE 21 Flow Model FM is a modelling package based on a flexible mesh (FM) structure, developed by the Danish Hydraulic Institute (DHI). The modelling system has been developed for applications within oceanographic, coastal and estuarine environments. The Hydrodynamic Module (HD) is the central computational component of the package, solving 2D shallow water equations. The module simulates unsteady flow taking account of bathymetry, sources and external forcing, it consists of continuity, momentum, temperature, salinity and density equations. The latest version of the software, MIKE 2023, has been used within this assessment.

4.2 Model Extent

The coastal model extent covers a large portion of the Inner Moray Firth, extending from the Beauly Firth in the west, to Balintore and Findhorn in the east, including the Cromarty Firth as shown in Figure 4-1. This model extent is similar to that adopted in previous phases of modelling undertaken in relation to Ardersier Port, however the coastline detail, bathymetry and model mesh have all been updated and refined for this latest phase of modelling.

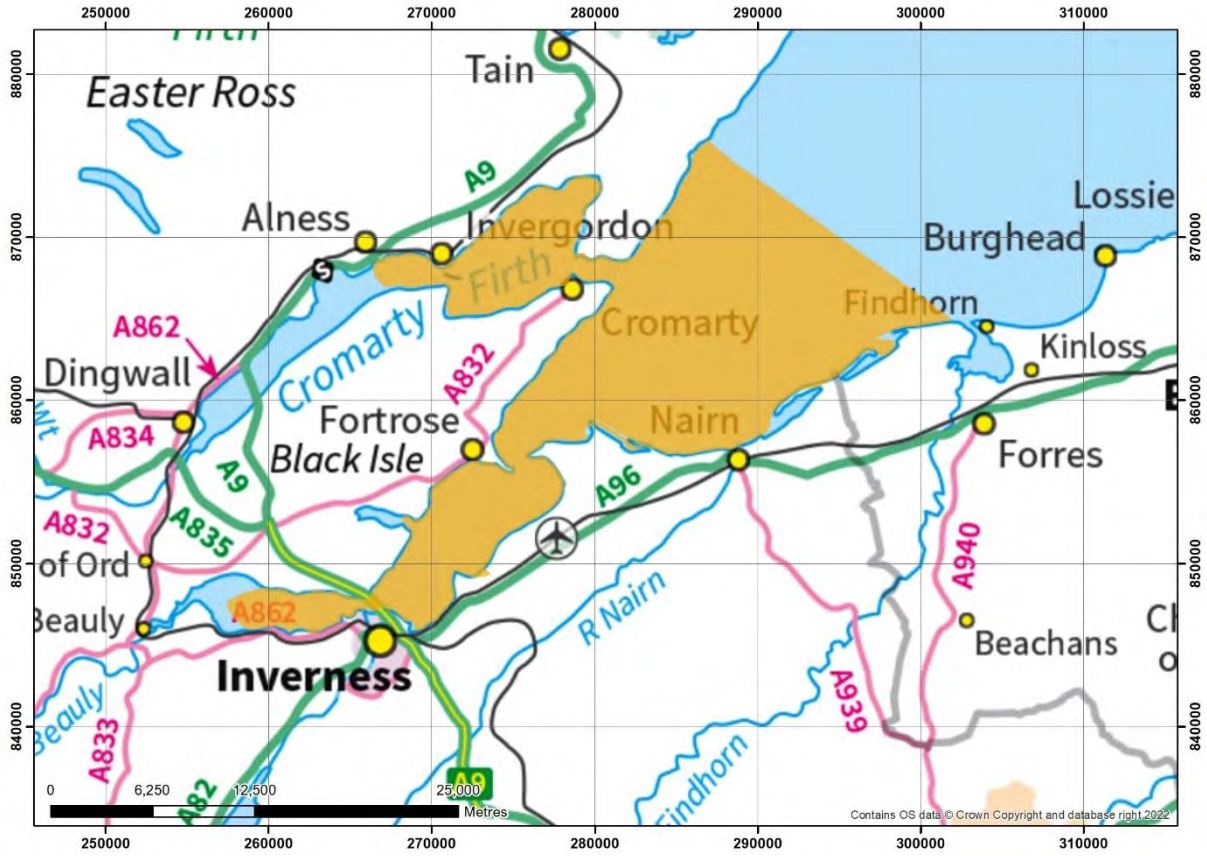


Figure 4-1: Model Extent (Orange)

4.3 Input Data

4.3.1 Bathymetry

The following bathymetric data has been used within the modelling study:

- UK Hydrographic Office (UKHO) Bathymetric Survey[1]
  - Moray Firth 0-40m 2m resolution (2020);
  - Moray Firth 38-40m 4m resolution (2020);
  - Moray Firth Riff Bank 2m resolution (2022).
- DHI C-Map bathymetry data in wider Moray Firth;
- Aspect Surveys – Topographic and Bathymetric Survey Whiteness Head (2018);
- CainTech Surveys - Topographic and Bathymetric Survey Whiteness Head (2023).

The datasets have been used to create a combined Digital Terrain Model (DTM) for use within the hydrodynamic model. Snapshots of the DTM with bathymetry displayed relative to Chart Datum are presented in Figure 4-2 and Figure 4-3 below.

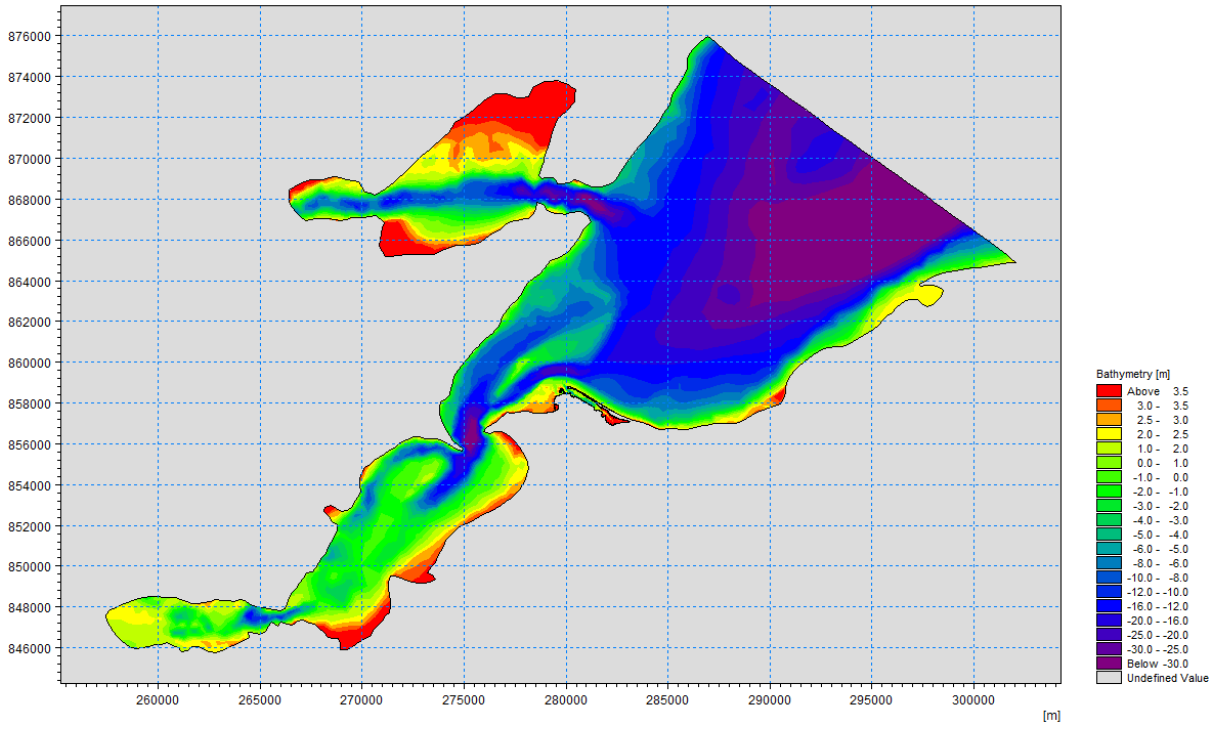


Figure 4-2: Model Bathymetry – Full Extent

[1] Admiralty Maritime Data Solutions: Seabed Mapping Service (https://seabed.admiralty.co.uk/?x=-19567.88&y=6780270.16&z=5.00)

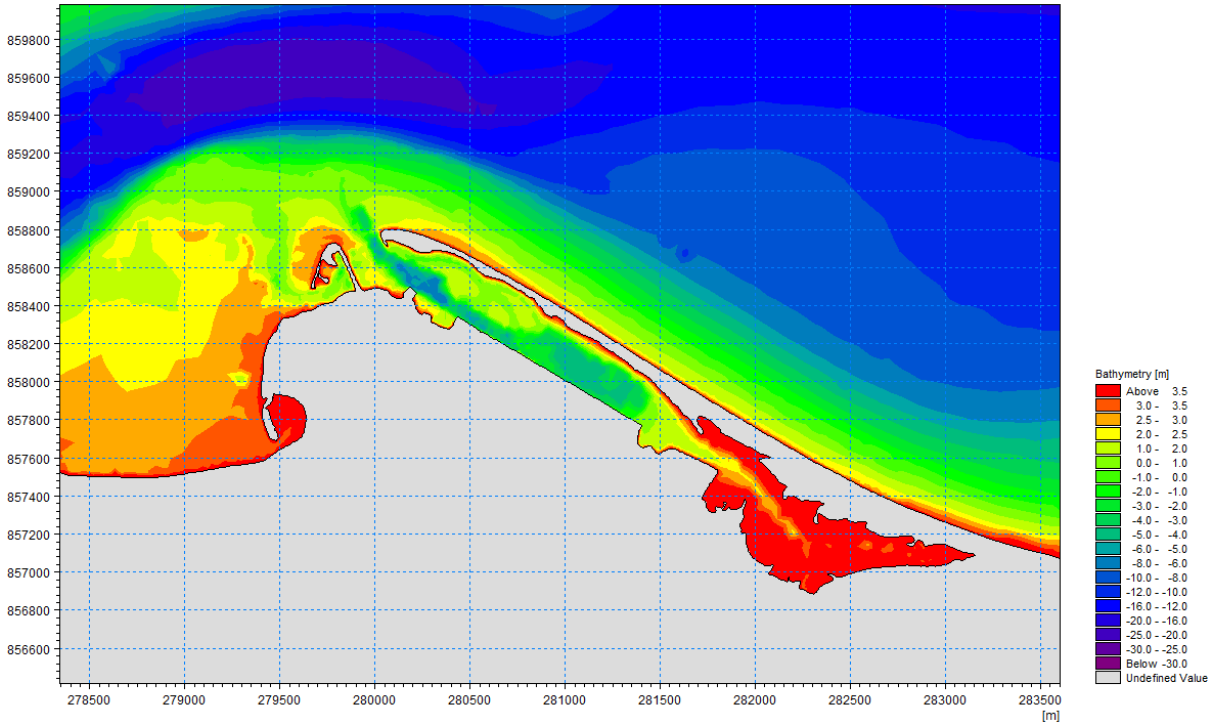


Figure 4-3: Model Bathymetry - Ardersier Port and Immediate Surrounds

4.3.2 Tidal Boundary Conditions

There is a single open tidal boundary within the model extent, located on the eastern perimeter stretching between Balintore in the north and Findhorn in the south. Tidal boundary conditions for the HD model have been extracted from the DHI Global Tide Model.

4.4 Model Mesh

The model utilises a flexible mesh to represent the offshore and coastal areas. The flexible mesh is composed of triangles of varying size and can therefore represent complex coastal alignments or bathymetry accurately.

The 2023 baseline model mesh extent and bathymetry are shown in Figure 4-4 below. The mesh has been generated using the bathymetric data described in section 4.3.1. The mesh has progressive refinement in resolution towards Whiteness Head, becoming finer in the area of interest, as shown in Figure 4-5 and Figure 4-6. Finer mesh regions have also been used to represent areas near the mouth of the Cromarty Firth, between Fort George and Chanonry Point, and at the Kessock Bridge, where narrow channels influence local hydrodynamics. Key characteristics of the baseline mesh are summarised in Table 4-1.

Table 4-1: Baseline HD Mesh Characteristics

Mesh Characteristic	Value
Number of elements	15,929
Number of nodes	9,102
Min. Z level (mCD)	-60.3
Max. Z level (mCD)	+5.9
Max triangular area - Ardersier Port Outer Harbour/Approach	600m^2 (approx. 25m resolution)

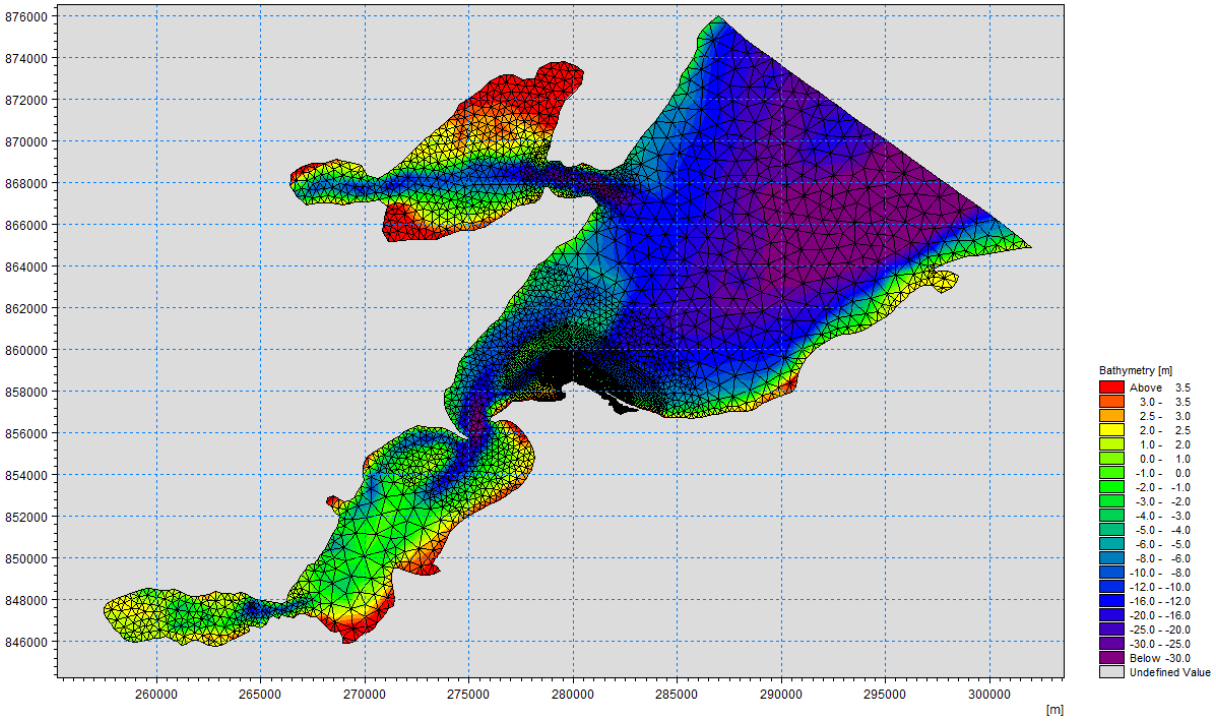


Figure 4-4: Baseline HD Model Mesh – Full Extent

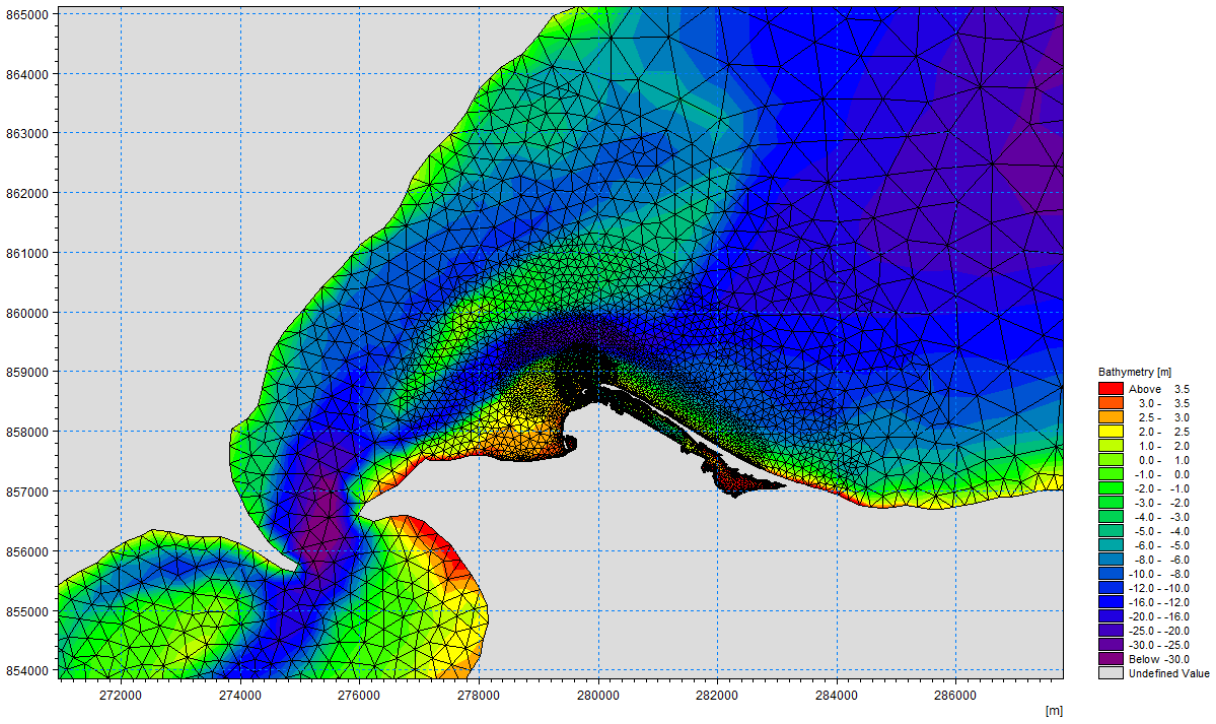


Figure 4-5: Baseline HD Model Mesh – Ardersier Port and Surrounds

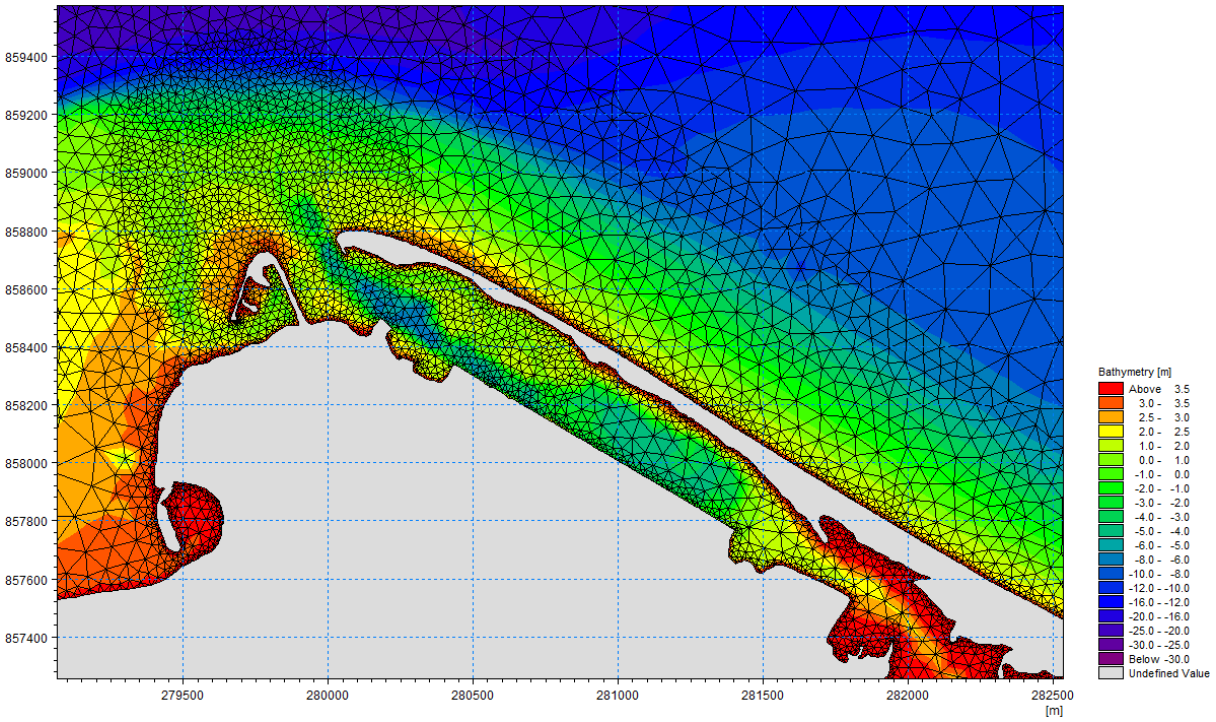


Figure 4-6: 2023 Baseline HD Model Mesh - Ardersier Port

A 2023 post-development version of the HD model mesh has been generated to include the proposed development footprint, as shown in Figure 4-7. The bathymetry for the post-development mesh was also updated to include the proposed dredge pockets. The proposed development layout and proposed dredge details are shown in Appendix A.

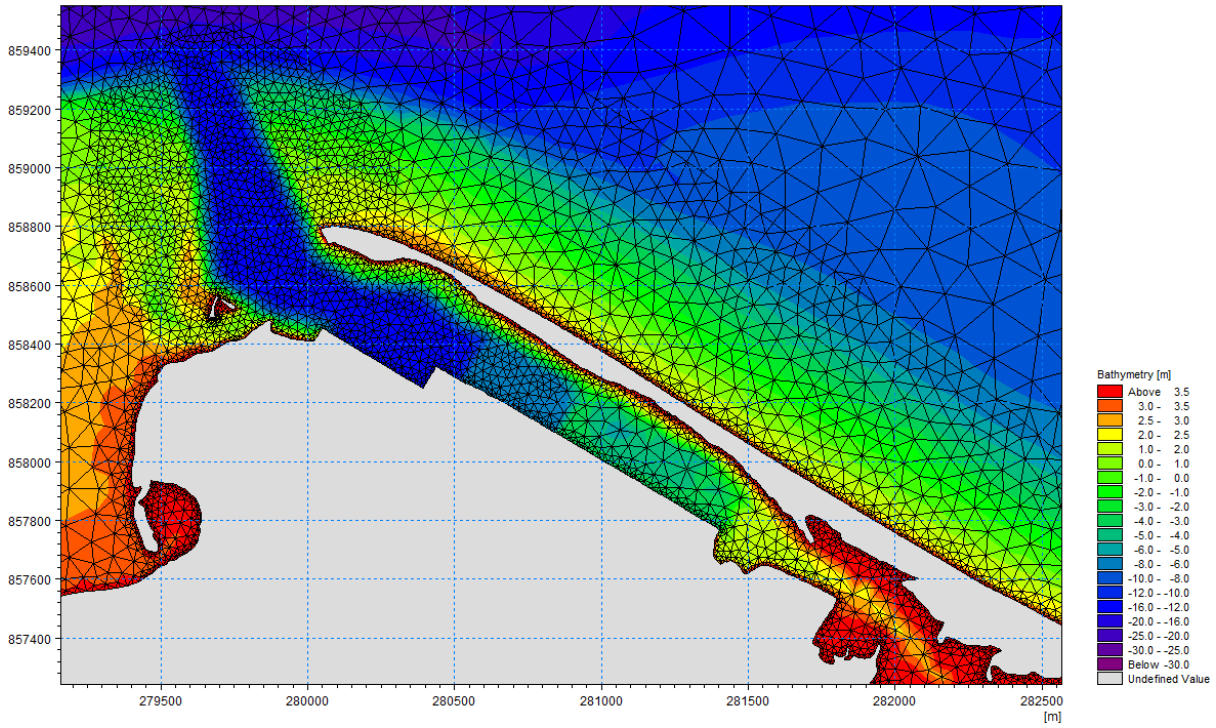


Figure 4-7: 2023 Post-Development HD Model Mesh – Ardersier Port

In addition to the 2023 model meshes described above, updated versions of the 2018 baseline and proposed-development model meshes have been developed. These include both the recently available more detailed wider Moray Firth bathymetry and the same mesh structure used in the 2023 meshes, in order to allow for better comparison with the 2023 model versions. Figure 4-8 and Figure 4-9 show the 2018 baseline and 2018 post-development model meshes respectively.

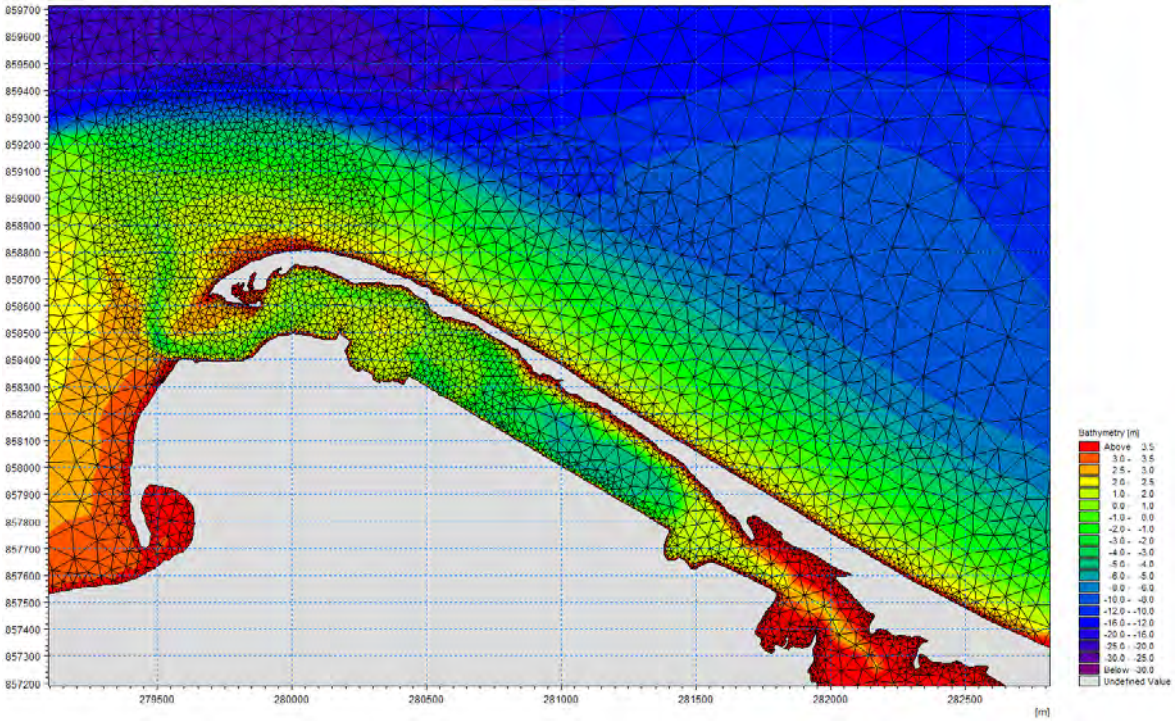


Figure 4-8: 2018 Baseline HD Model Mesh - Ardersier Port

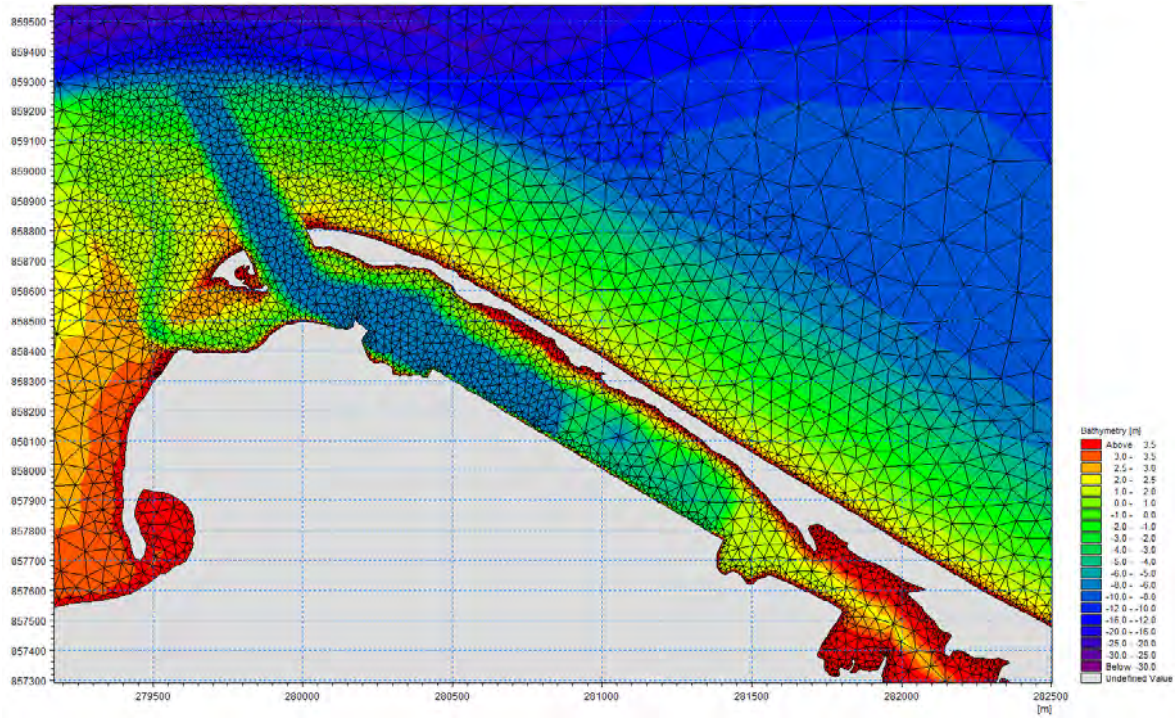


Figure 4-9: 2018 Post-Development HD Model Mesh – Ardersier Port

4.5 Model Setup

Further details of the MIKE 21 FM HD model setup are provided below:

- For each model simulation the modelled extent includes the entire mesh as described in section 4.4;
- Open boundary time-varying tidal water level conditions have been derived from the DHI global tide model as described in section 4.3.2;
- Further model parameters are detailed below:
    - Simulation time-step interval: 300s
    - Model solution technique: Higher order shallow water equations
    - Model solution time-step: Minimum (0.01s) Maximum (30s)
    - Drying depth: 0.005m
    - Wetting depth: 0.1m
    - Bed resistance: $32m^{(1/3)}/s$

The modelling has been undertaken with the following computing specification:

- Dell Precision 5820 Tower:
    - 64GB RAM;
    - Utilising 14 Cores – Intel Xeon CPU (2.5GHz);
    - Windows 10 Pro 64-bit operating system.

4.6 Model Outputs

The MIKE 21 FM HD model simulations have been setup to produce results as both point and area outputs. The outputs include the following key parameters:

- Water surface elevation;
- Current speed;
- Current direction; and
- Bed shear stress

The area outputs are generated for the whole model extent, whilst point outputs have been generated at a number of identified locations within the model extent, selected key locations are detailed in Table 4-2. The locations of the selected key point outputs are situated within the immediate vicinity of Whiteness Head and the proposed development including the capital dredge pockets. Point output locations are shown in Figure 4-10.

Table 4-2: HD Model Point Output Locations

Point Output Location	Easting	Northing
Point 2	279900	858850
Point 4	280200	858550
Point 6	281000	858150
Point 16	279500	859600

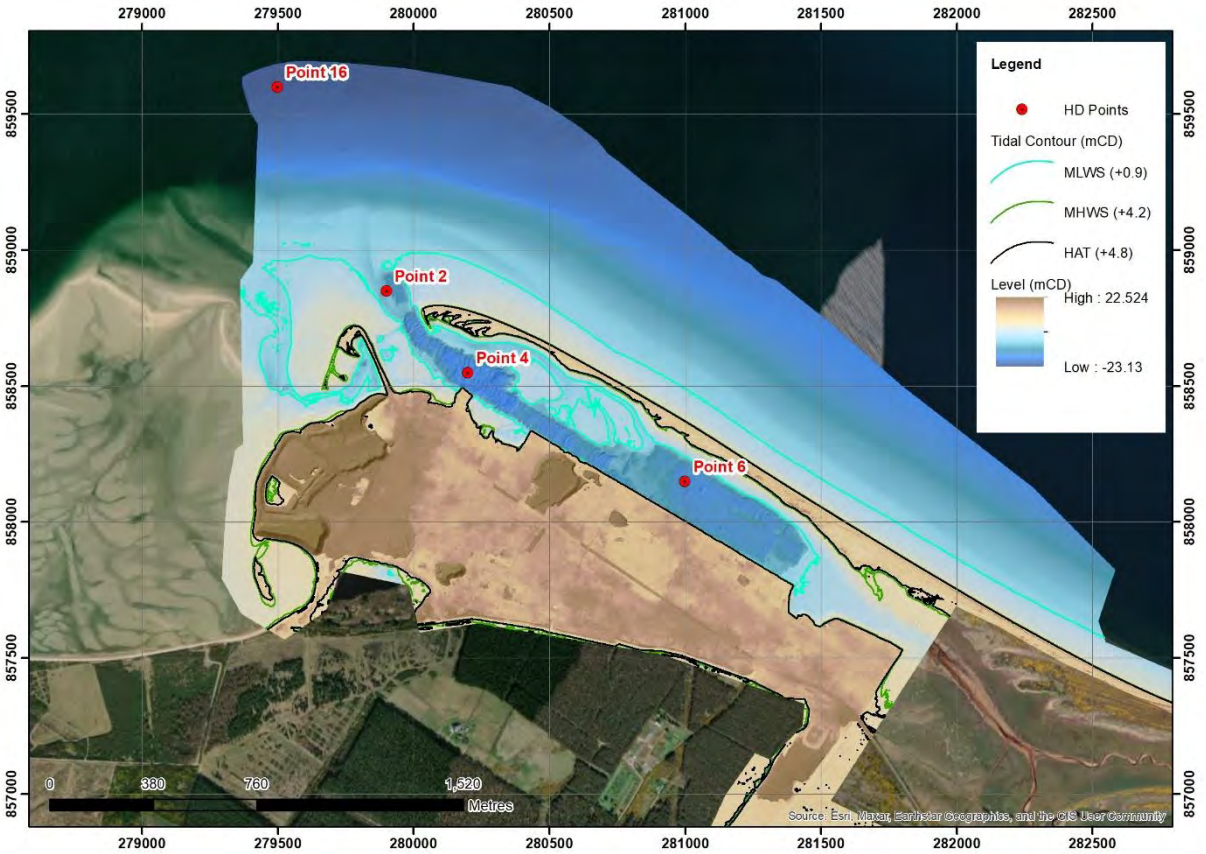


Figure 4-10: Selected Key HD Point Output Locations

4.7 Model Simulations

The key model simulations undertaken using the MIKE 21 FM HD model are presented in Table 4-3.

Table 4-3: HD Model Simulations

HD Model Simulation	Description
FMHD_A Baseline 2023	Baseline HD model simulating existing conditions, with present day (CainTech 2023) bathymetry. Run for January 2003 tidal cycle, including spring and neap tides.
FMHD_B PostDev 2023	Post-development HD model simulating conditions following proposed 2023 (-12.9 mCD) capital dredge, with present day (CainTech 2023) bathymetry. Run for January 2003 tidal cycle, including spring and neap tides.
FMHD_C Baseline 2018	Baseline HD model simulating pre-development conditions in 2018, with 2018 (Aspect 2018) bathymetry. Updated version of model scenario from previous 2018 assessment, run for January 2003 tidal cycle, including spring and neap tides.
FMHD_D PostDev 2018	Post-development HD model simulating conditions following proposed 2018 (-6.5 mCD) capital dredge, with 2018 (Aspect 2018) bathymetry. Updated version of model scenario from previous 2018 assessment, run for January 2003 tidal cycle, including spring and neap tides.

4.8 Model Validation

Validation of the model has been undertaken through comparison of baseline modelled tidal levels with measured tidal levels for the same tide, at McDermott Base (the site), as shown for the first 10 days of the model run in Figure 4-11. This comparison highlights that the modelled levels and tidal phasing have good agreement with the observed data, generally returning levels within a few centimetres at correct timings.

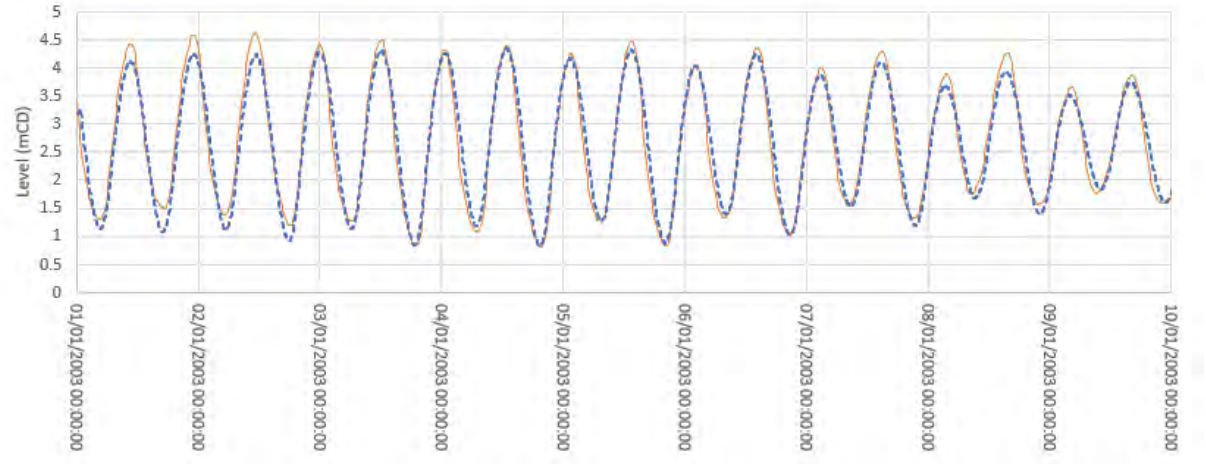


Figure 4-11: Comparison of Measured (Orange) and Modelled 2023 Baseline (Blue) Water Levels

Additionally, tidal current speeds predicted by the baseline model have been compared to annotated tidal stream speeds on UKHO hydrographic charts for the Moray Firth, with model peak current speed predictions lying within the published range of current speed.

Given the results of the above validation exercise the model is therefore considered to perform well.

4.9 Model Results

4.9.1 2023 Baseline

The modelled water levels at Point 4 within the harbour are shown in Figure 4-12 for the whole 2023 baseline scenario. Figure 4-13 and Figure 4-14 present area plots of current speed in and around Ardersier Port for mid-flood and mid-ebb spring tides respectively. Figure 4-15 presents modelled current speeds at selected key locations for the whole 2023 baseline scenario.

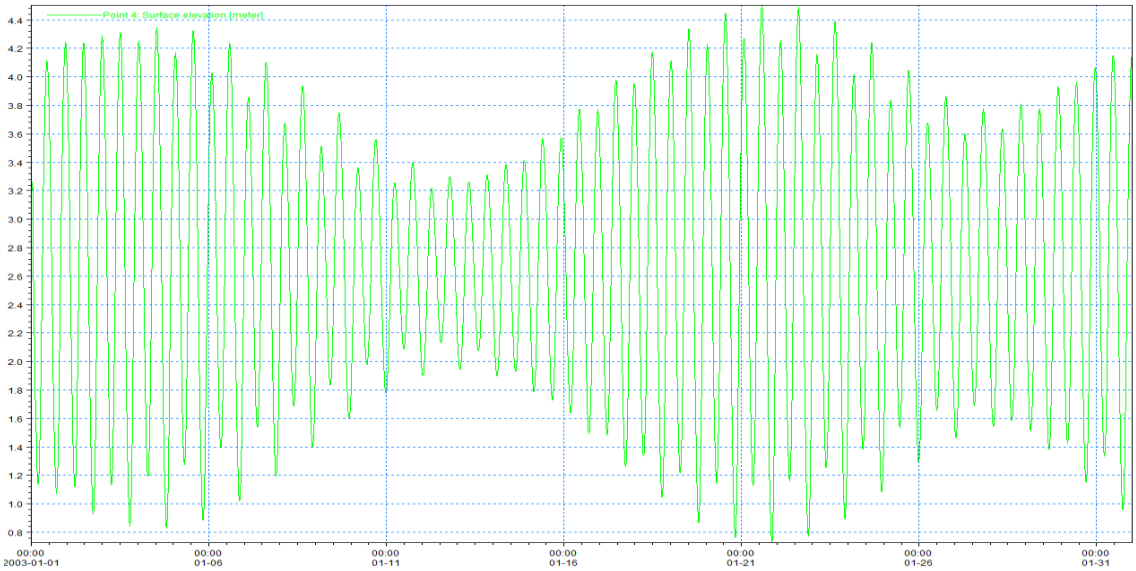


Figure 4-12: FMHD_A Baseline 2023 Full Model Run – Water Level at Point 4

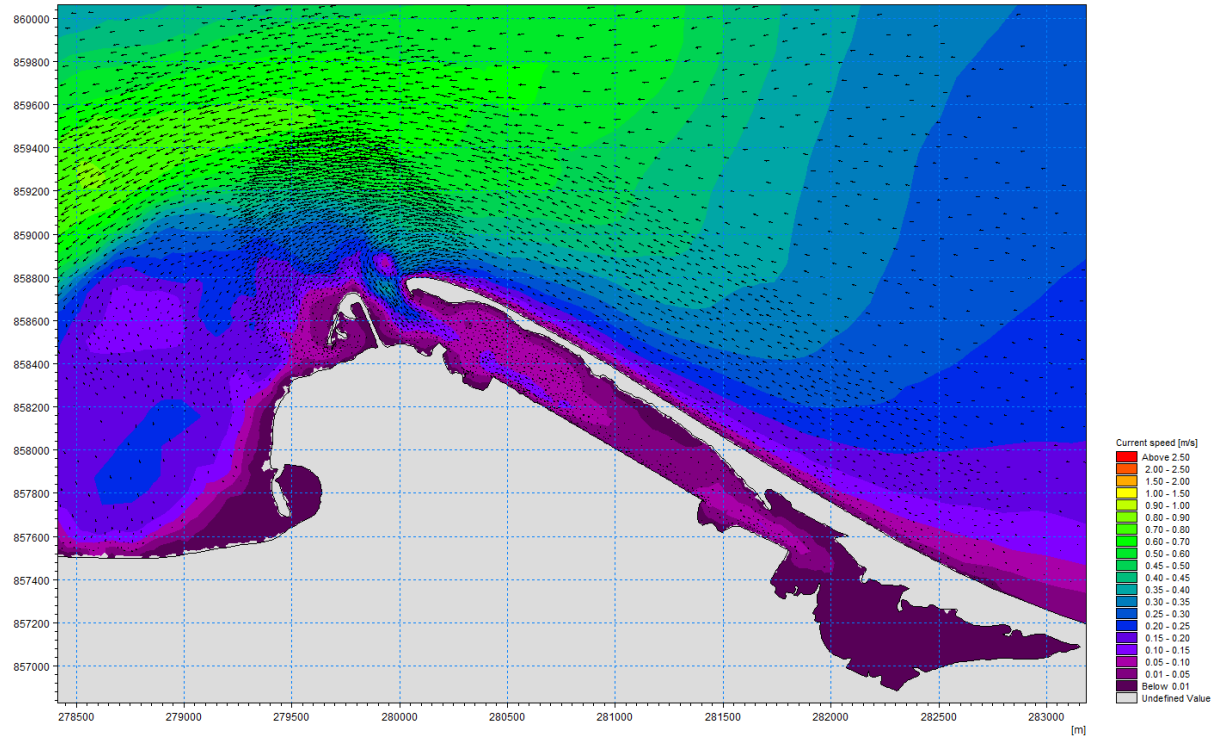


Figure 4-13: FMHD_A Baseline 2023 Mid-Flood Spring Tide – Current Speed

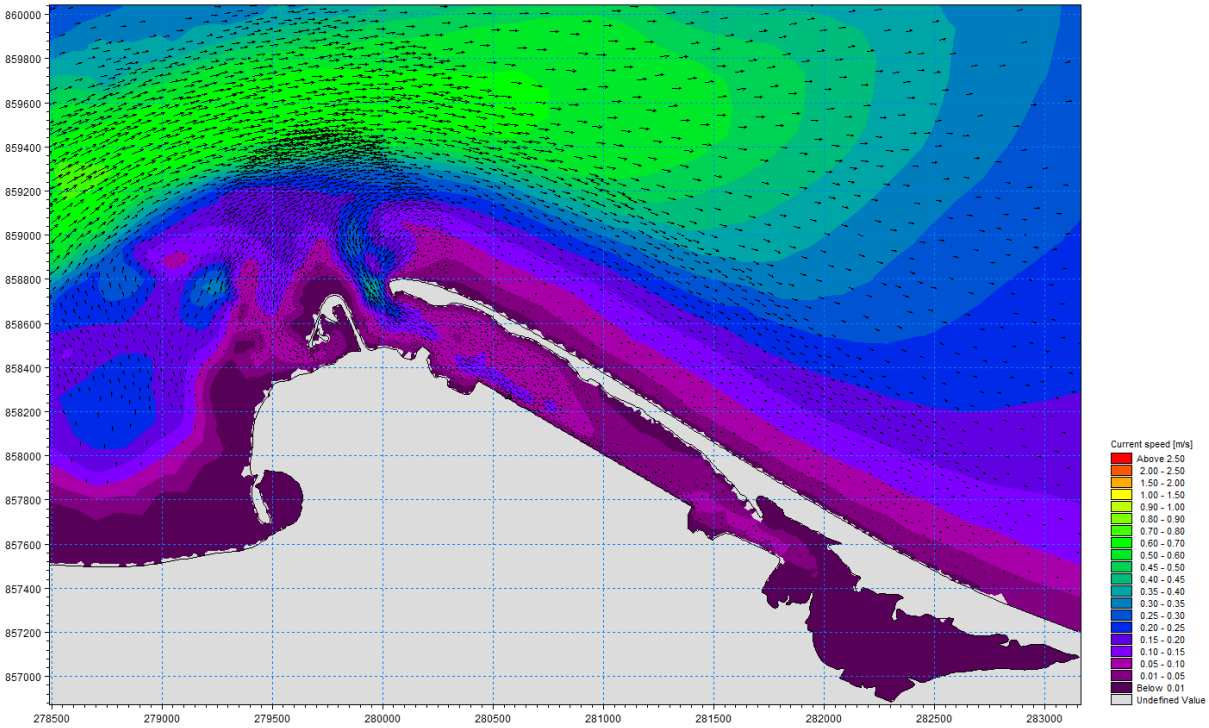


Figure 4-14: FMHD_A Baseline 2023 Mid-Ebb Spring Tide – Current Speed

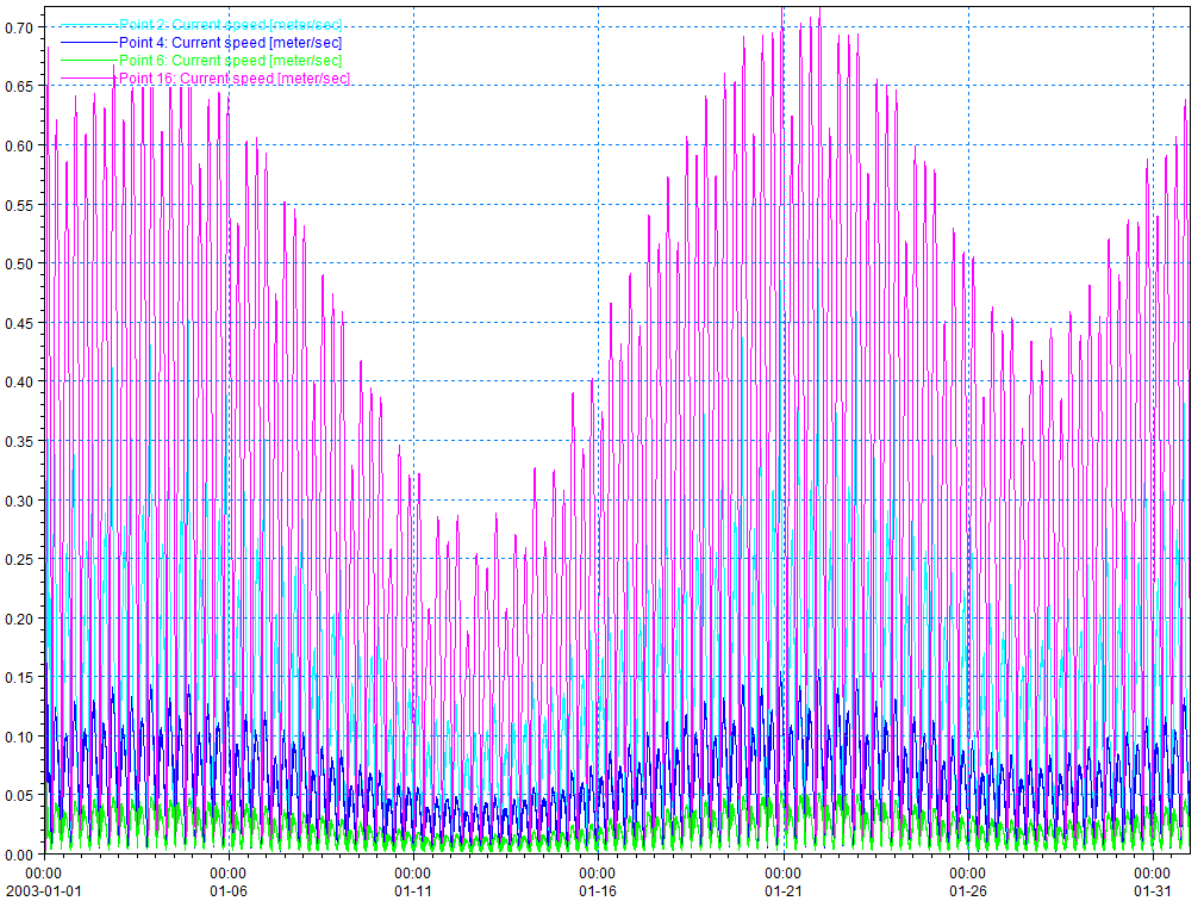


Figure 4-15: FMHD_A Baseline 2023 Point Output – Current Speed

4.9.2 2023 Post-Development

Figure 4-16 and Figure 4-17 present 2023 post-development scenario area plots of current speed in and around Ardersier Port for mid-flood and mid-ebb spring tides respectively. Figure 4-18 presents modelled current speeds at selected key locations for the whole 2023 post-development scenario.

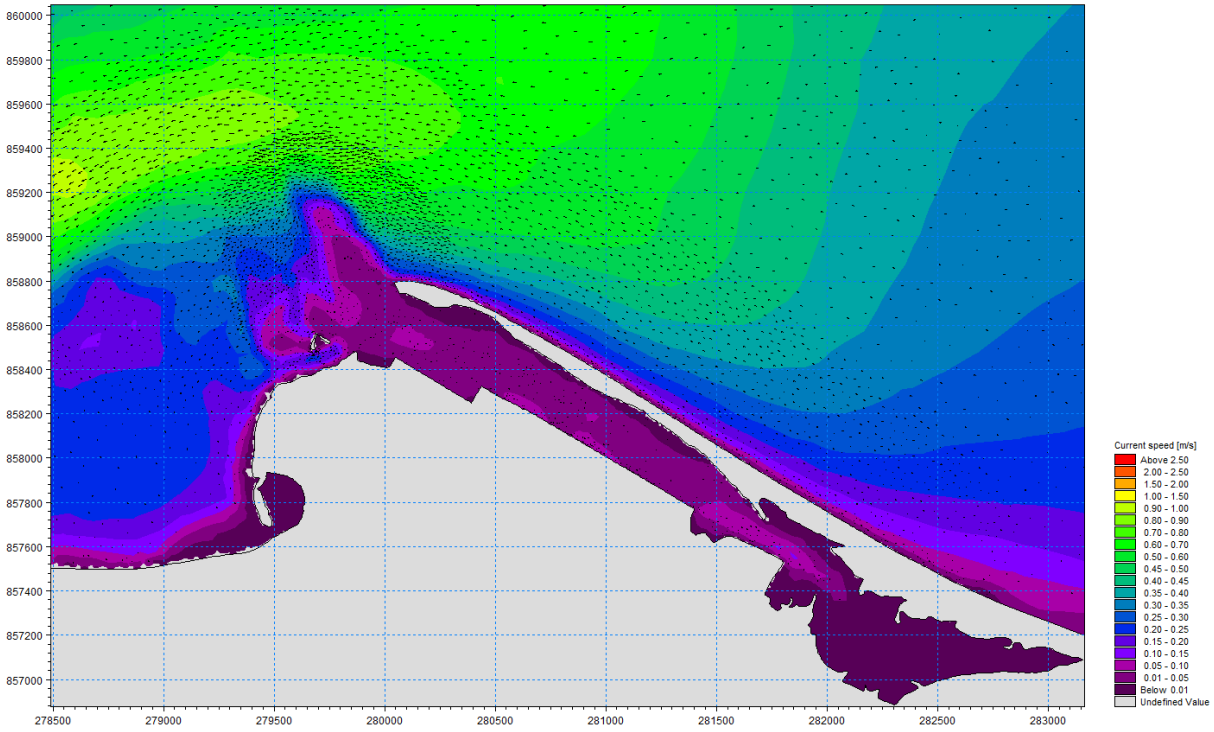


Figure 4-16: FMHD_B Post-Development 2023 Mid-Flood Spring Tide – Current Speed

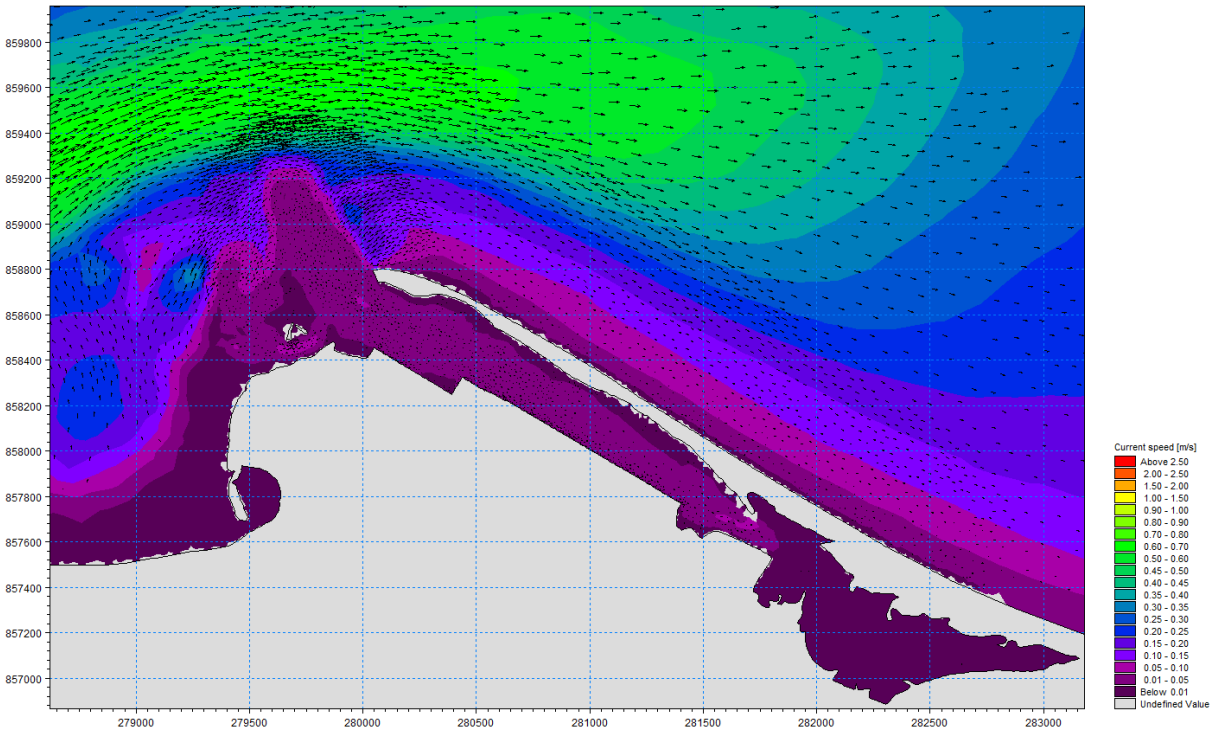


Figure 4-17: FMHD_B Post-Development 2023 Mid-Ebb Spring Tide – Current Speed

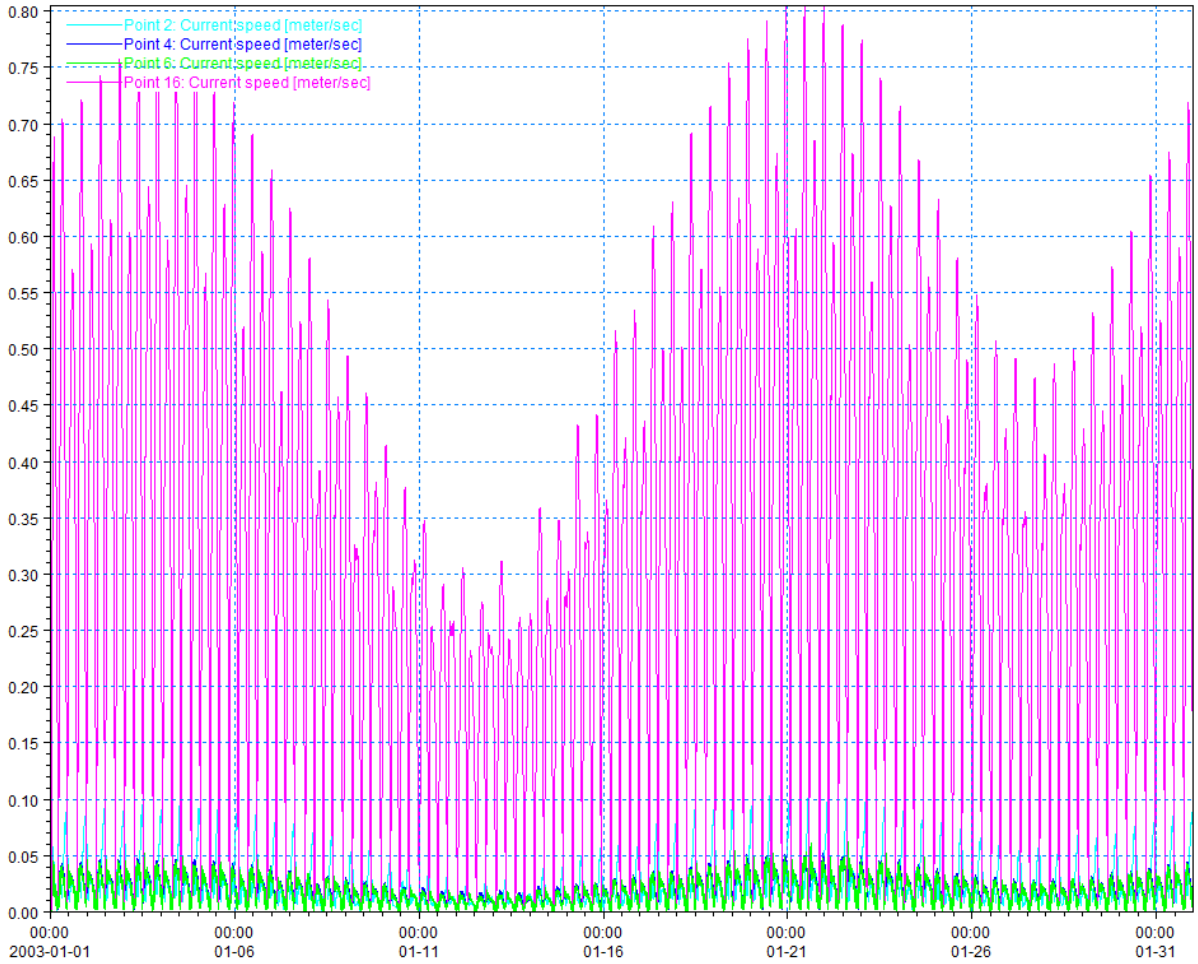


Figure 4-18: FMHD_B Post-Development 2023 Point Output – Current Speed

4.9.3 2018 Baseline

Figure 4-19 and Figure 4-20 present 2018 baseline scenario area plots of current speed in and around Ardersier Port for mid-flood and mid-ebb spring tides respectively.

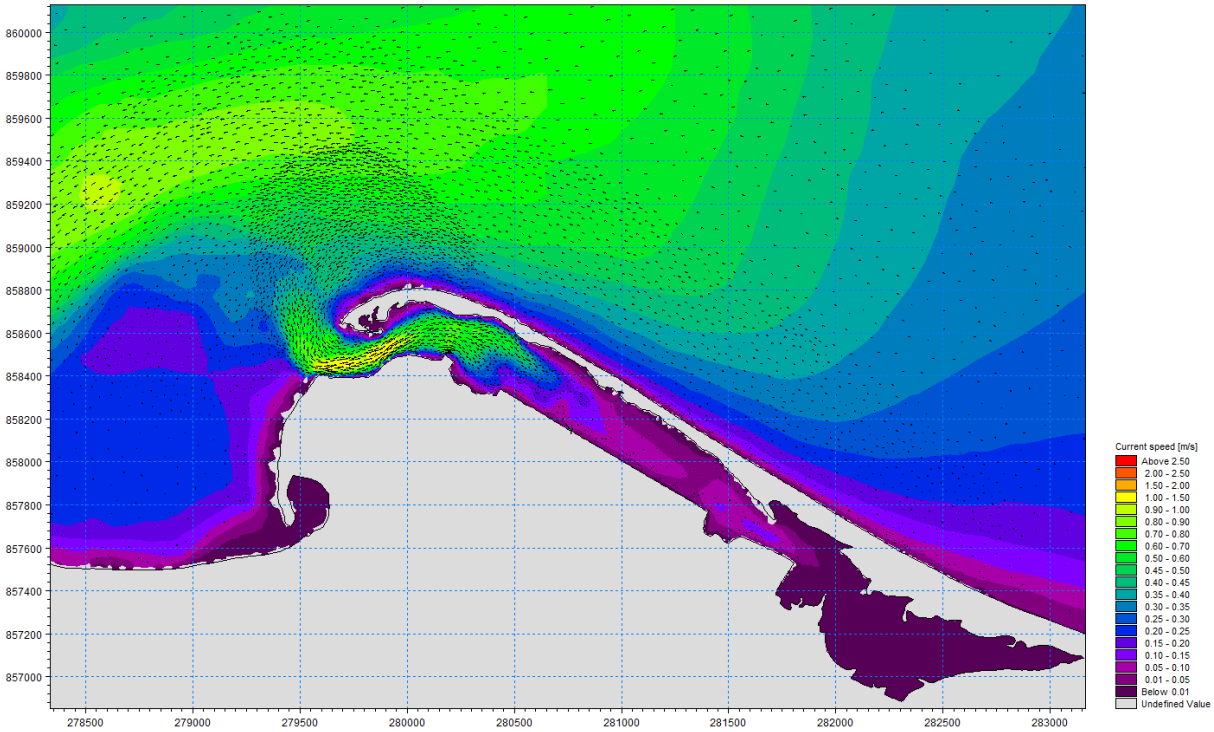


Figure 4-19: FMHD_C Baseline 2018 Mid-Flood Spring Tide – Current Speed

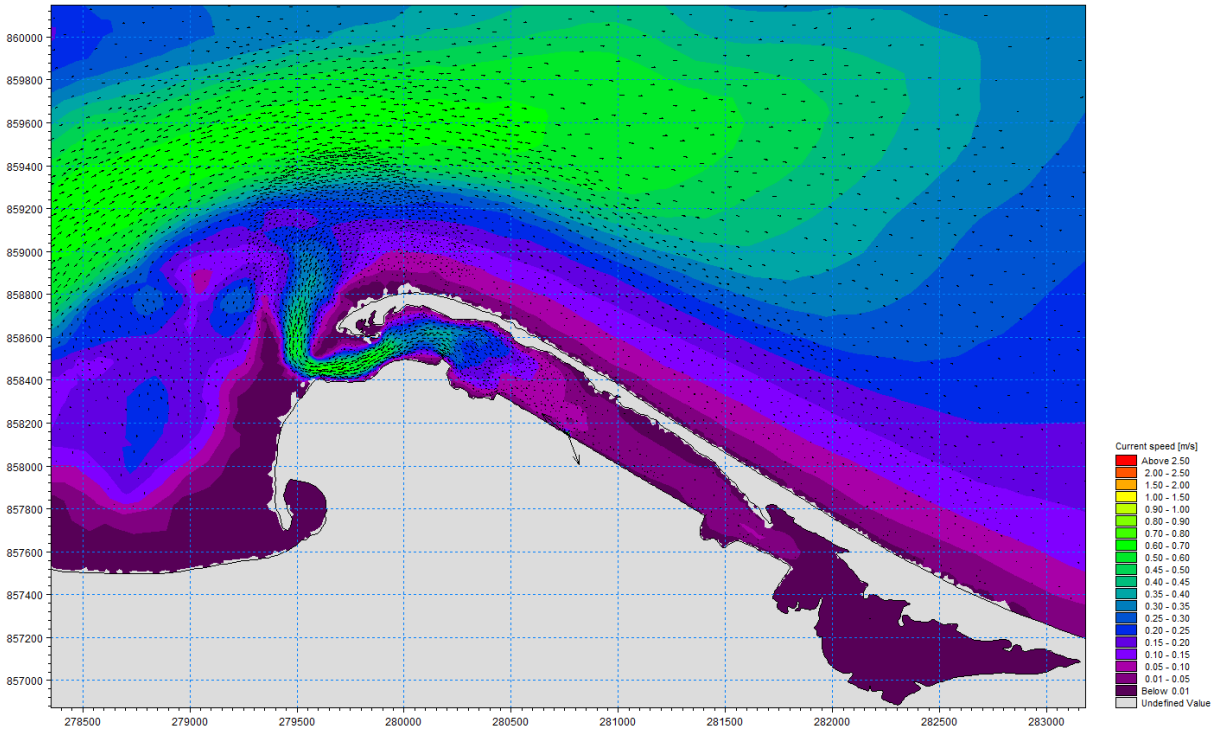


Figure 4-20: FMHD_C Baseline 2018 Mid-Ebb Spring Tide – Current Speed

4.9.4 2018 Post-Development

Figure 4-21 and Figure 4-22 present 2018 post-development scenario area plots of current speed in and around Ardersier Port for mid-flood and mid-ebb spring tides respectively.

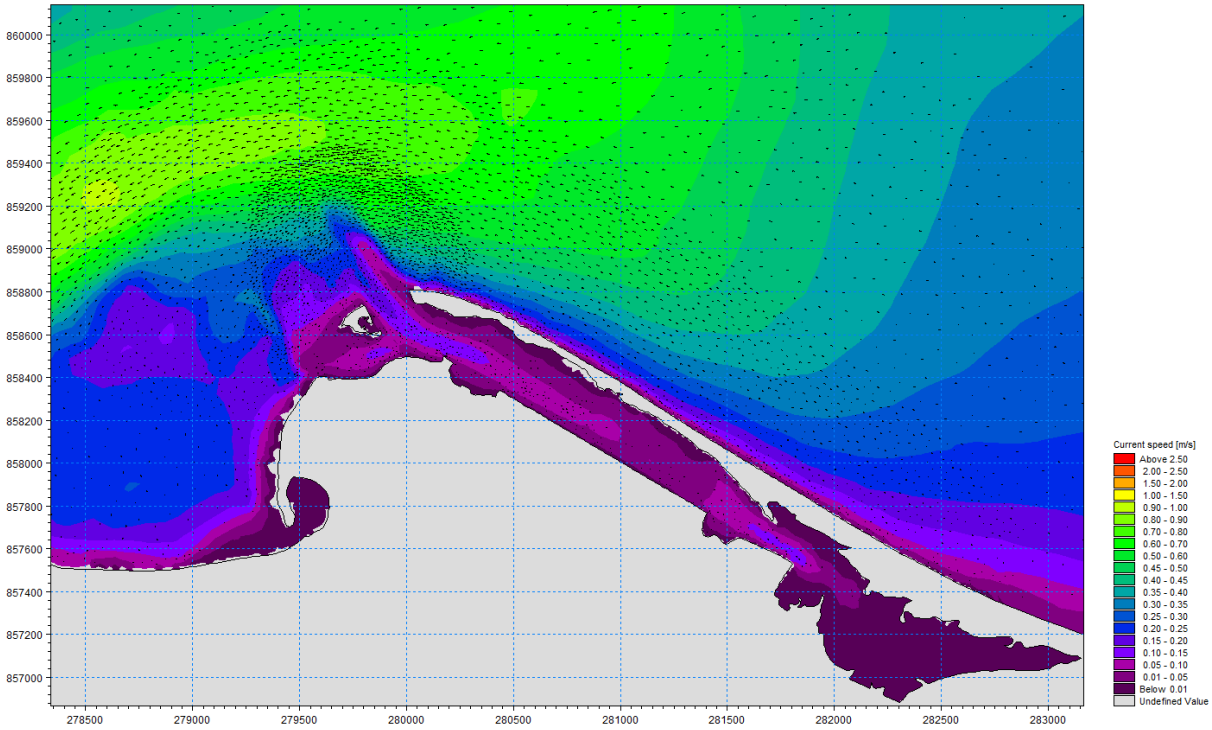


Figure 4-21: FMHD_D Post-Development 2018 Mid-Flood Spring Tide – Current Speed

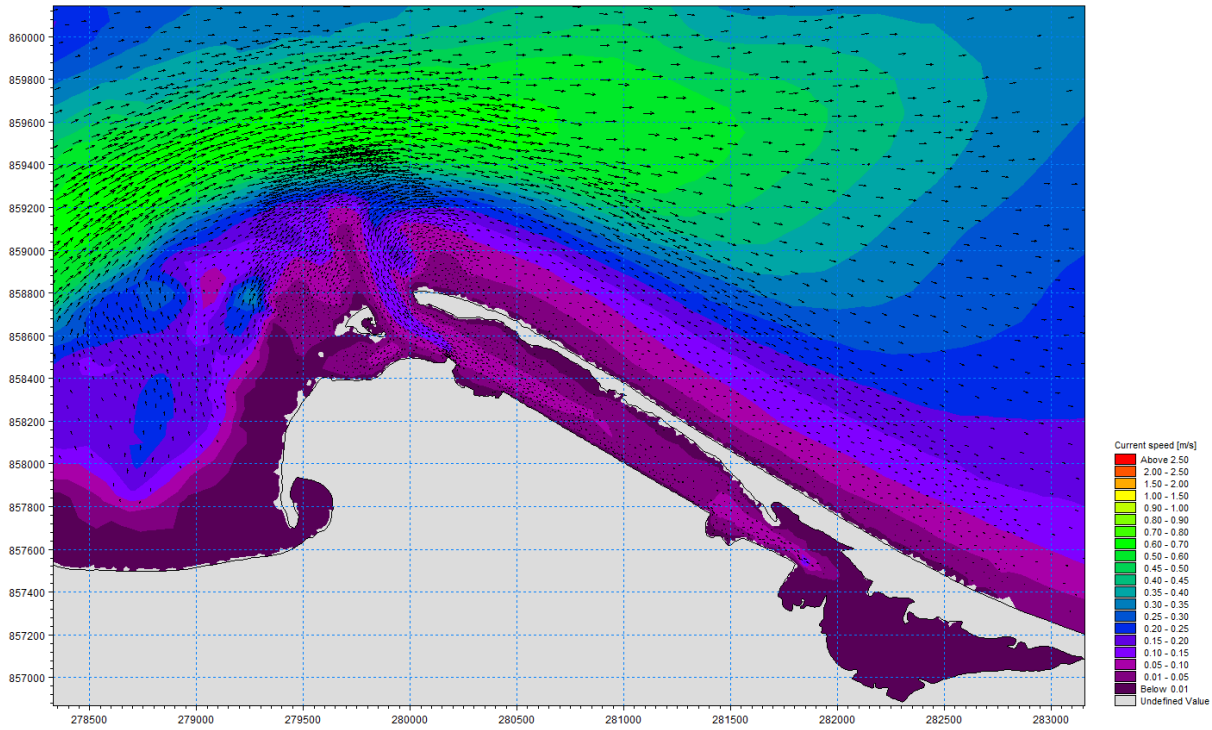


Figure 4-22: FMHD_D Post-Development 2018 Mid-Ebb Spring Tide – Current Speed

5 SPECTRAL WAVES MODEL

5.1 MIKE 21 Flow Model FM – Spectral Waves (SW) Module

Offshore to inshore wave transformation modelling has been undertaken using the MIKE 21 Spectral Waves (SW) module. MIKE 21 SW FM is a new generation spectral wind wave model based on unstructured meshes. The latest versions of the software, MIKE 2023 and 2024, have been used in this assessment. The model simulates the growth, decay and transformation of wind-generated waves and swell in offshore and coastal areas.

5.2 Model Extent

The SW model extent is the same as that of the HD model, as outlined in section 4.2.

5.3 Input Data

All bathymetry input data remains the same as that of the HD model, as outlined in section 4.3.1. Corresponding HD model results form the input water level data to SW model runs for the same scenario, as described in Table 5-2.

5.3.1 Wave and Wind Data

UK Meteorological Office wind and wave data for the Moray Firth at 57.7 N, 3.75 W (12 km grid) from their 2nd Generation UK Water Wave Model for the period March 2000 to March 2007 forms the input wave and wind data to the spectral wave model. The Met Office model data is provided at 3 hour intervals, with the wave data containing the significant wave height, peak wave period and direction. The wave data is input to the model open boundary, whilst the wind data is applied across the whole model extent.

5.4 Model Mesh

The SW model meshes are the same as that of the HD model, as outlined in section 4.4.

5.5 Model Setup

Further details of the MIKE 21 SW model setup are presented below:

- For each model simulation the modelled extent includes the entire mesh as described in section 4.4;
- Model input data is described in section 5.3;
- The model applies the fully spectral and quasi stationary (time) formulations;
- Diffraction is included using the phase-decoupled refraction-diffraction approximation;
- Wave breaking is accounted for based on the formulation of Battjes and Janssen (1978); and
- The model time step interval is 1,800 seconds.

5.6 Model Outputs

The MIKE 21 SW model simulations have been setup to produce results as both point and area outputs. The outputs include the following key parameters:

- Significant wave height;
- Maximum wave height;
- Peak wave period; and
- Mean wave direction

The area outputs are generated for the whole model extent, whilst point outputs have been generated at a number of locations within the model extent as detailed for selected key locations in Table 5-2, and shown in Figure 5-1.

Table 5-1: HD Model Point Output Locations

Point Output Location	Easting	Northing
Point 3	281000	859500
Point 4	280000	860000
Point 6	280100	858600

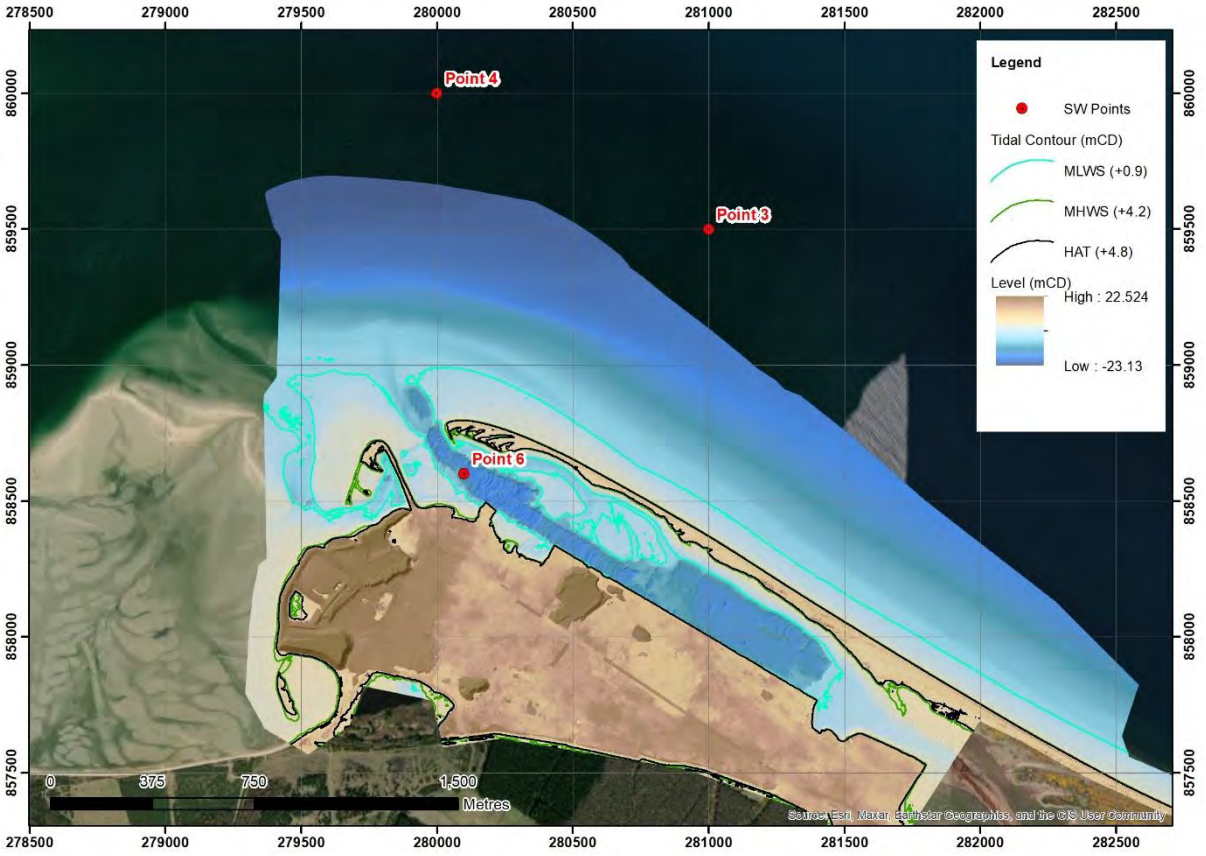


Figure 5-1: Selected Key SW Point Output Locations

5.7 Model Simulations

The key model simulations undertaken using the MIKE 21 FM SW model are presented in Table 5-2.

Table 5-2: SW Model Simulations

SW Model Simulation	Description
FMSW_A Baseline 2023	Baseline SW model simulating wave climate under existing conditions, with present day (CainTech 2023) bathymetry. Run for January 2003 wave and wind conditions, with water levels from FMHD_A_Baseline2023 including spring and neap tides.
FMSW_B PostDev 2023	Post-development SW model simulating wave climate under conditions following proposed 2023 (-12.9 mCD) capital dredge, with present day (CainTech 2023) bathymetry. Run for January 2003 wave and wind conditions, with water levels from FMHD_B_PostDev2023 including spring and neap tides.
FMSW_C Baseline 2018	Baseline SW model simulating wave climate under pre-development conditions in 2018, with 2018 (Aspect 2018) bathymetry. Updated version of model scenario from previous 2018 assessment. Run for January 2003 wave and wind conditions, with water levels from FMHD_C_Baseline2018 including spring and neap tides.
FMSW_D PostDev 2018	Post-development SW model simulating wave climate under conditions following proposed 2018 (-6.5 mCD) capital dredge, with 2018 (Aspect 2018) bathymetry. Updated version of model scenario from previous 2018 assessment. Run for January 2003 wave and wind conditions, with water levels from FMHD_D_PostDev2018 including spring and neap tides.

5.8 Model Validation

Due to lack of observed wave data in the vicinity of Whiteness Head it is not possible to validate the model outputs with respect to waves. However, simulated results for wave heights are closely aligned with those of previous modelling exercises, and it is considered that the simulated values are as expected for the physical setting.

5.9 Model Results

5.9.1 Baseline 2023

Figure 5-2 presents an area plot of modelled significant wave height in the vicinity of Ardersier Port for a selected storm event on 22nd January 2003. Figure 5-3 presents point output results for significant wave height at locations 3, 4 and 6 for the full model run duration.

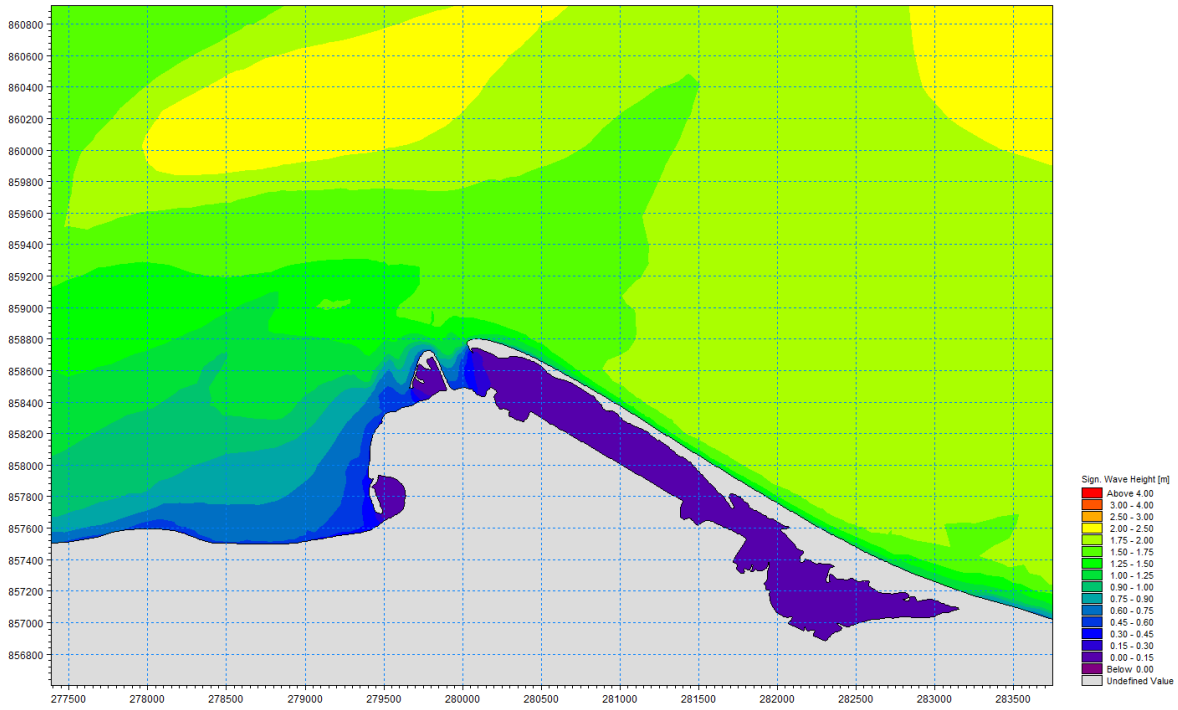


Figure 5-2: FMSW_A Baseline 2023 Storm Event – Significant Wave Height

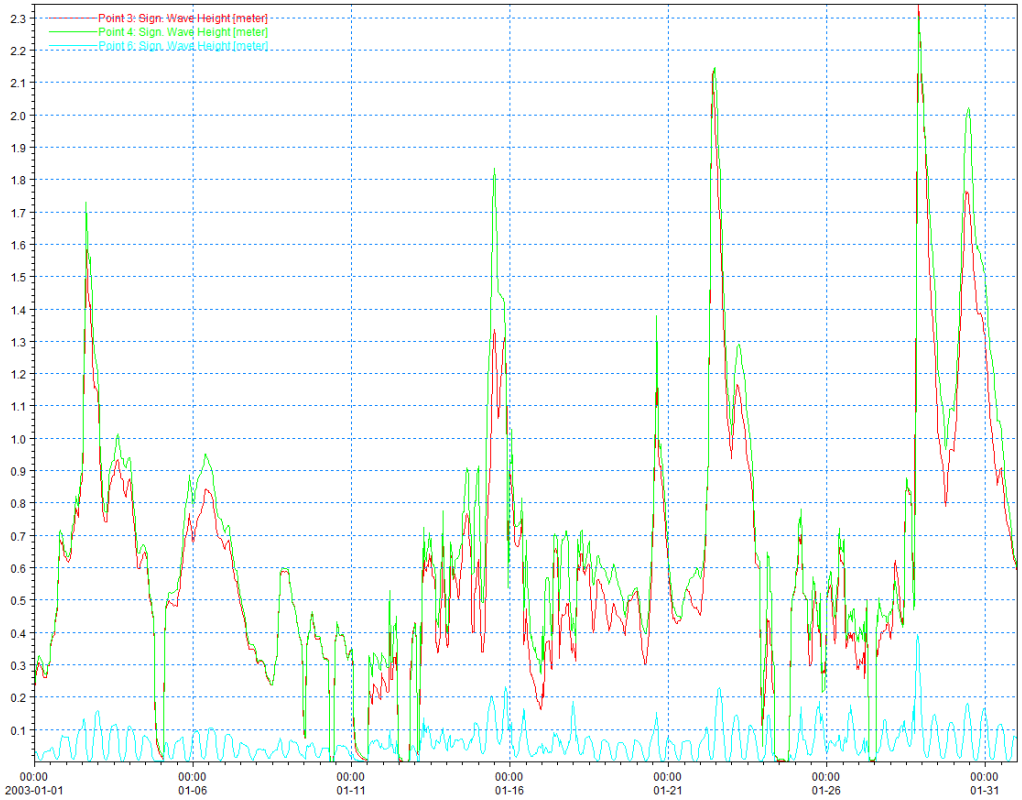


Figure 5-3: FMSW_A Baseline 2023 Full Model Run Point Output – Significant Wave Height

5.9.2 Post-Development 2023

Figure 5-4 presents an area plot of modelled significant wave height in the vicinity of Ardersier Port for a selected storm event on 22nd January 2003. Figure 5-5 presents point output results for significant wave height at locations 3, 4 and 6 for the full model run duration.

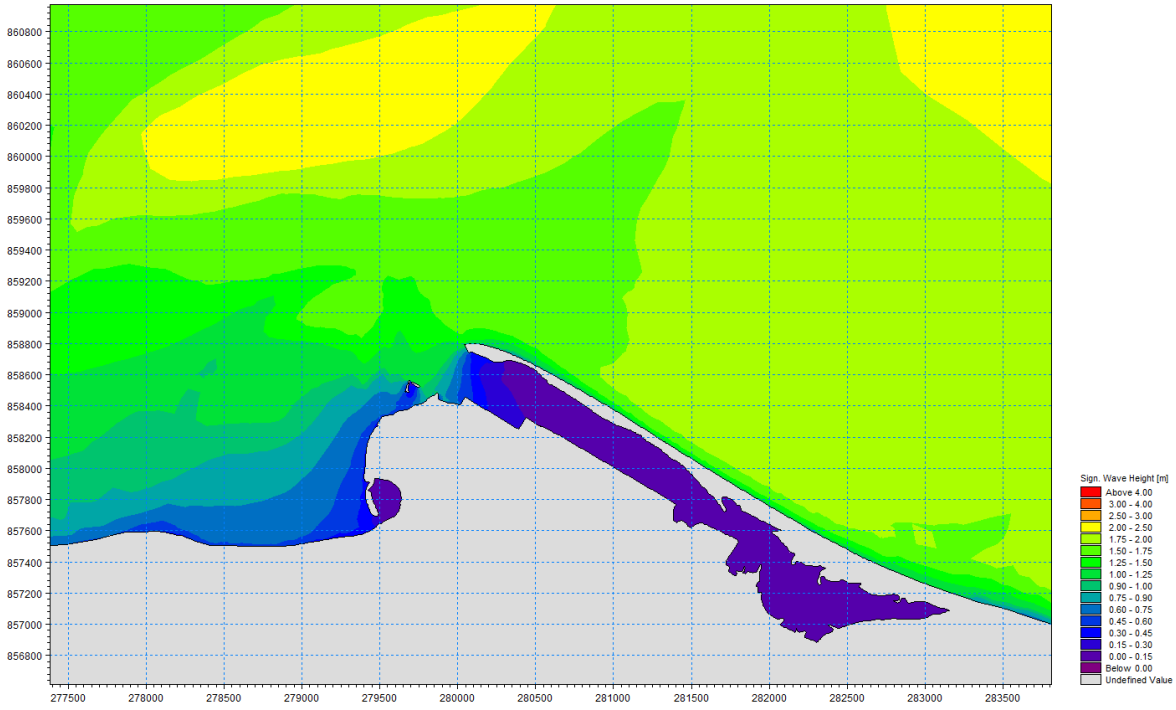


Figure 5-4: FMSW_B PostDev 2023 2023 Storm Event – Significant Wave Height

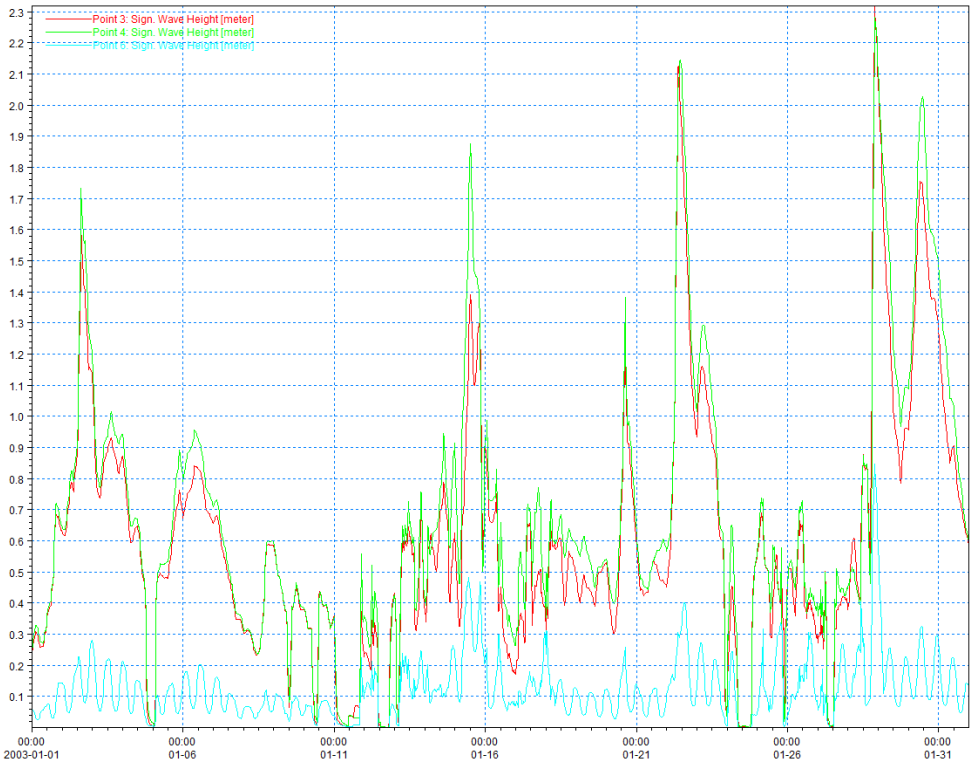


Figure 5-5: FMSW_B PostDev 2023 Full Model Run Point Output – Significant Wave Height

5.9.3 Baseline 2018

Figure 5-6 presents an area plot of modelled significant wave height in the vicinity of Ardersier Port for a selected storm event on 22nd January 2003. Figure 5-7 presents point output results for significant wave height at locations 3, 4 and 6 for the full model run duration.

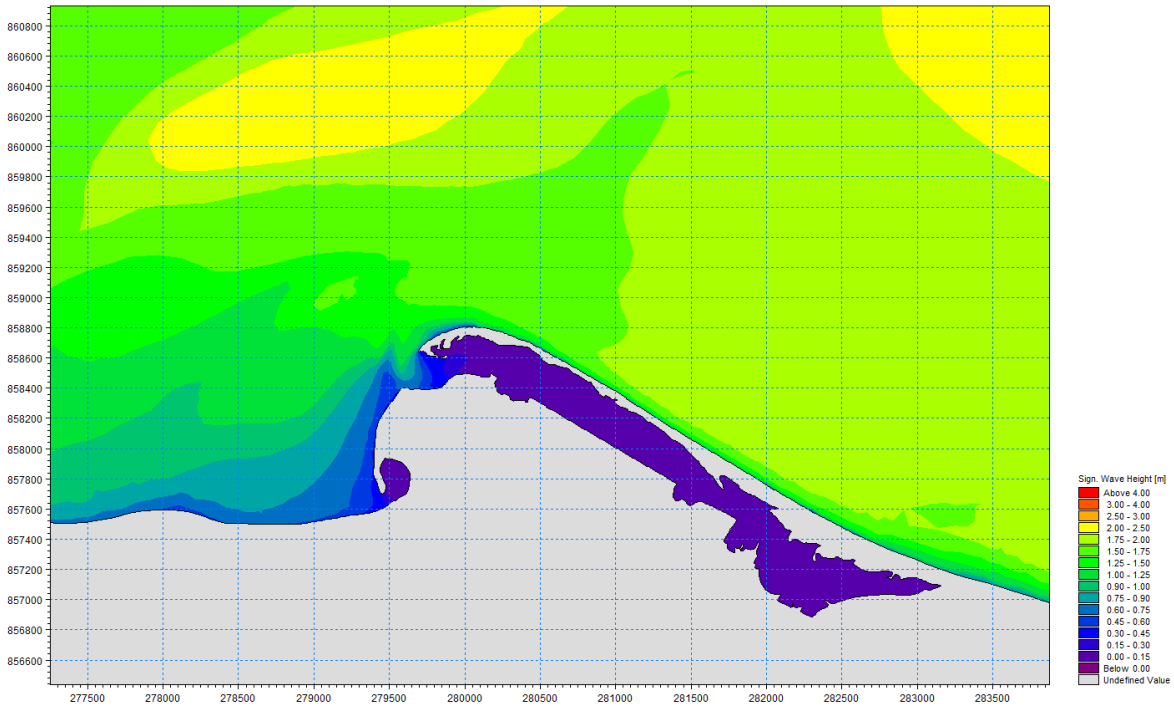


Figure 5-6: FMSW_C Baseline 2018 Storm Event – Significant Wave Height

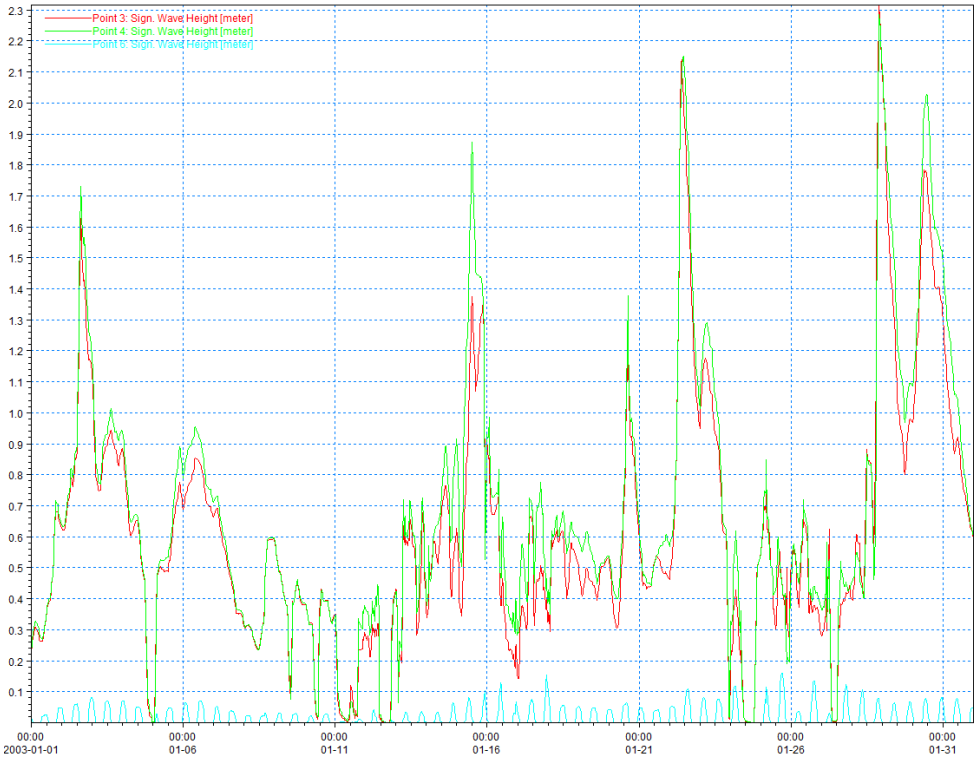


Figure 5-7: FMSW_C Baseline 2018 Full Model Run Point Output – Significant Wave Height

5.9.4 Post-Development 2018

Figure 5-8 presents an area plot of modelled significant wave height in the vicinity of Ardersier Port for a selected storm event on 22nd January 2003. Figure 5-9 presents point output results for significant wave height at locations 3, 4 and 6 for the full model run duration.

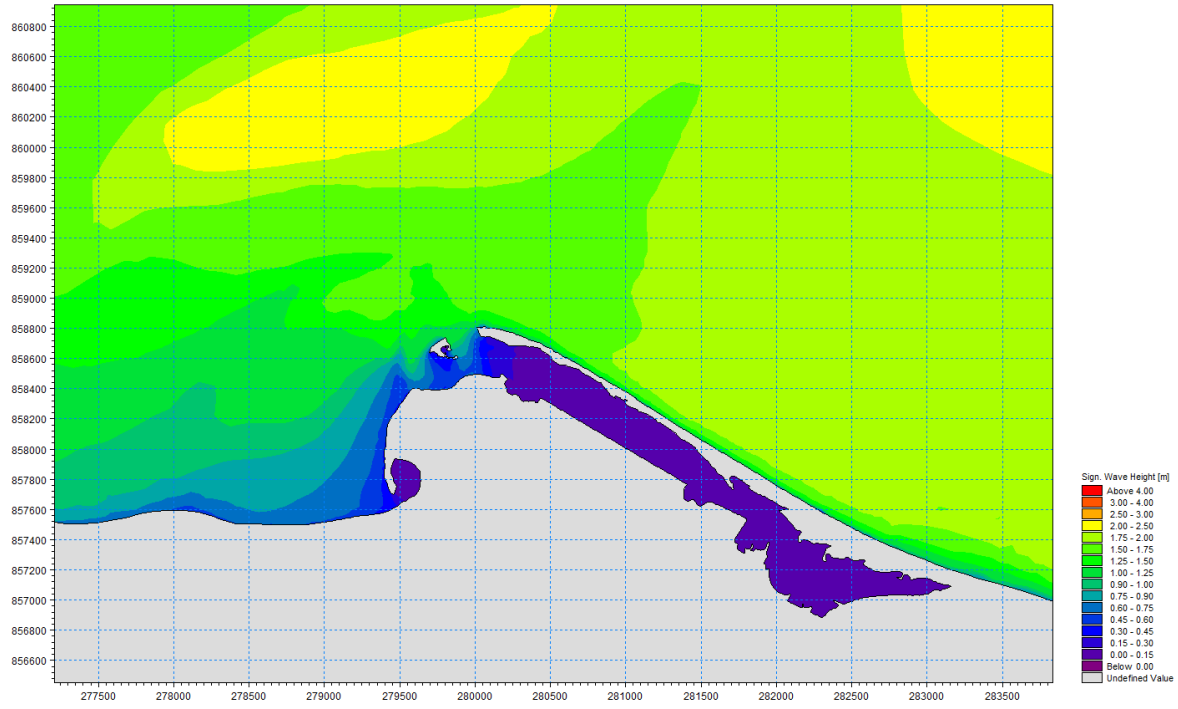


Figure 5-8: FMSW_D PostDev 2018 Storm Event – Significant Wave Height

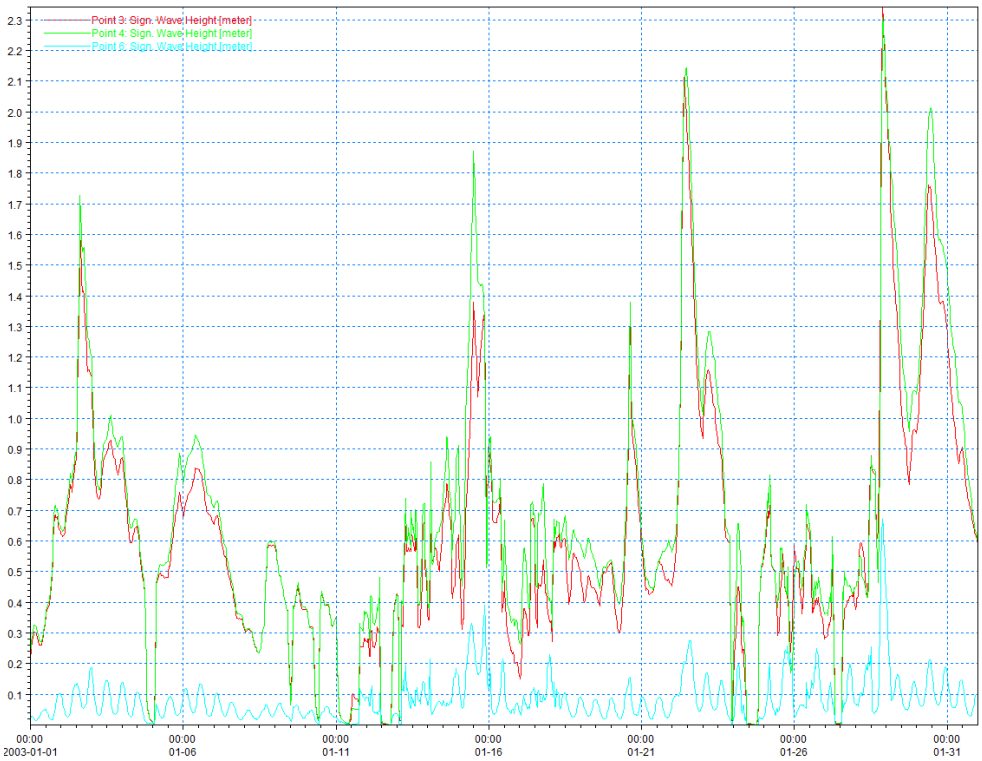


Figure 5-9: FMSW_D PostDev 2018 Full Model Run Point Output – Significant Wave Height

6 SEDIMENT TRANSPORT MODEL

6.1 MIKE 21 Flow Model FM – Sand Transport (ST) Module

The MIKE 21 ST module allows calculation of sediment transport capacity and associated bed level changes for non-cohesive sediment (sand) resulting from tidal currents or a combination of tidal currents and waves. The module applies the sediment transport calculations to a flexible mesh, and allows for the functionality to include morphological feedback on the bathymetry and coupled hydrodynamic modelling of tidal currents.

6.2 Model Extent

The ST model extent is the same as that of the HD model, as outlined in section 4.2 and Figure 4-1.

6.3 Input Data

All bathymetry input data remains the same as that of the HD model, as outlined in section 4.3.1. Corresponding SW model results form the input wave conditions to ST model runs for the same scenario, as described in Table 6-1. The ST model is run with a coupled HD model providing the water level and current forcing, as described in Table 6-1.

Input sediment characteristics are derived from the sediment data described in section 3.2 and Figure 3-5.

6.4 Model Mesh

The ST model meshes are the same as that of the HD model, as outlined in section 4.4.

6.5 Model Setup

Further details of the MIKE 21 ST model setup are presented below:

- For each model simulation the modelled extent includes the entire mesh as described in section 4.4;
- Model input data is described in section 6.3;
- The ST model is coupled with an HD model, the HD model setup is as described in section 4.5;
- The ST model includes for sand transport by both waves and currents;
- The sediment data format is ‘varying in domain’, with sediment characteristics as per those shown in Figure 3-5;
- Wave forcing is provided by the corresponding SW model run, as described in Table 6-1; and
- Dynamic feedback on the hydrodynamic and sand transport calculations are included, with a constant speedup factor of 3 applied to all results, effectively extending 1 month simulations to 3 months; and
- For the spit and sands trace model scenarios the initial sediment layer thickness available for transport is varying in domain, restricted to areas around the spit and sands respectively.

6.6 Model Outputs

The MIKE 21 ST model simulations have been setup to produce results as area outputs. The outputs include the following key parameters:

- Total load, x-component;
- Total load, y-component;
- Rate of bed level change;
- Bed level change; and
- Bed level

The area outputs are generated for the whole model extent.

6.7 Model Simulations

The key model simulations undertaken using the MIKE 21 FM ST model are presented in Table 6-1.

Table 6-1: ST Model Simulations

ST Model Simulation	Description
FMHDST_A Baseline 2023	Baseline HD and ST model simulating tidal action and sand transport under existing conditions, with present day (CainTech 2023) bathymetry. Run for January 2003 tidal cycle, including spring and neap tides. Wave forcing from FMSW_A Baseline 2023. Morphology speed up factor of 3 to extend sand transport results to 3 months.
FMHDST_B PostDev 2023	Post-development HD and ST model simulating tidal action and sand transport under conditions following proposed 2023 (-12.9 mCD) capital dredge, with present day (CainTech 2023) bathymetry. Run for January 2003 tidal cycle, including spring and neap tides. Morphology speed up factor of 3 to extend sand transport results to 3 months.
FMHDST_C PostDev 2018	Post-development HD and ST model simulating tidal action and sand transport under conditions following proposed 2018 (-6.5 mCD) capital dredge, with 2018 (Aspect 2018) bathymetry. Updated version of model scenario from previous 2018 assessment, run for January 2003 tidal cycle, including spring and neap tides. Morphology speed up factor of 3 to extend sand transport results to 3 months.
FMHDST_D PostDev 2023 Spit Trace	As per FMHDST_B but with available sand extent for transport limited to the sand spit and adjacent nearshore. To assess westward transport of sand in relation to proposed dredge channel. Morphology speed up factor of 3 to extend sand transport results to 3 months.
FMHDST_E PostDev 2018 Spit Trace	As per FMHDST_C but with available sand extent for transport limited to the sand spit and adjacent nearshore. To assess westward transport of sand in relation to proposed dredge channel. Morphology speed up factor of 3 to extend sand transport results to 3 months.
FMHDST_F PostDev 2023 Sands Trace	As per FMHDST_B but with available sand extent for transport limited to the Whiteness Sands and adjacent nearshore. To assess eastward transport of sand in relation to proposed dredge channel. Morphology speed up factor of 3 to extend sand transport results to 3 months.
FMHDST_G PostDev 2018 Sands Trace	As per FMHDST_C but with available sand extent for transport limited to the Whiteness Sands and adjacent nearshore. To assess eastward transport of sand in relation to proposed dredge channel. Morphology speed up factor of 3 to extend sand transport results to 3 months.

6.8 Model Validation

As per the 2018 assessment, the sand transport model has been validated through both comparison to successive bathymetric surveys, and hindcast modelling utilising earlier bathymetry. The duration of the sand transport model runs are shorter than the duration between successive bathymetric surveys, so the validation approach has been to compare simulated zones of sediment deposition and erosion with observed changes and the conceptual understanding of the coastal processes. It is considered that the model provides a reasonable representation of the patterns of sand erosion, transport and deposition observed and is therefore deemed suitable for use in assessing coastal processes.

6.9 Model Results

6.9.1 Baseline 2023

Figure 6-1 presents predicted bed level change in the vicinity of Ardersier Port at the end of the 2023 baseline simulation.

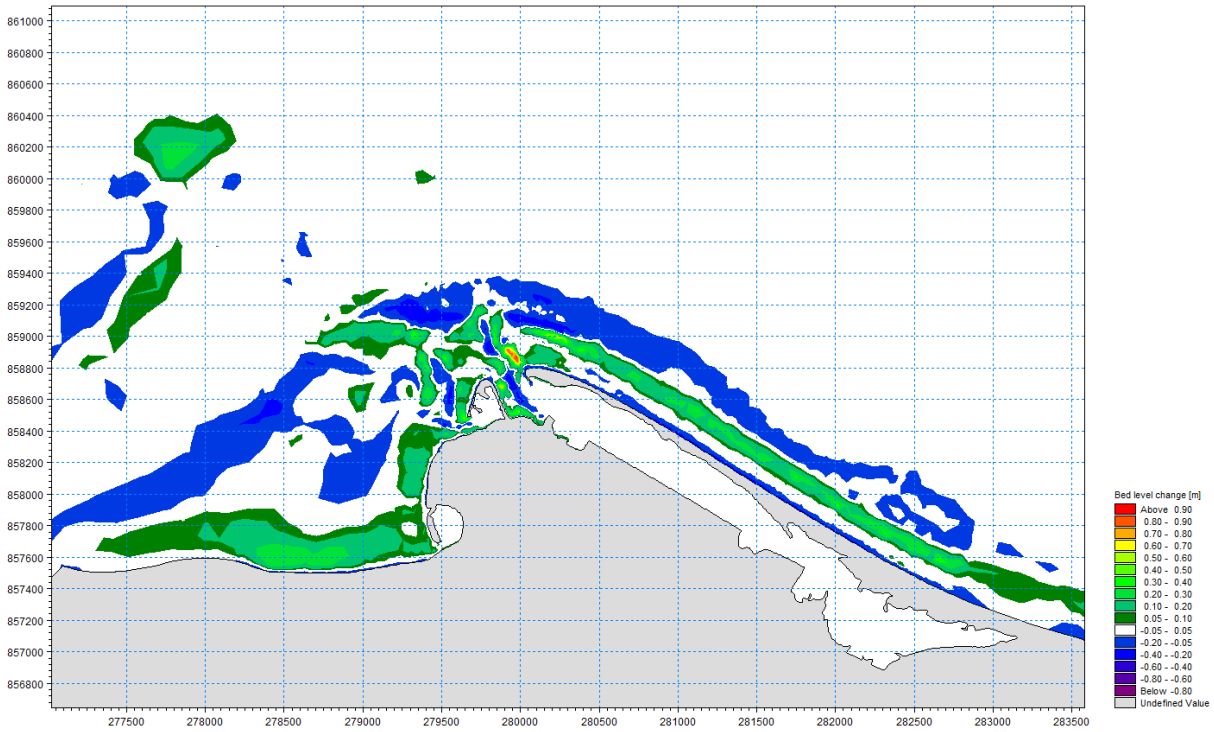


Figure 6-1: FMHDST_A Baseline 2023 Final Timestep – Bed Level Change

6.9.2 Post-Development 2023

Figure 6-2 presents predicted bed level change in the vicinity of Ardersier Port at the end of the 2023 post-development simulation.

Figure 6-3 presents predicted bed level change in the vicinity of Ardersier Port at the end of the 2023 post-development spit trace simulation, whilst Figure 6-4 presents equivalent results for the sands trace simulation.

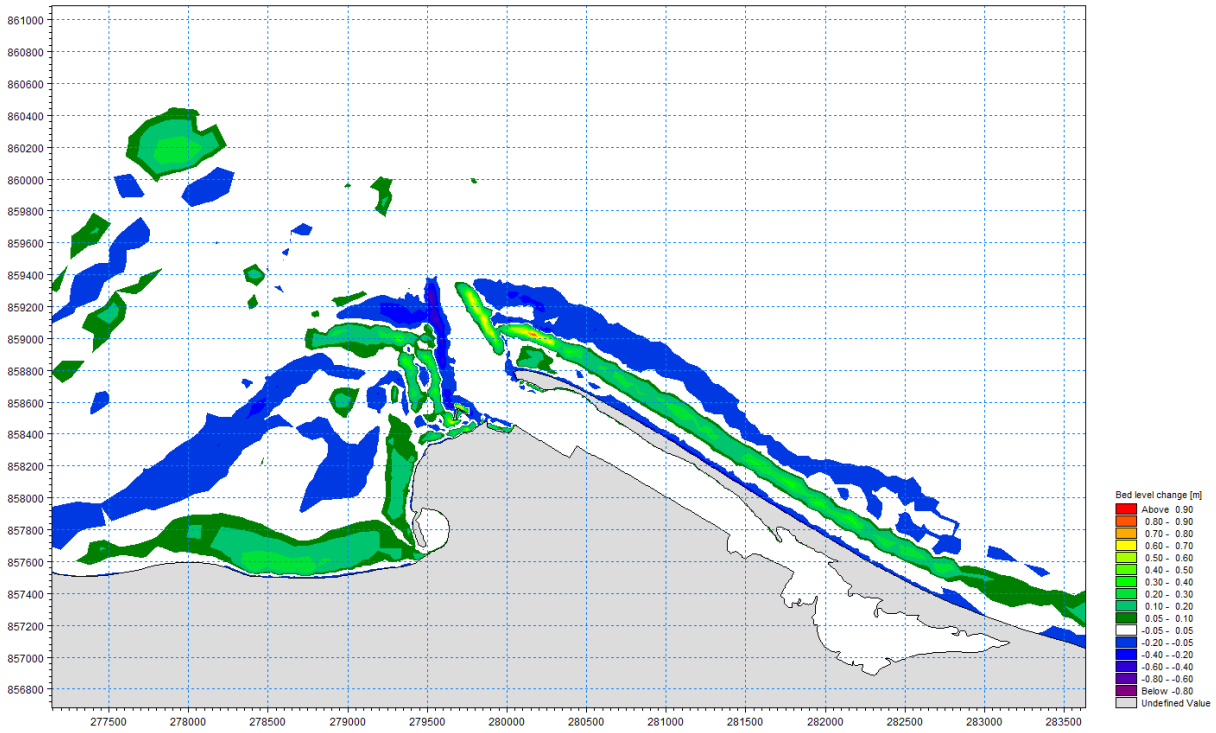


Figure 6-2: FMHDST_B PostDev 2023 Final Timestep – Bed Level Change

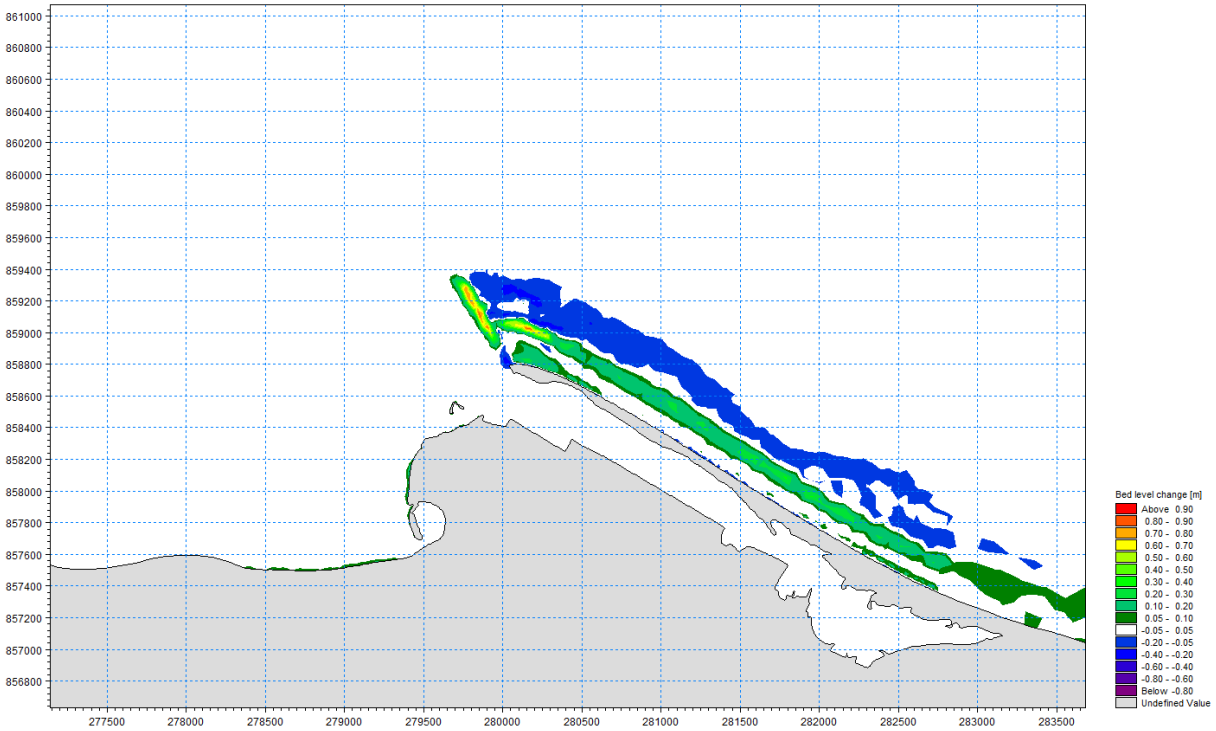


Figure 6-3: FMHDST_D PostDev 2023 Spit Trace Final Timestep – Bed Level Change

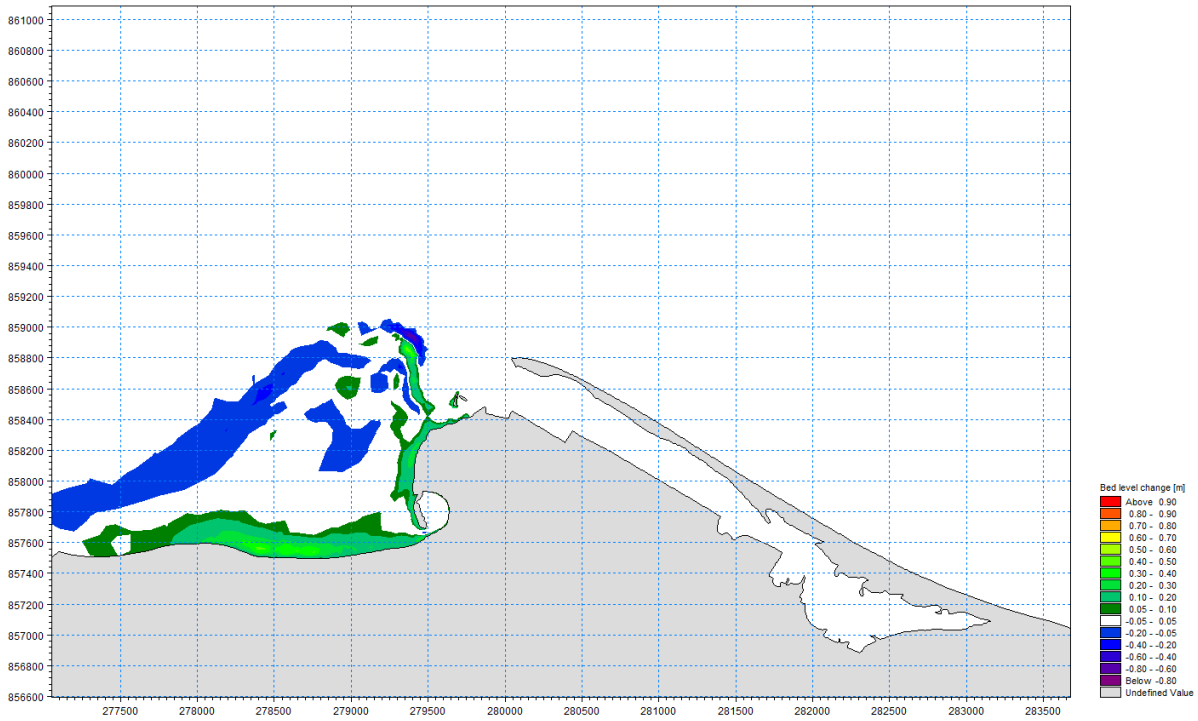


Figure 6-4: FMHDST_F PostDev 2023 Sands Trace Final Timestep – Bed Level Change

6.9.3 Post-Development 2018

Figure 6-5 presents predicted bed level change in the vicinity of Ardersier Port at the end of the 2018 post-development simulation. Figure 6-6 presents predicted bed level change in the vicinity of Ardersier Port at the end of the 2018 post-development spit trace simulation, whilst Figure 6-7 presents equivalent results for the sands trace simulation.

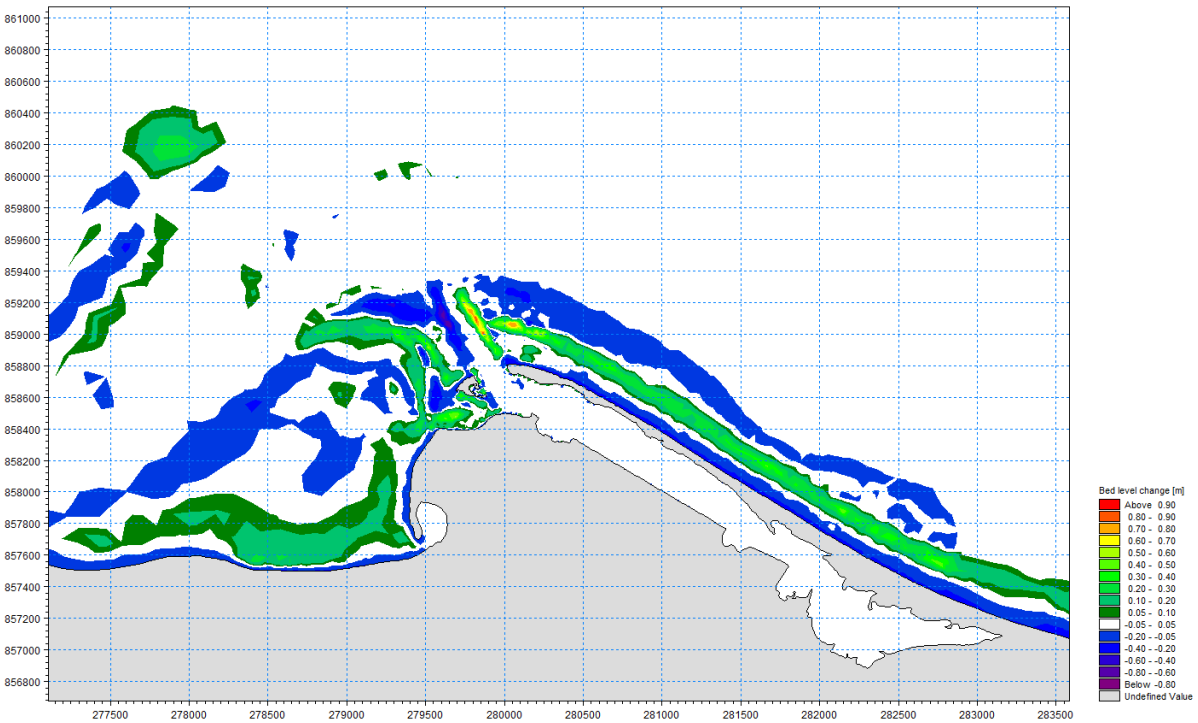


Figure 6-5: FMHDST_C PostDev 2018 Final Timestep – Bed Level Change

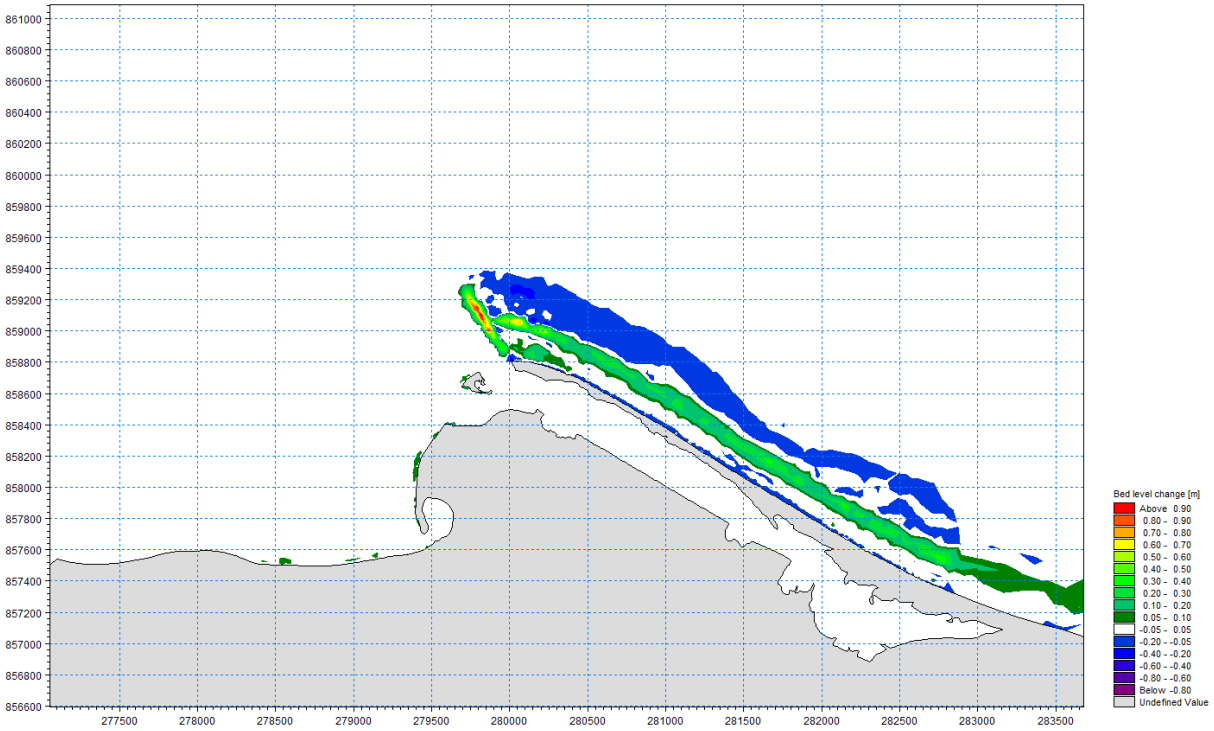


Figure 6-6: FMHDST_E PostDev 2018 Spit Trace Final Timestep – Bed Level Change

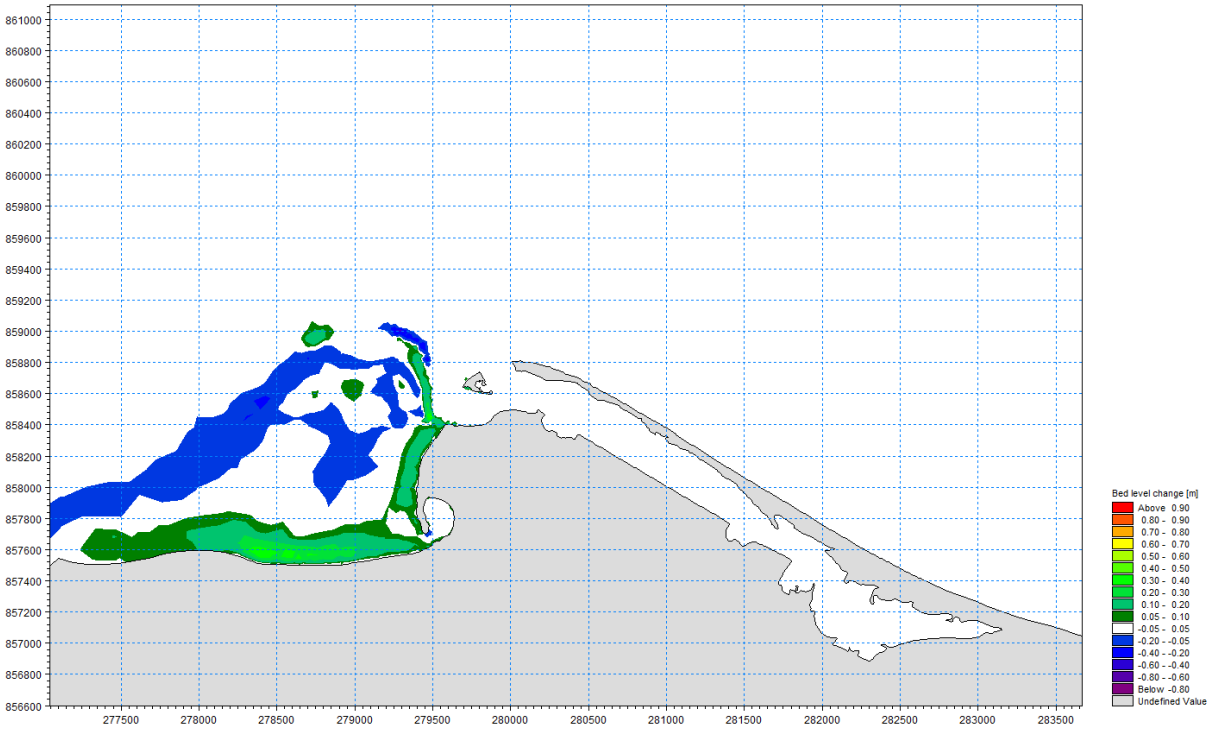


Figure 6-7: FMHDST_G PostDev 2018 Sands Trace Final Timestep – Bed Level Change

7 IMPACT ASSESSMENT

7.1 Coastal Processes

The model results described in the previous sections of this report have been reviewed and compared to assess the likely impacts to coastal processes resulting from the licenced change in design to the previously consented dredge activity. Comparisons between model results for the proposed 2023 post-development (dredge) scenario, results for the existing baseline (2023), and results for the previously consented 2018 post-development (dredge) scenario, are outlined in the following sections.

7.1.1 Tides

2023 Post-Development Versus 2023 Baseline

A comparison of the modelling results with and without the proposed 2023 dredge variation has been undertaken. This comparison highlights that there will be no significant impact on tidal levels, except to increase low water tidal range within the dredge zone. This is particularly evident where deposition has occurred in the harbour.

Hydrodynamic modelling results allow comparison of both flood and ebb tidal currents during a spring tidal cycle, with and without the 2023 dredge extent. A differential plot of mid-flood spring tidal currents (2023 post-development minus 2023 baseline) is presented in Figure 7-1. Figure 7-2 presents the equivalent plot for mid-ebb tide, and Figure 7-3 for the statistical maximum current speeds from each model scenario.

Comparison of the model results for the mid flood spring tidal currents indicates that there would be localised reductions in tidal velocity (up to 0.45 m/s) within the immediate vicinity of the navigation channel. Further outside the immediate vicinity of the proposed dredge zone, comparison of modelling results indicates there would be no significant impact on tidal velocities during the flood tide.

The ebb tide comparison of modelling results indicates a similar pattern to the flood tide, although with a slightly reduced extent, and reductions in current velocity (up to 0.45 m/s) within, and immediately adjacent to, the navigation channel. Again, outside the immediate vicinity of the proposed dredge zone comparison of modelling results indicates there would be no significant impact on tidal velocities during the ebb tide.

A similar pattern is shown on review of the statistical maximum differential plot, with results indicating reductions in current velocity (up to 0.6 m/s) within, and immediately adjacent to, the navigation channel. Again, outside the immediate vicinity of the proposed dredge zone comparison of modelling results indicates there would be no significant impact on tidal velocities.

Whilst the modelling results indicate that the proposed dredging will produce localised changes in current velocities. It is considered that these variations are insignificant in terms of the wider hydrodynamic regime of the Moray Firth, with post development velocities of a similar nature to those observed elsewhere.

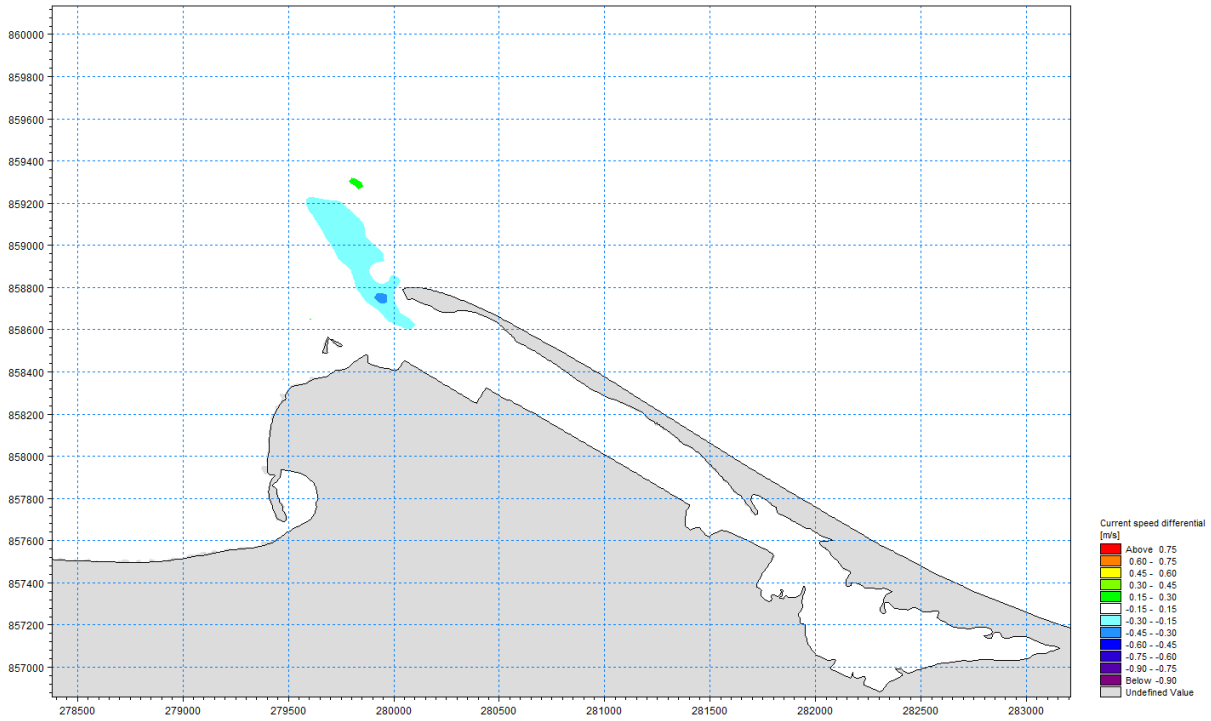


Figure 7-1: 2023 Post-Development Versus 2023 Baseline Mid-Flood Spring Tide – Current Speed Differential

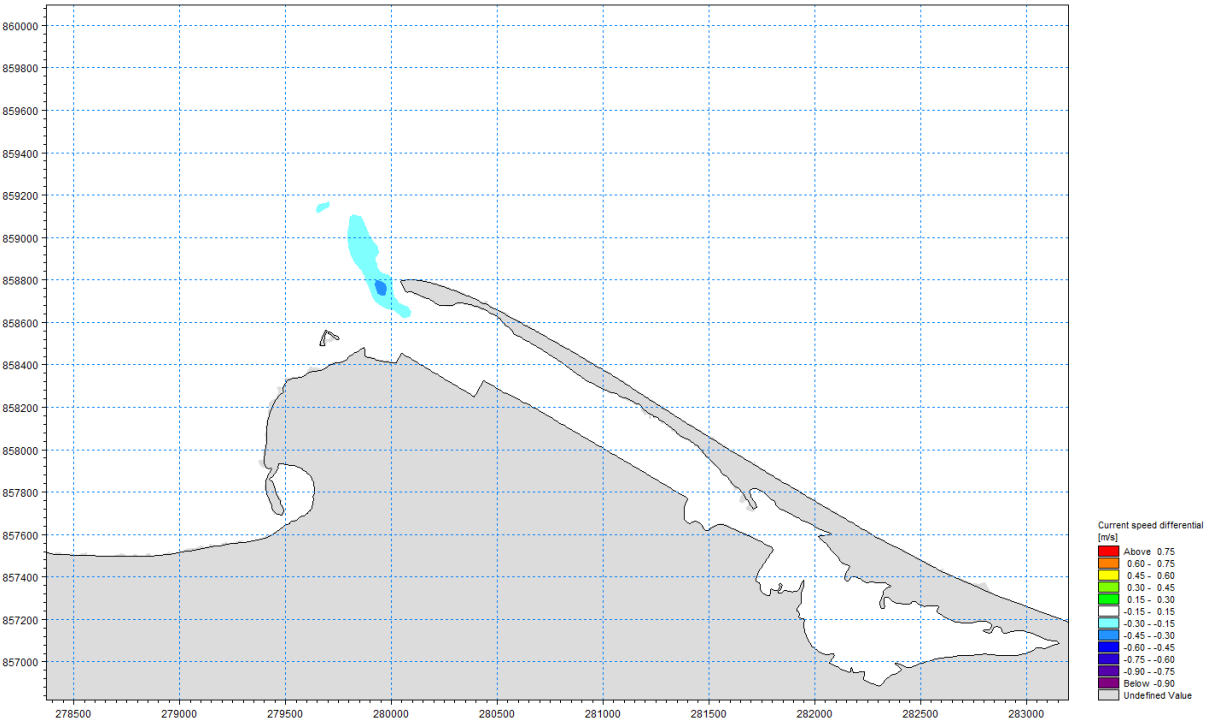


Figure 7-2: 2023 Post-Development Versus 2023 Baseline Mid-Ebb Spring Tide – Current Speed Differential

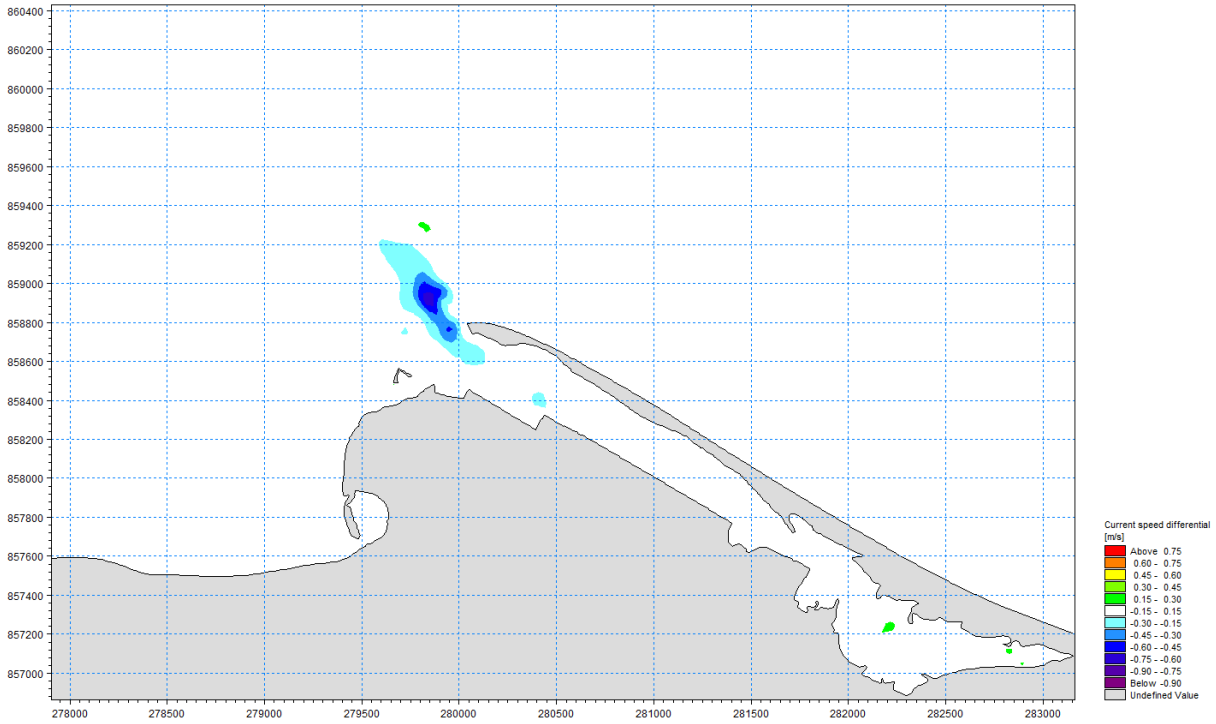


Figure 7-3: 2023 Post-Development Versus 2023 Baseline – Statistical Maximum Current Speed Differential

2023 Post-Development Versus 2018 Post-Development

A comparison of the modelling results with the proposed 2023 dredge variation versus the proposed 2018 consented dredge extent has been undertaken. This comparison highlights that there will be no significant impact on tidal levels.

Hydrodynamic modelling results allow comparison of both flood and ebb tidal currents during a spring tidal cycle, with the 2023 dredge extent versus the 2018 dredge extent. A differential plot of mid-flood spring tidal currents (2023 post-development minus 2018 post-development) is presented in Figure 7-4. Figure 7-5 presents the equivalent plot for mid-ebb tide, and Figure 7-6 for the statistical maximum current speeds from each model scenario.

Comparison of the model results for the mid flood spring tidal currents indicates that there would be limited and localised reductions in tidal velocity (up to 0.3 m/s) within the immediate vicinity of the navigation channel. Further outside the immediate vicinity of the proposed dredge zone, comparison of modelling results indicates there would be no significant impact on tidal velocities during the flood tide.

On the ebb tide comparison of modelling results indicate no significant change in current velocity between the two scenarios.

A similar pattern to the flood tide results is shown on review of the statistical maximum differential plot, with results indicating limited and localised reductions in current velocity (up to 0.3 m/s) within, and immediately adjacent to, the navigation channel. Alongside the quay face limited reductions (up to 0.6 m/s) are also observed. Outside the immediate vicinity of the proposed dredge zone comparison of modelling results indicates there would be no significant impact on tidal velocities.

The modelling results indicate that the proposed 2023 dredge variation will produce very limited and localised changes in current velocities within the dredge extent versus the consented 2018 dredge. It

is considered that these variations are insignificant in terms of the wider hydrodynamic regime of the Moray Firth, with post development velocities of a similar nature to those observed elsewhere.

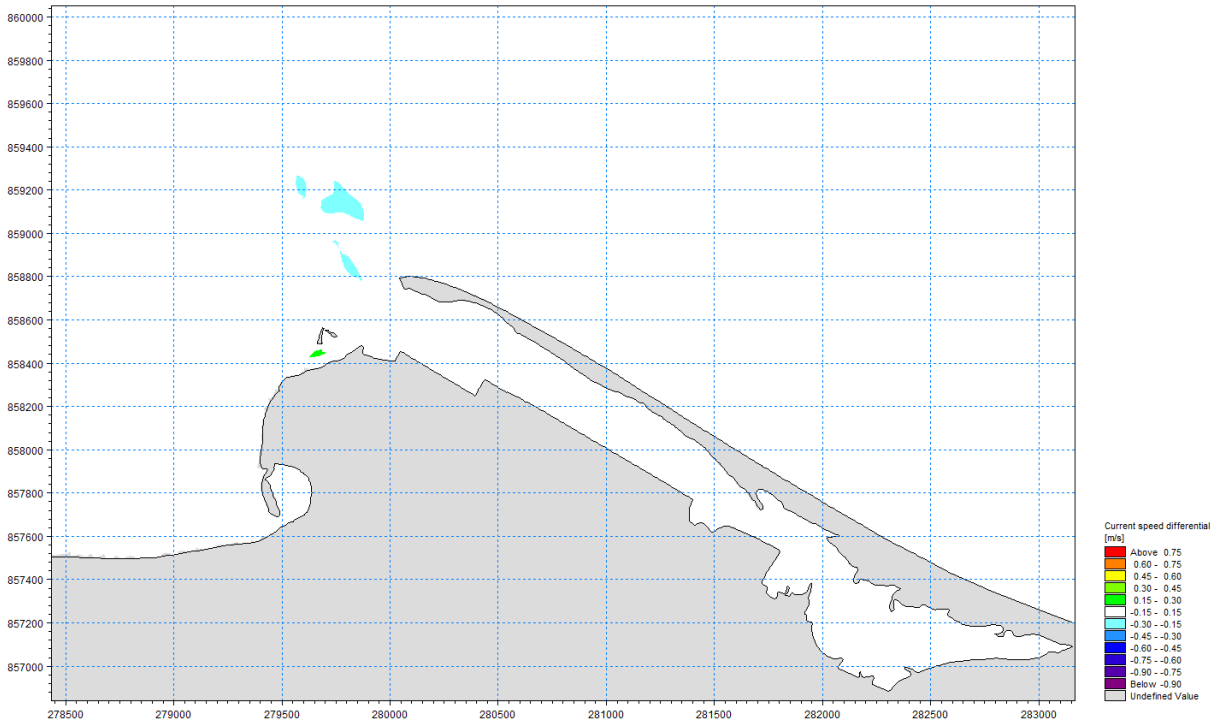


Figure 7-4: 2023 Post-Development Versus 2018 Post-Development Mid-Flood Spring Tide – Current Speed Differential

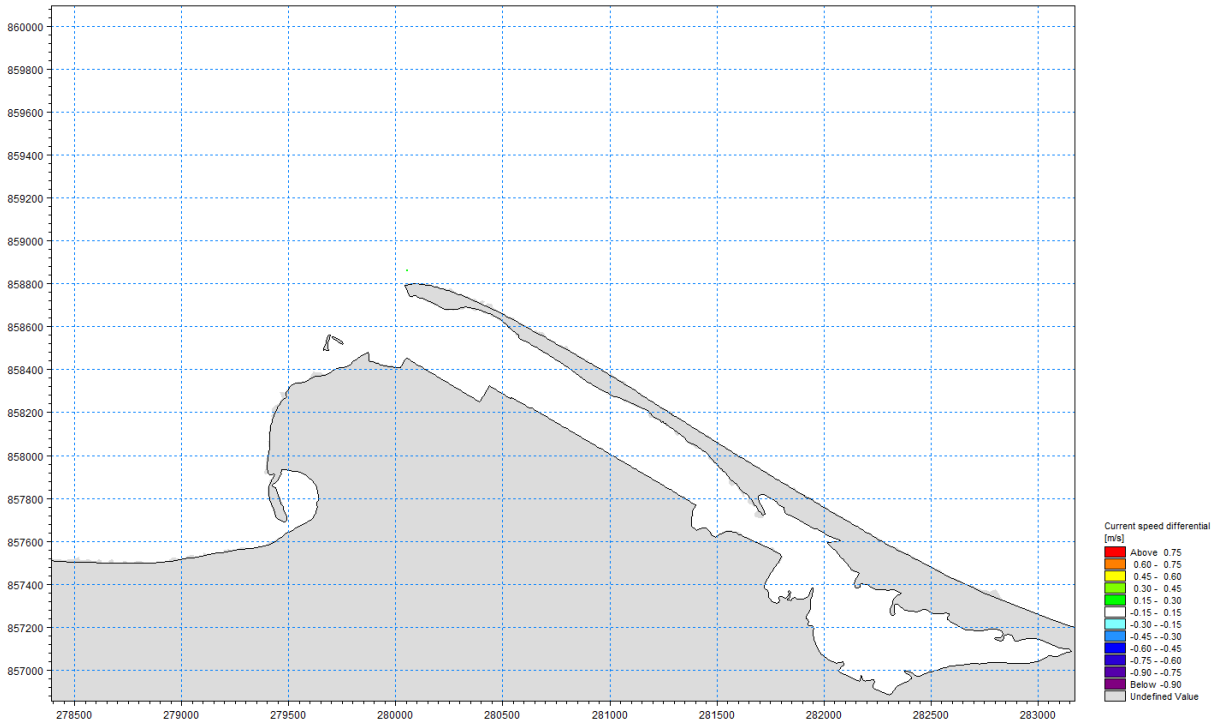


Figure 7-5: 2023 Post-Development Versus 2018 Post-Development Mid-Ebb Spring Tide – Current Speed Differential

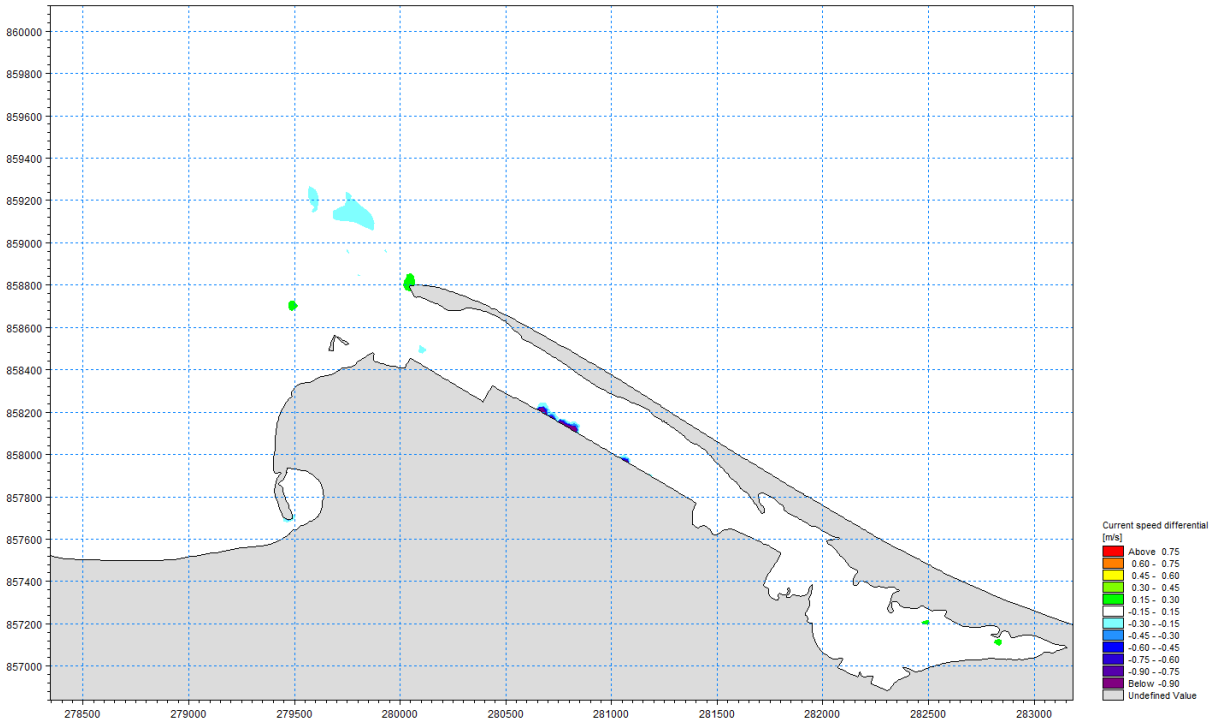


Figure 7-6: 2023 Post-Development Versus 2018 Post-Development – Statistical Maximum Current Speed Differential

7.1.2 Waves

2023 Post-Development Versus 2023 Baseline

Figure 7-7 presents a differential plot (2023 post-development minus 2023 baseline) of significant wave height for a selected storm in January 2003. Modelling results show that during such a typical winter period storm from the north-east the proposed dredging generally results in a slight increase in significant wave height within the dredge zone and immediate vicinity.

Waves would also be able to penetrate further into the harbour through the navigation channel. Elsewhere, outside the immediate vicinity of the proposed dredge zone the modelling indicates that the proposed development will have no significant impact on wave climate.

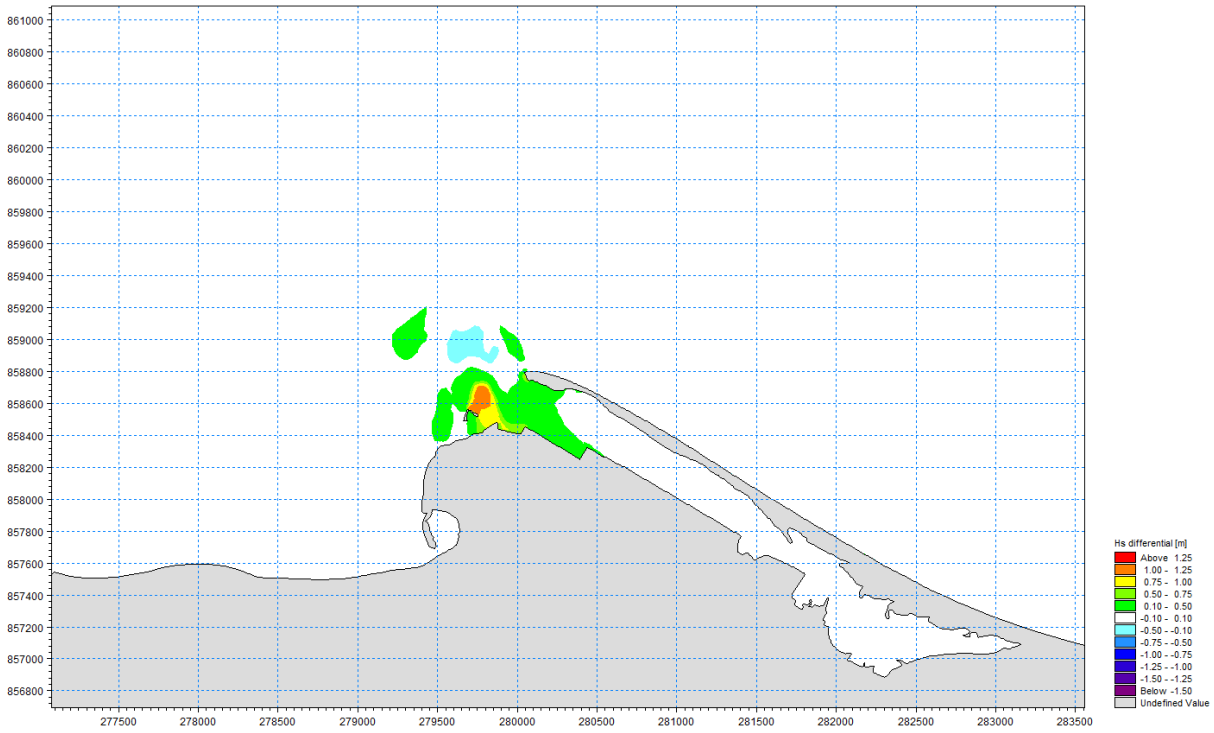


Figure 7-7: 2023 Post-Development Versus 2023 Baseline – Significant Wave Height Differential

2023 Post-Development Versus 2018 Post-Development

Figure 7-8 presents a differential plot (2023 post-development minus 2018 post-development) of significant wave height for the same storm in January 2003. Modelling results show that during such a typical winter period storm from the north-east the proposed dredge variation generally results in a slight increase in significant wave height within the dredge zone and immediate vicinity.

Waves would also be able to penetrate further into the harbour through the deeper and wider navigation channel. Elsewhere, outside the immediate vicinity of the proposed dredge zone the modelling indicates that the proposed development will have no significant impact on wave climate, with some minor differences observed related to bathymetric changes between 2018 and 2023.

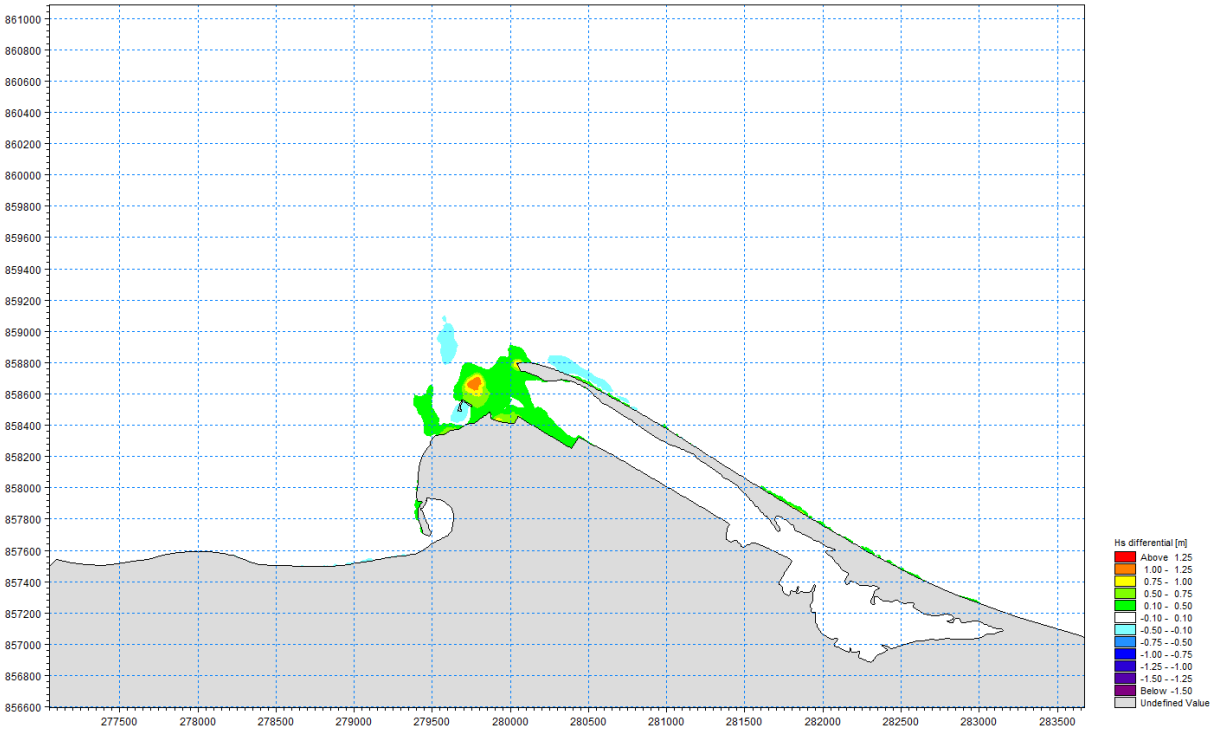


Figure 7-8: 2023 Post-Development Versus 2018 Post-Development – Significant Wave Height Differential

7.1.3 Sediment Transport (Coastal Morphology)

2023 Post-Development Versus 2023 Baseline

Sand transport patterns and pathways have been modelled for conditions with the proposed 2023 dredging works in place. Model runs applying a morphology speedup factor have simulated 3 months of sand transport under existing and proposed dredge conditions, as detailed in sections 6.9.1 and 6.9.2.

Figure 7-9 presents a differential plot of bed level change at the end of each simulation (post-development 2023 minus baseline 2023). This plot highlights that significant differentials in bed level change are limited to the dredge navigation channel, and the immediate vicinity. This indicates that the longshore transport of sand along the eastern face of the spit will continue unaffected by the proposed 2023 dredge. The modelling highlights that whilst the north-western intertidal and subtidal build out of the spit will continue to the east of the dredged navigation channel, the channel will act as a trap to the further westward transport of sediment.

To the west of the new channel the results indicate that the remaining intertidal and subtidal head of the spit will be subject to ongoing erosion, with sand predominantly being transported further west into the present location of the former dredged navigation channel, and across the north-eastern fringe of Whiteness Sands, in line with present day processes.

Due to the large volume of sediment currently available within the local coastal system, it is considered that the removal of the proposed dredge budget to land will not be significant in terms of the wider system. Observed trends, model results and the conceptual understanding of local sediment transport processes all indicate that potential impacts to sediment transport and coastal morphology will be localised in extent. It is considered that the longshore feed of sediment along the spit will continue,

with change limited to the footprint and immediate vicinity of the dredge channel, and the north-eastern fringe of Whiteness Sands.

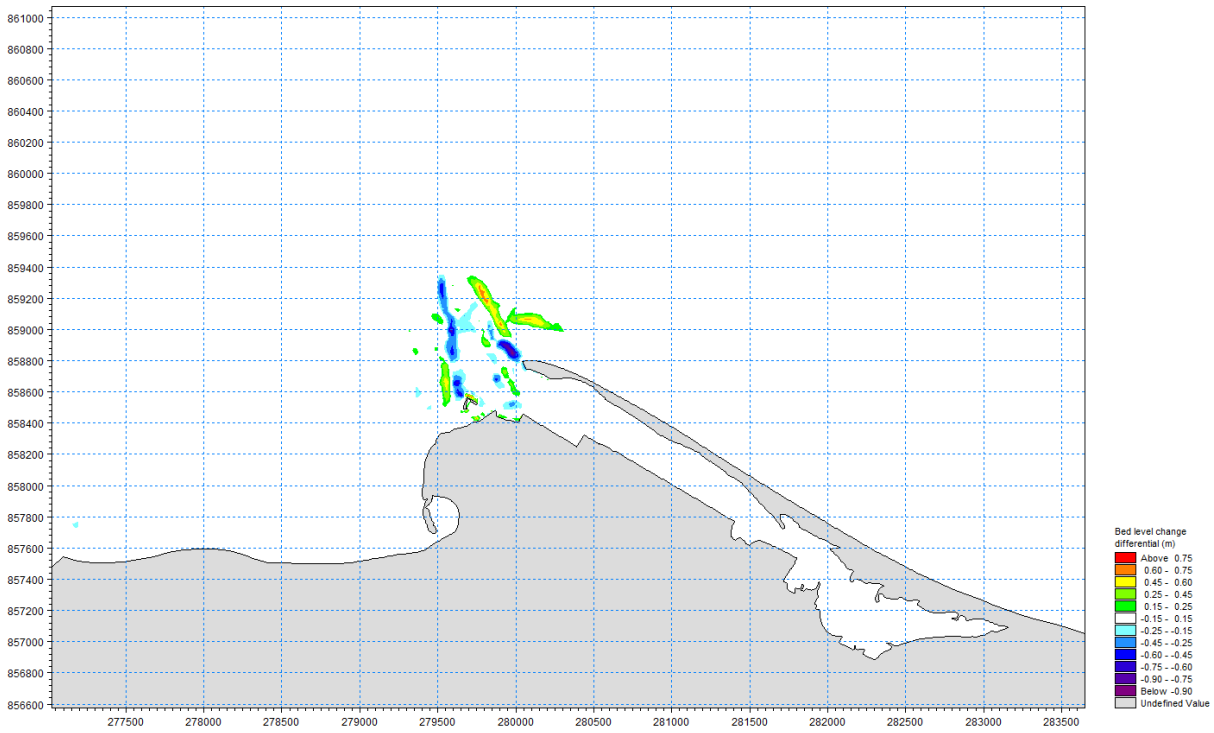


Figure 7-9: 2023 Post-Development Versus 2023 Baseline – Bed Level Change Differential

2023 Post-Development Versus 2018 Post-Development

Comparison has been undertaken between sand transport model results for the proposed 2023 dredge variation versus the consented 2018 dredge extent. Figure 7-10 presents a differential plot of bed level change at the end of each simulation (post-development 2023 minus post-development 2018). This plot highlights that differentials are limited to the dredge extent and immediate surrounds. Some of these differences may be attributed to changes in bathymetry between 2018 and 2023 input survey datasets, however primarily they relate to the change in dredge channel extent and the position of the channel tie-in slopes.

Figure 7-11 presents a differential plot of bed level change at the end of each simulation (post-development 2023 minus post-development 2018) for the spit trace model scenario, which focuses on assessing transport of sand from the sand spit in the east, and immediate surrounds. This plot highlights the movement in zone of deposition between the two dredge scenarios due to the wider dredge channel in the 2023 scenario. No significant change is predicted elsewhere, and importantly no change to the west of the dredge channel. Figure 6-3 highlights that some sand transport would continue across the dredge channel, with deposition occurring around the southern margin of Whiteness sands.

Figure 7-12 presents a differential plot of bed level change at the end of each simulation (post-development 2023 minus post-development 2018) for the sands trace model scenario, which focuses on assessing transport of sand from the Whiteness Sands in the west, and immediate surrounds. The plot shows very limited and localised differential between the two scenarios.

The model results and analysis indicate that the proposed dredge variation will have only limited and localised impact to sand transport processes, versus the consented 2018 dredge extents, with these

changes primarily observed within the dredge extent. The results indicate that present day processes will continue relatively unaffected by the development in the wider setting, and key sediment transport pathways between the spit and sands are not significantly affected by the variation in dredge design.

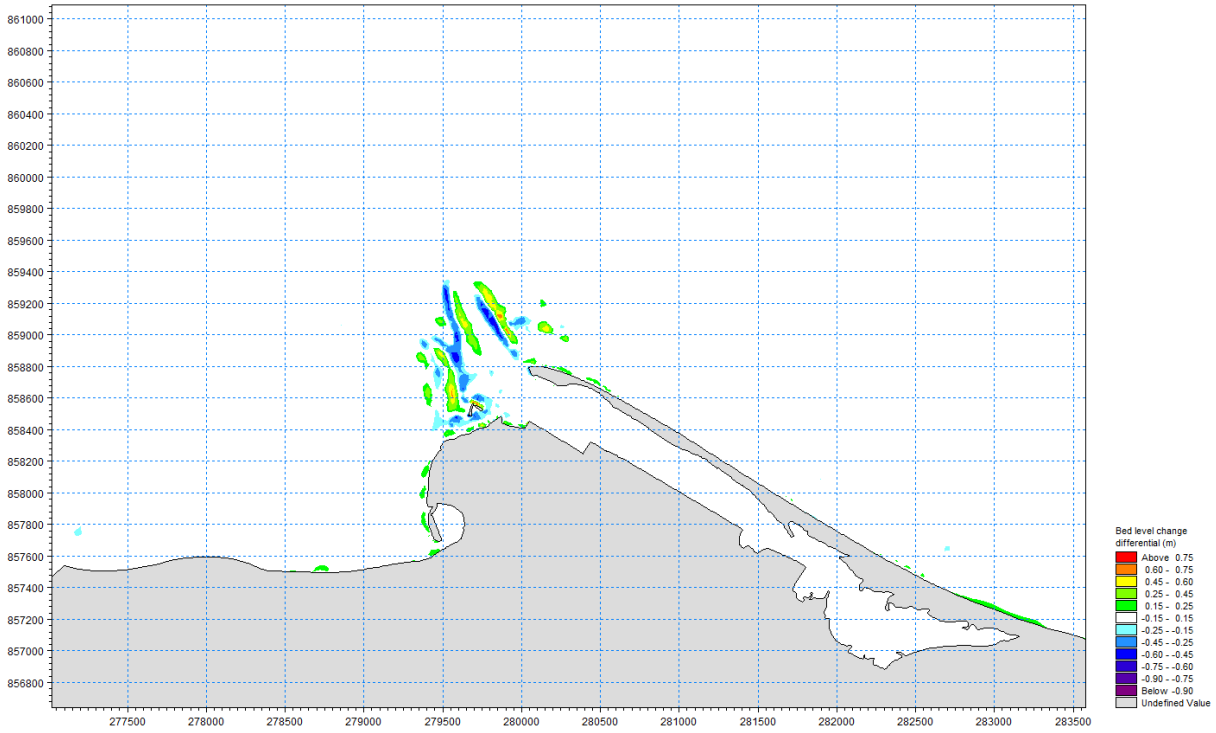


Figure 7-10: 2023 Post-Development Versus 2018 Post-Development – Bed Level Change Differential

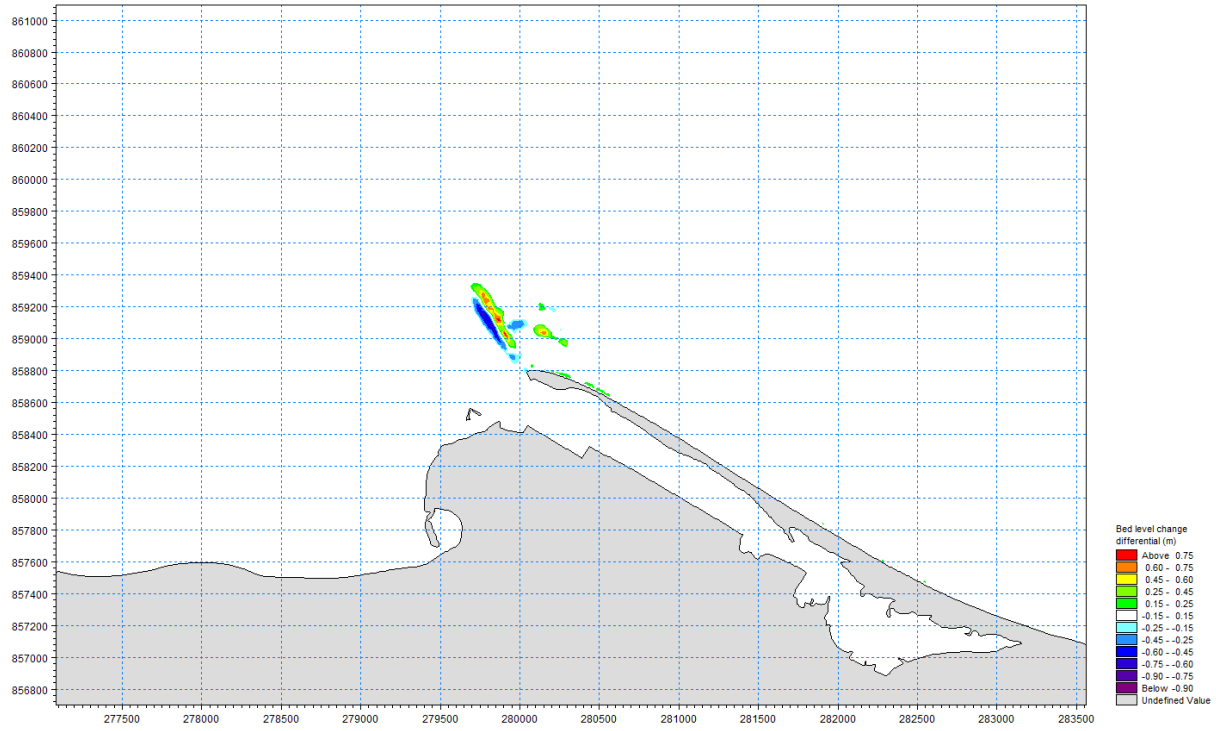


Figure 7-11: 2023 Post-Development Versus 2018 Post-Development – Bed Level Change Differential (Spit Trace)

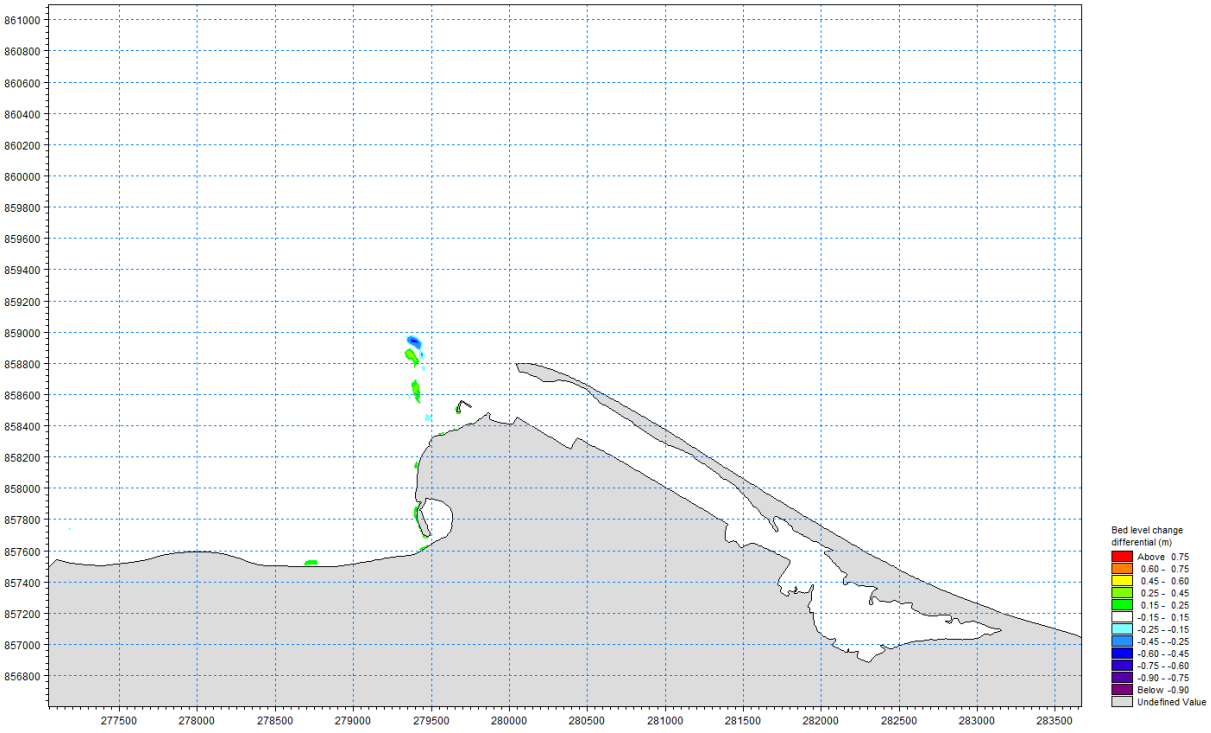


Figure 7-12: 2023 Post-Development Versus 2018 Post-Development – Bed Level Change Differential (Sands Trace)

7.2 Impact on Designations

The predicted zone of impact to coastal processes from the proposed 2018 dredge extent in relation to designated sites, as previously assessed, is identified in Figure 7.13. These impacts relate primarily to the dredging activities to reinstate the navigation channel and harbour. The extents shown are based on the conceptual understanding and supported by hydraulic modelling. Given the results of the updated coastal modelling presented in this report, it is considered that this predicted zone of impact remains true for the proposed 2023 dredge variation.

Comments in relation to the extent of the impact on the designated sites, and relative proportions of designation impacted, are provided in Table 7.1. The areas of the designated sites potentially impacted are small.

The findings of this assessment remain consistent with those of the NCCA report, Cell 3 – Cairnbulg Point to Duncansby Head, for Whiteness Head (Site 34) as presented below.

'Currently the site has planning permissions for both a new town development (postponed after 2006) and a renewables fabrication yard, which has yet to advance due to the Port of Ardersier going into administration. The past, recent and anticipated changes do not present a risk or threat to the nature conservation designation interest of the site.'(Hansom et al., 2017)

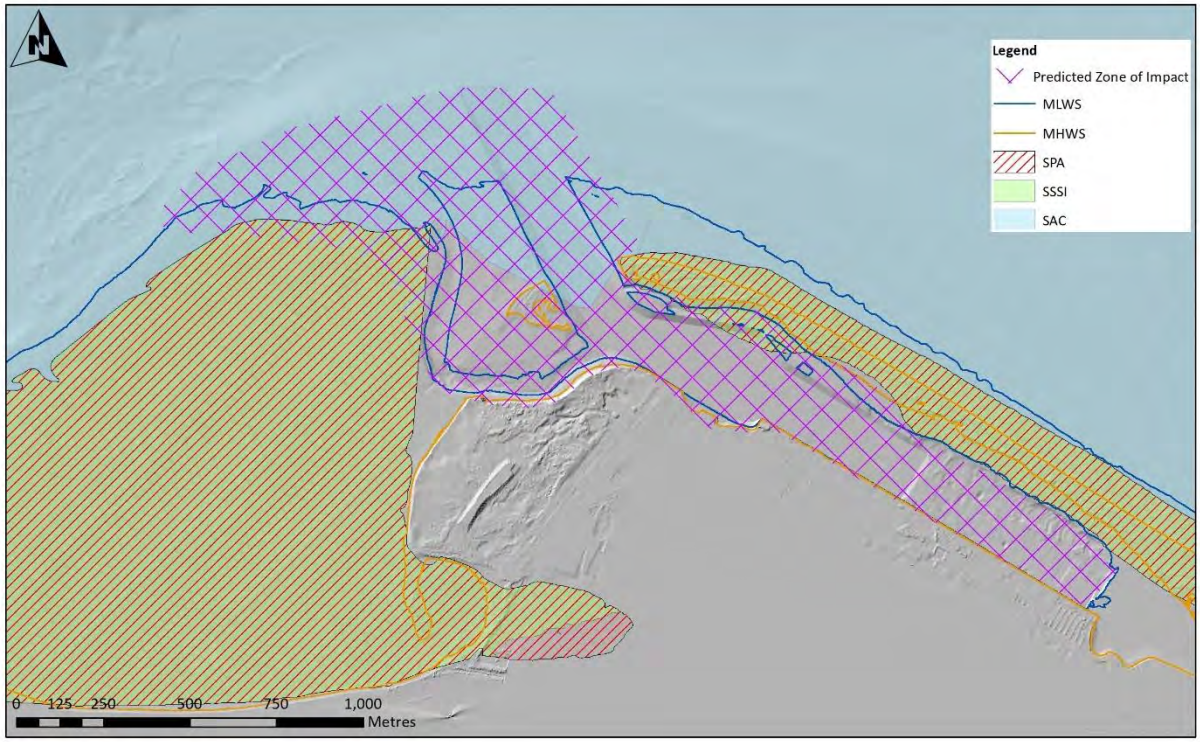


Figure 7.13: Predicted Zone of Impact in Relation to Designated Sites

Table 7.1: Zone of Impact Extents in Relation to Designated Sites

Designated Site	Comment	Approximate Area of Site Impacted
Whiteness Head SSSI	Spit: Predominantly outside designated boundary, but includes present spit head and future development area.	<3%
	Sands: Small area limited to north-eastern extent of intertidal sands.	
Inner Moray Firth SPA	Impact zone limited to Whiteness Head and Whiteness Sands. Comments as per SSSI above.	0.1%
Moray Firth SAC	Intertidal and subtidal zone around dredge channel and immediately to the west.	<0.1%

8 SUMMARY OF IMPACTS

In general terms, the proposed dredge design represents an increase in depth and width to the navigation channel as previously assessed in 2013 and 2018, while the relative positioning remains similar. The key findings of the predicted effects of the 2018 assessment have been reviewed in relation to the proposed design and the updated modelling presented in this report, as summarised in Table 8.1.

Table 8.1: Review of Coastal Processes Impacts (2018) to 2023 Design Change

Coastal Process	2018 Assessment Findings	2023 Proposed Design Conditions
Tides	No significant impact on tidal levels.	No Change.
	Low water tidal range will increase within dredge zone.	No Change.
	Localised reductions in tidal velocities within the immediate vicinity of dredge zone.	Further reduction due to increased depth and width of dredge zone.
	No significant impact on tidal velocities outside the immediate vicinity of dredge zone.	No change.
	Variations in tidal velocities considered insignificant in terms of the wider hydrodynamic regime of the Moray Firth.	No change.
Waves	Slight increase in significant wave height within the dredge zone and waves able to penetrate into the harbour via the dredge channel.	Further increases in wave height in dredge channel and penetration into outer harbour / quay.
	No significant impact on wave climate outside the immediate vicinity of the dredge zone.	No change.
Sand Transport (Coastal Morphology)	Longshore transport of sand along spit from east will continue unaffected by the dredge.	No change.
	Intertidal and subtidal build up of the spit will continue to the east of the navigation channel.	No change.
	The navigation channel dredge zone will act as a trap to onward westward sediment transport along spit, with material being deposited.	No significant change to process, position of initial deposition moves with dredge extents.
	Immediately west of the navigation channel dredge zone, the remaining intertidal and subtidal head of the spit will be subject to ongoing erosion, with material being transported predominantly west into the former dredged channel and the north-eastern fringe of Whiteness Sands, with some material moving south and east into the navigation channel.	Process will remain similar. Increase in area of subtidal bed exposed to erosion.
	Further west across the central parts of Whiteness Sands will remain relatively unaffected.	No change.
	The proposed material removal by dredging is not considered significant in terms of the wider system due to the large volume of sediment currently available within the local coastal system.	No change.
	Impacts to sediment transport and coastal morphology will be localised in extent, with areas of change limited to the footprint and immediate vicinity of the dredge channel and the north-eastern fringe of Whiteness Sands	No change.

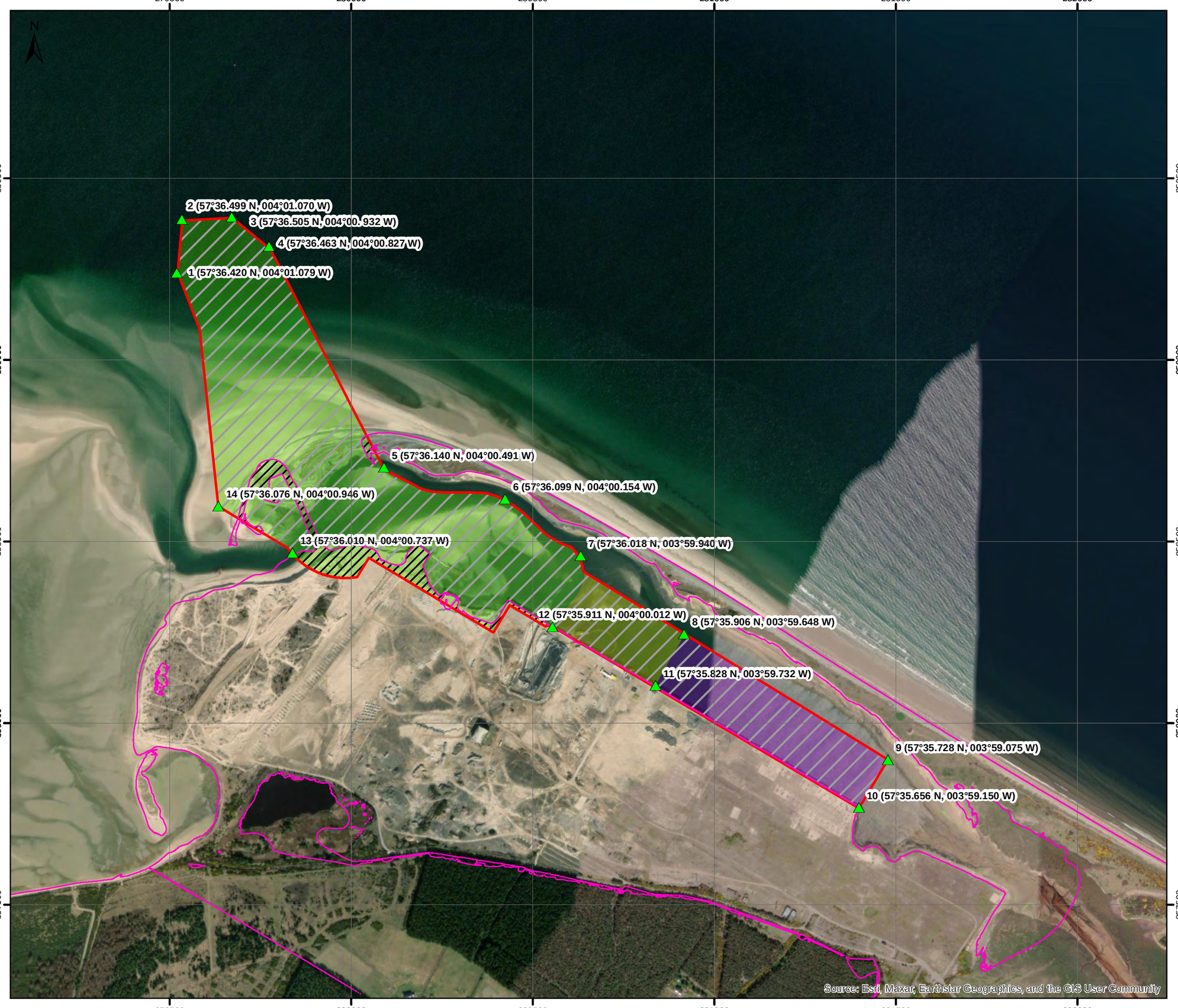
Coastal Process	2018 Assessment Findings	2023 Proposed Design Conditions
Impact on Designated Sites	Areas potentially impacted assessed as being small. Whiteness Head SSSI (<3%); Inner Moray Firth SPA (0.1%); and Moray Firth SAC (<0.1%)	No significant change.

This updated assessment has reviewed the findings of the 2018 coastal processes assessment, in the context of a now proposed deeper and wider dredge within the same corridor, finds similar impacts would be anticipated. Where changes have been identified, these are predominantly within the immediate vicinity of the dredge zone, becoming less beyond this zone. Where changes are expected versus existing conditions, these are anticipated to be of a similar magnitude to those previously assessed in 2018 for the consented dredge design.

The overall impact of the proposed deeper dredge on the local conditions and processes is therefore not predicted to significantly change the overall findings of the 2018 assessment.

APPENDICES

A DREDGE DESIGN AND EXTENT



Legend

- Project Extent
- Mean High Water Springs (MWHS)
- Dredge Point Co-ordinates
- Areas Above MHWS for Removal
- Dredge Area Below MHWS

Dredge Depth (mCD)

- -3.0
- -6.5
- -12.9

Note: MWHS is 4.2mCD digised from CainTech UAV Survey undertaken in 2023

Do not scale this map

Client
Ardersier Port (Scotland) Ltd.

Project
Ardersier Port Dredge

Title
Revised Dredge Boundary 2023

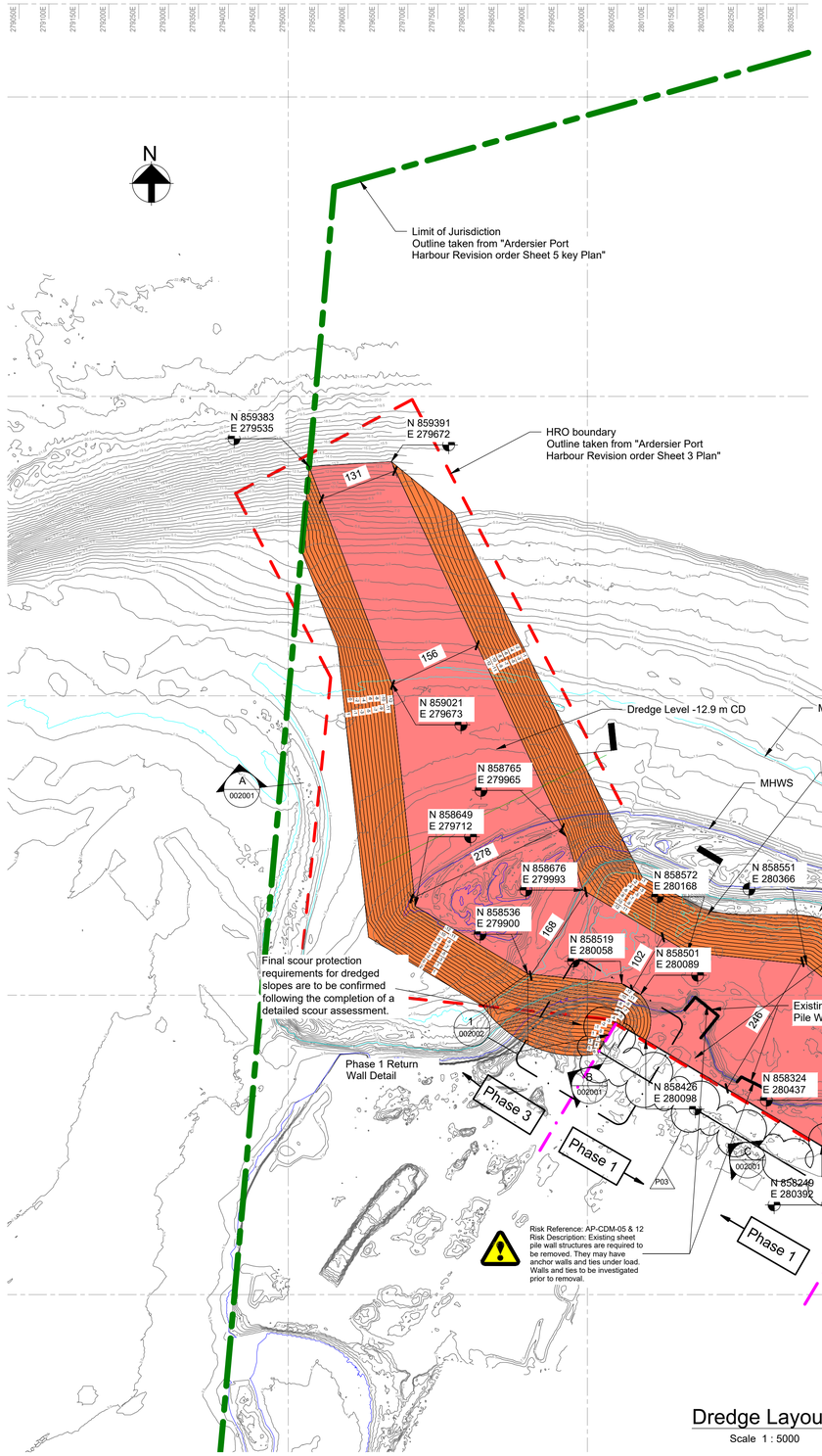
Status
FINAL

Drawing No.	Revision	Date
676693-GIS006	B	10 Oct 2023
Drawn	**Checked**	**Approved**
MN	CCAS	CCAS

Scale
1:10,000 @A3
0 50 100 200 300 Metres

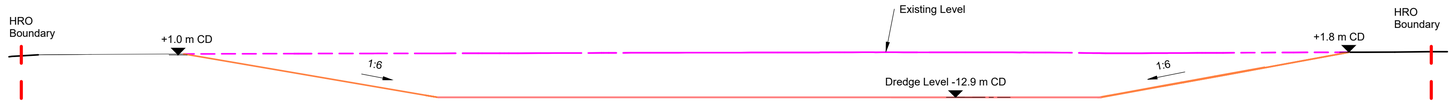
Rev	Date	Amendment	Initials
A	25/10/23	MHWS added and co-ordinates updated	JAS
B	02/11/23	Labels updated	JAS

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



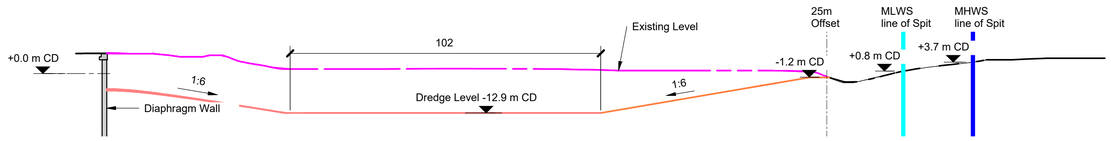
Dredge Layout

Scale 1 : 5000



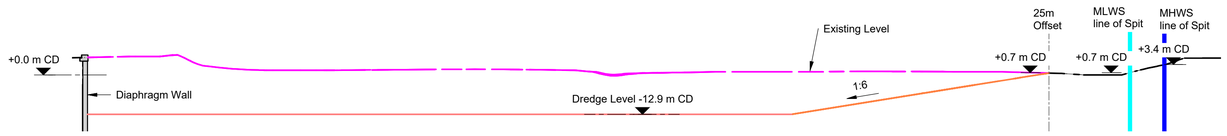
A Section A

1 : 1000



B Section B

1 : 1000



C Section C

1 : 1000

Legend

- Dredge Slope 1:6
- Spit Reinstatement area

SAFETY, HEALTH & ENVIRONMENT

Notes below are additional to hazards normally associated with this type of work which a competent Contractor using safe methods of working should be aware of. Consult Arup Designer Risk register (Ref: "AP-CDM") for assessment of hazards at this stage of design. Additional hazards (including any associated with construction, operation, maintenance, or removal / demolition) are to be determined by Temporary Works Designer.

1.	Ref: AP-CDM-05	Existing sheet piles at likely to have associated anchor walls which are not recorded on surveys.
2.	Ref: AP-CDM-12	Contractors to be aware of the risk of unrecorded buried obstructions or services.
3.	Ref: AP-CDM-20	Potential risk of encountering UXO during excavations / dredging.
4.	Ref: AP-CDM-21 & Ref: AP-CDM-31	Contaminated ground.
5.	Ref: AP-CDM-25	Excessive diaphragm wall movement.
6.	Ref: AP-CDM-34	Unexpected ground conditions / obstructions.
7.		Refer to specific risks highlighted on sheet.

Not for Construction

Notes:

1. All levels are in m above Chart Datum (mCD).
2. Coordinates are shwon to OS National Grid.
3. Details shown are based on concept design calculations and information. All details are subject to detailed design.
4. Phase 1 dredge levels are proposed on the basis that no scour protection is constructed, however, the berthing pocket will be monitored for signs of scour and reinstated if scour is observed. Bathymetric surveys shall be undertaken as follows:
   a) following construction of the works but prior to operation of the port;
   b) 2 weeks after the port becomes operational or after the first three vessels have used the port, whichever is first;
   c) every two months following the first operational survey;
   d) after any significant event which may have caused scour (e.g. after vessels of greater than 200m length or vessels which have a under keel clearance of 2m or less have used the port).

   The frequency of survey shall be reviewed after 12 months.
5. Assumed design life for sheet piles and tie rods is 60 years. TBC as part of detailed design.

Issue	Date	
P03	14/07/2023	Updated in line with Bauer Diaphragm and Anchor wall confirmation
P02	21/06/2023	Updated for Concept design stage submission.
P01	18/05/2023	First Issue

ARUP
8 Fitzroy Street
London W1T 4BJ
Tel +44 (0)20 7636 1531 Fax +44 (0)20 7580 3924
www.arup.com

Client: Ardersier Port

Project Title: Ardersier Port

Drawing Title: Phase 1 Proposed Dredging Layout Sheet 1

Scale at A1: As indicated | By / Chkd / Appd: JDW/AR/PST

Role: Civil - Geotechnical

Status: S2 - Suitable for Information -

Arup Job No: 294067-00 | Rev: P03

ID: 294067-ARUP-XX-XX-DR-CG-002001

14/07/2023 10:17:05

Do not scale

Sediment Transport Monitoring Plan

Ardersier Port
Sediment Transport Monitoring Plan

July 2024

CONTROL SHEET

Client: Haventus Ltd.
Project Title: Ardersier Port
Report Title: Sediment Transport Monitoring Plan
Document number: 13678
Project number: 676693

Issue Record

Issue	Status	Author	Reviewer	Approver	Issue Date
1	Issue	MN	KMD	CCAS	15/09/2023
2	Issue	MN	CCAS	CCAS	06/10/2023
3	Issue	MN	CCAS	CCAS	09/10/2023
4	Issue	MN	CCAS	CCAS	11/10/2023
5	Issue	MN	CCAS	CCAS	12/07/2024

EnviroCentre Limited Office Locations:

Glasgow **Edinburgh** **Inverness** **Banchory**

Registered Office: Craighall Business Park 8 Eagle Street Glasgow G4 9XA
Tel 0141 341 5040 info@envirocentre.co.uk www.envirocentre.co.uk

EnviroCentre Limited is registered in Scotland under no. SC161777.

VAT no. GB 348 6770 57.

Contents

Appendices

Tables

1 INTRODUCTION

This plan has been produced to ensure that the recommendations made for sediment transport monitoring as part of the assessment of sediment transport undertaken during the planning stages of this project, and further refined during subsequent consultation, are implemented during the construction and operational phase of the port.

This plan was produced initially in 2017, and was updated in 2018 as part of the Environmental Impact Assessment report (EIAR). A further addendum update was issued in 2021, in response to changes in the proposed dredge method. The monitoring plan has been active during capital dredging works completed to date. A summary report detailing the findings of monitoring undertaken was issued in March 2023 (EnviroCentre Report No.13193). This present version represents the latest update to the Sediment Transport Monitoring Plan developed in response to a further revision in the proposed dredge design and method, and accounting for proposed sediment nourishment activities to surrounding depositional features. Sediment nourishment activity locations are detailed on Drawing ArdPhase1-HAV-WP3-ZZ-DR-C-0006 in Appendix A. The key aspects of the new dredge design include a change to dredge extents and an increased depth of dredge to -12.9 mCD, the proposed dredge extent is shown in Drawing 1, Appendix A.

This plan will remain an active document during the construction and future operation of the port to inform forward management decisions potentially impacting coastal processes.

The Draft Construction Environment Management Plan (CEMP) submitted as part of the Environmental Statement (ES) produced in 2013 stated within the Draft Scheme of Mitigation for coastal processes that:

> *"Monitor the circulation of capital dredge material around Whiteness Sands through further bathymetric surveys to confirm modelling predictions for dredged material deposited at the spoil ground. Adopt a dynamic monitoring and mitigation approach which can adapt to consider deposition of maintenance dredged material at other locations (including along the line of the Spit) to protect designated features as required and with the approval of Marine Scotland in consultation with SNH."*

The Coastal Processes Assessment included within the ES (Vol. 3 Appending 11.1) recommended:

> *To confirm the findings of the coastal processes review, and to inform future modelling at the site, a sediment transport monitoring plan will be implemented. This will be agreed with Marine Scotland and SNH and it is recommended that this would include:*
>
> - *Regular (2 to 3) bathymetric/topographic surveys of Whiteness Sands, access channel and Whiteness Spit during the first year post capital dredge. Ideally one of the surveys would be carried out after a storm event. These should include at least one detailed survey along with agreed transects.*
> - *Monthly visual inspections of the disposal area at low tide, incorporating fixed point photography for visual comparison to document sediment dispersal.*
> - *A monitoring buoy will be deployed for a three month period post capital dredge to gather wave and tidal data, this would provide site specific data to inform any future modelling.*
> - *Installation of a mechanical bed-load trap samplers such as booner tubes to record sediment transport in the intertidal zone and also include foreshore sand traps for aeolian transport.*

The present 2023 dredge strategy does not include for placement of capital dredge material on the Whiteness Sands spoil disposal ground, or along the outer shore of Whiteness Spit. As a result, the aeolian transport sampling noted in the final bullet point above is not considered necessary.

Subsequent to the assessment undertaken as part of the ES, the Scottish Government has recently completed the National Coastal Change Assessment (NCCA). The NCCA establishes historic coastal change by comparing Ordnance Survey maps (1892-1905) to both the 1970's and current coastal position in order to estimate past erosion/accretion rates. These historic coastal change rates are then projected into the future using a Coastal Erosion Susceptibility Model (CESM) to limit erosion to areas where the hinterland is susceptible to erosion. The NCCA aims to inform existing strategic planning and also identify those areas which may remain susceptible in the coming decades and require supplementary support through the development of future management policies and adaptation plans robustly based on a strategic and objective evidence base. Whiteness Head is identified as an area susceptible to erosion and the sediment data collected as part of this plan will contribute to future management and adaptation plans.

2 AIMS AND OBJECTIVES

The plan is intended to provide relevant information on sediment transport, erosion and deposition within the area of Whiteness Spit, Whiteness Sands and Ardersier Port, to inform future maintenance dredge works, and associated sediment nourishment activities.

The sediment transport monitoring information collected will be used support future assessment and modelling, including consideration of volumes of material to be dredged, and options for sediment disposal or re-use.

The wider aims of this plan are to:

- Monitor the movement of natural material around Whiteness Spit and Sands;
- Provide a dataset of sediment transport information to inform future maintenance dredging and sediment nourishment activities; and
- Provide supporting information to the Habitat Management Plan in relation to Whiteness Head and Whiteness Sands.

The specific objectives of this plan are to:

- Define the scope of the type and frequency of monitoring that will be undertaken;
- Define areas that will be monitored to assess sediment transport;
- Collect data to compare with existing and future coastal modelling predictions;
- Provide data for analysis and/or coastal modelling to inform design of future maintenance dredge operations and sediment nourishment activities; and
- Inform the Spit Habitat and Protection and Enhancement Plan within the Natural Heritage Management Plan.

As outlined in Section 1, active sediment monitoring has been undertaken during capital dredge works completed to date. This current monitoring plan will build on these existing datasets and will continue to expand the baseline dataset, before continuing monitoring during the next phase of capital dredge works, and through the subsequent operation of Ardersier Port.

Reporting will include a post-dredge factual report and update reports in relation to subsequent maintenance dredge operations. The update reports will include a review of the type, extent and frequency of monitoring. Any changes proposed will be considered in consultation with the Marine Directorate (MD) and Ardersier Port Ecological Management Group (EMG).

3 MONITORING

3.1 Overview

The sediment transport monitoring plan is designed to monitor the circulation of natural material around Whiteness Spit and Sands prior to, during and after the capital dredge phase at Ardersier, in accordance with the commitments made during the planning and licencing process.

The extent of the monitoring will include the harbour access channel, Whiteness Spit, Whiteness Sands and immediate surrounds.

The anticipated maintenance dredge interval is approximately 1-3 years following capital dredge, so the monitoring plan is designed for commencement prior to the pre-capital dredge phase and will continue through the operation of the port while dredging activities are planned. The monitoring plan will therefore cover anticipated maintenance dredge activities, including associated dredge arising disposal or re-use where it occurs within the monitoring area. Reuse of dredge arisings is proposed through sediment nourishment, by reinstatement of the inner harbour facing (western) edge of Whiteness Spit, and by targeted placement to the north-eastern intertidal and subtidal edge of Whiteness Sands, to the west of the proposed harbour navigation channel.

The proposed dredge volume is 3,900,000 m^3 as per the Marine Licence (reference MS-00010583). This material is intended to be disposed of as shown in Table 3-1. It is likely the material will be dredged by a cutter suction dredger and deposited by means of a discharge pipeline. This method will be confirmed following procurement.

Table 3-1: Dredge Disposal and Reuse Summary

Option	Sub-option	Estimated Volume (m^3)	Comments
Sea Disposal – Sutors and Burghead	Total	2,500,000	The sea disposal Total Volume includes a contingency of 400,000m^3 to accommodate the volume earmarked for coastal replenishment should there be any issues arising with this.
	Sutors	200,000	
	Burghead	2,300,000	
Beneficial Reuse – Site Profiling	-	Up to 600,000	This would focus on material already onshore.
Recycling – Aggregate as a Resource	-	1,400,000	Potential for up to 1.5M m^3 of material to be retained but to be confirmed. Licenses in place and pending outcome of commercially confidential discussions.
Beneficial Reuse – Coastal replenishment –	2018 Spit Reinstatement Area	280,000	Already agreed

Option	Sub-option	Estimated Volume (m^3)	Comments
Spit and Whiteness Sands	Spit Reinstatement West		Area of thinning west of "scalloped" area to be restored in same manner as scalloped area to protect spit as requested by NatureScot.
	Whiteness Sands East	120,000	Area immediately west of dredge channel as detailed on Drawing ArdPhase1-HAV-WP3-ZZ-DR-C-0006in Appendix A. .
	Whiteness Sands Disposal Area		Existing disposal area on northern edge of Whiteness Sands as detailed on Drawing ArdPhase1-HAV-WP3-ZZ-DR-C-0006in Appendix A.

The sediment transport monitoring plan comprises of routine monitoring, completed at regular frequencies as outlined in Table 3.2. Where practicable, the routine monitoring activities will be carried out during suitable tidal conditions to allow observation of potential changes between monitoring events. The monitoring plan and associated frequencies will be reviewed at least 3 months prior to the commencement of capital dredge, taking consideration of proposed dredge programme, and latest bathymetric and topographic survey data. The proposed monitoring extents and locations are shown in Appendix A.

Table 3-2: Monitoring schedule and frequency

Item	Frequency	Timing (in relation to dredge)		
		Pre	During	Post
Site inspection including fixed point photography	Monthly*	✓	✓	✓
Bathymetric survey	Annual*	✓		✓
Topographic survey	Twice yearly*	✓		✓
Aerial photography	Twice yearly*	✓		✓
Weather station	Sub-hourly	✓	✓	✓
Tide level monitoring	Sub-hourly	✓	✓	✓
Wave buoy	Once (3 month period)			✓
Intertidal sediment sampling	Individual event (1 month period)	✓	✓	✓
Suspended sediment sampling	Individual event	✓	✓	✓

* Year 1, then frequency reviewed.

In addition to routine monitoring, provision is made for event monitoring, which is considered to be required following the occurrence of an event (such as a large storm) which may require management intervention prior to the next planned maintenance dredge. This monitoring would be expected to involve some, but not all of the routine monitoring activities. The events that are considered likely to trigger such a monitoring event are as follows:

- Offshore wave swell waves greater than 2.5 m, as available from websites including magicseaweed and swellmap, based on Met Office offshore wave data from previous analysis showing 1 in 2 year return period, or 50% annual exceedance probability (AEP), significant wave height as 2.56 m;
- Sustained wind speed recorded at Kinloss in excess of 18 m/s, which is approximately the 1 in 2 year return period (or 50% AEP) and 75% of the predicted 1 in 50 year return period average hourly wind speed of 24 m/s as predicted in BS 6399; and
- End of spit visibly encroaching into the navigation channel.

3.2 Site Inspection

Site inspections will be undertaken monthly, where practicable, at key locations within the study area and will include ground-based fixed-point and direction photographs. Locations are shown in Drawing 3, Appendix A. These photographs will provide a continuous record of the coastline. Site inspections will be used to assist the identification of changes to the intertidal and shoreline areas. The key inspection locations will include:

- Proximal end of the spit;
- Representative mid section of the spit;

- Distal end of the spit (at navigation channel);
- Island to west of navigation channel (former distal end of spit cut off by channel dredge);
- Restored area of spit on inner channel;
- Head of the inner channel; and
- Identified larger scale intertidal bedforms within accessible areas (informed by topographic survey).

A geomorphic inspection of key coastal features will be completed biannually by an experienced practitioner to identify coastline condition at regular intervals along the shoreline. Observations will be recorded on a standard proforma and include information on erosion or accretion, sediment characteristics, the extent of sedimentary features and any transient features identified.

3.3 Topographic and Nearshore Hydrographic Survey

The proposed extents of the topographic and nearshore hydrographic surveys are shown in Drawing 2, Appendix A. These extend west to east across Whiteness Sands and Whiteness Head and north to south from the centre of the South Channel to the head of the inner channel saltmarsh.

Topographic surveys will be obtained twice yearly to quantify changes in the coastal features from the inter-tidal area and upwards to the dunes and spit crest within the study area. Topographic surveys will be captured using a technique (or combination of techniques) capable of generating a comprehensive digital surface elevation model (DEM). It is anticipated that an Unmanned Aerial Vehicle (UAV) will be deployed to increase data capture across the inter-tidal sands. The minimum spatial resolution of the DEM will be 1.0 m, which is considered sufficient to capture the topographic variations across the intertidal and landward areas.

Nearshore hydrographic surveys will be undertaken annually to record the inter-tidal to sub-tidal conditions. The hydrographic surveys will include the inner channel and dredge area seawards to the centre of the South Channel, including the disposal ground. The hydrographic survey will extend to meet the extent of the topographic survey coverage to provide an integrated ground model and the timing of the surveys will ensure that they are undertaken at or very close to the same time to ensure consistency of conditions.

The reporting of this survey data will comprise of:

- DEM data as surveyed;
- Change in level dataset when compared to previously surveyed DEM;
- At least two fixed transects at the Spit and across Whiteness Sands (where possible) extracted from the DEM for comparison; and
- Volumetric change provided for the sub-tidal, inter-tidal and landward zones.

3.4 Aerial Photograph Survey

Using UAV techniques to collect the ground model data will allow aerial photographs to be captured at the same time.

3.5 Weather Monitoring

Weather data recording for the site comprising a minimum of wind speed and direction, rainfall and temperature will be set up prior to the pre-dredge sediment sampling commencing. This will be

provided either through installing a weather station on site or obtaining weather data from nearby weather stations at Inverness Airport or Kinloss.

3.6 Tide Monitoring

Prior to the capital dredge operations commencing, a tide gauge will be installed within the harbour. This will be installed 4 weeks prior to the capital dredge to provide a period of pre-dredge conditions.

3.7 Wave Monitoring

The coastal modelling previously undertaken in support of the ES for the development of Ardersier Port relied on offshore wave data. One of the recommendations was to collect an inshore wave dataset to provide a calibration dataset for future modelling that may be required to inform maintenance dredging activities.

A monitoring buoy will be deployed for a three month period during the winter period post capital dredge to gather wave data (wave height and direction) which will provide site specific data to inform any future modelling.

3.8 Sediment Transport Monitoring

Sediment transport monitoring will be undertaken using a combination of field sampling, field survey measurements and comparison of wider scale topographic survey/aerial photographs.

Inter-tidal Sediment Sampling

Sediment transport in the intertidal zone will be monitored pre-, during and post capital dredge through the installation of mechanical bed-load trap samplers (such as Booner tubes) to record sediment processes in the intertidal zone

The Booner tubes will be located at several (3 – 4) fixed point intertidal locations, within the area shown in Drawing 3, Appendix A. During installation location selection consideration will be given to potential future re-use of maintenance dredge arisings, in order to enable future monitoring of such events. The deployment will extend for between a minimum of one neap to spring or spring to neap cycle and a full tidal cycle range. Where the number of days differ between deployment durations, they will be standardised to a consistent time period.

Sediment samples taken from the tubes will be measured and subject to particle size analysis (PSA). These will be compared to sediment samples taken at each location prior to installing the tubes and samples taken from the dredged material at source.

At each monitoring location, the pre-, during and post- dredge results will be compared in terms of total solids collected and PSA.

Suspended Sediment Sampling

As a minimum, on a single day during a spring high tide cycle, suspended sediment samples will be collected from up to five locations pre- and post- capital dredge to characterise the suspended sediment load and provide correlation with the bed sediment sampling. Proposed sample locations are shown in Drawing 3, Appendix A.

During the capital dredge works, suspended sediment samples will be taken at regular intervals appropriate to the length of capital dredge programme. The samples will be analysed by mass and PSA.

4 REPORTING

The monitoring information will be reviewed as required with a monitoring data report produced, which will be reviewed by the Ardersier Port Ecological Management Group. This will inform the Spit Habitat Protection and Enhancement Plan within the Habitat Management Plan.

The annual report will be a factual report containing the following:

- Monthly inspection reports;
- Fixed point photographs;
- Aerial photographs;
- Topographic surveys;
- Bathymetric surveys;
- Relative change in survey plots;
- Inter-tidal sediment sampling and measurement data;
- Weather (and wave when deployed) information;
- Tide data;
- Any event monitoring undertaken in addition to routine monitoring; and
- Recommendations for any change to type/extent/duration of monitoring.

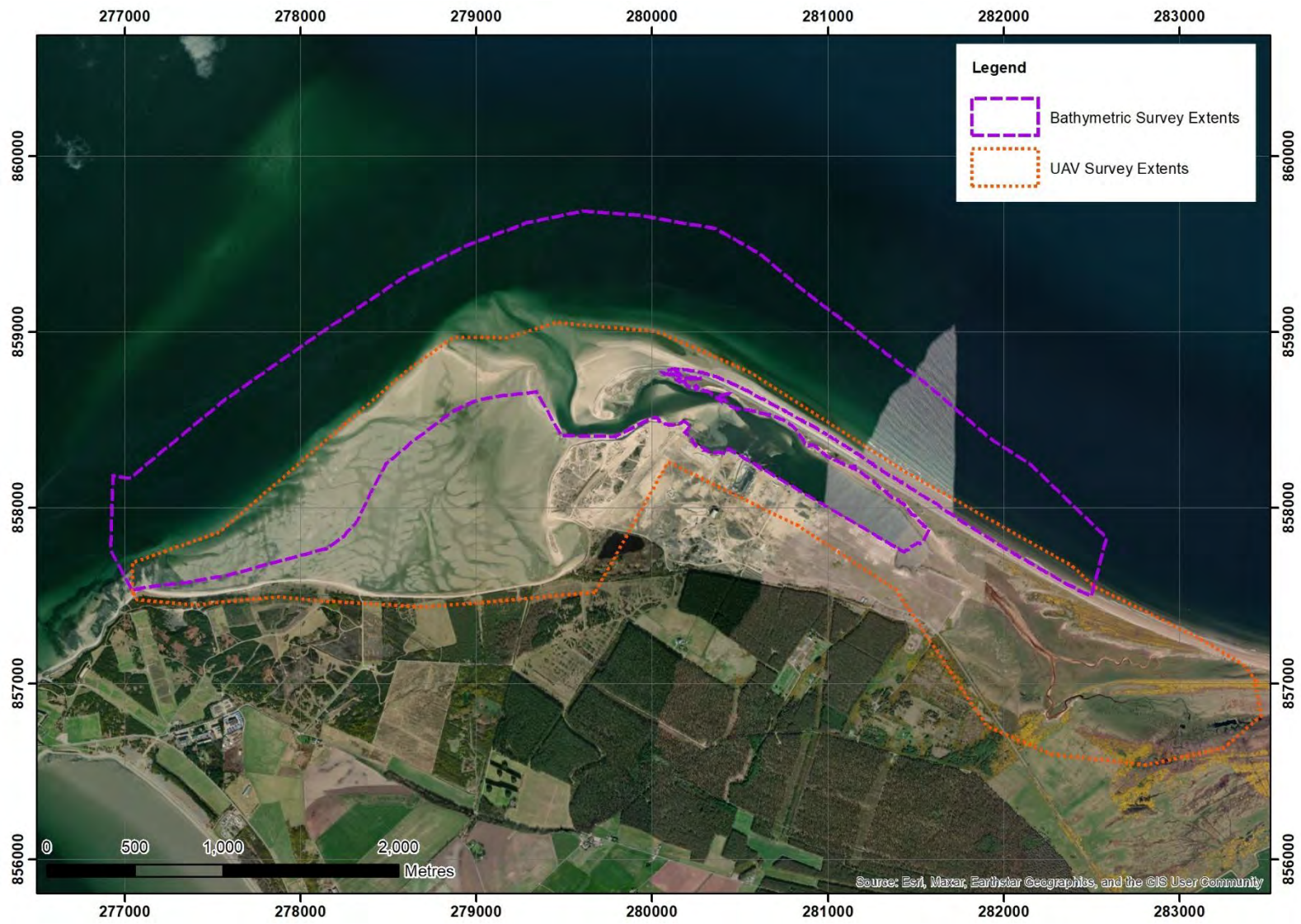
Updates will be provided when new survey data has been collected to ensure that the most recent data is available for the EMG to consider (anticipated typical 6 month basis).

In addition to the factual data report, a summary interpretative report will be produced in advance of any future maintenance dredging planned. This will compare the observed changes to what was expected, taking into account weather conditions and will make any recommendations with regard to the content and frequency of forward monitoring. This will provide a narrative to the monitoring data collected, analysing the changes observed and examining the dispersal and circulation of material from the capital dredge. This report may establish that sufficient information is available to inform the maintenance dredge, or identify recommendations for further data collection or modelling.

APPENDICES

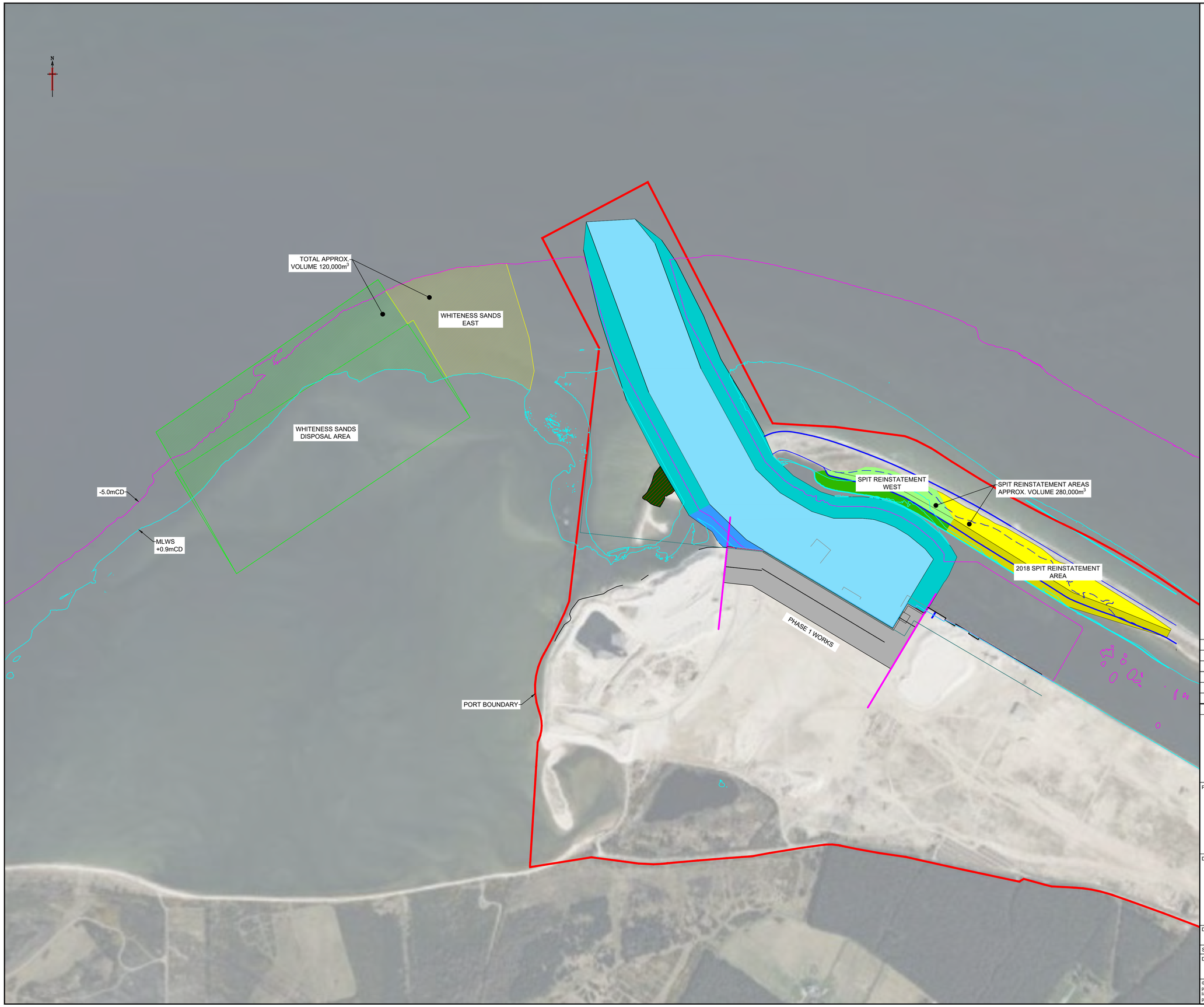
A DRAWINGS

Drawing 1: Proposed Dredge Extent



Drawing 2: Proposed Survey Extents

Drawing 3: Proposed Monitoring Locations



NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
3. ALL LEVELS ARE GIVEN IN METRES ABOVE CHART DATUM (m ACD). CORRECTION FOR ORDNANCE DATUM IS -2.14m (RELATIVE TO ORDNANCE DATUM AT NEWLYN).

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd
P01	18/04/2024	FOR INFORMATION	OM	CF	CF

Haventus

Project

ARDERSIER PORT REDEVELOPMENT PHASE 1

Drawing title

BENEFICIAL REUSE AREAS FOR CROWN ESTATES

Drawing status

FOR INFORMATION

Scale	1:5000 @A1	DO NOT SCALE

Drawing number

ArdPhase1-HAV-WP3-ZZ-DR-C-0006

Rev P01