Invergordon Service Base Phase 5 - Scoping Report

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1 Introduction

The Port of Cromarty Firth (PoCF) are planning to further extend the Invergordon Service Base (ISB). This will be their fifth phase of development therefore the project is known as Phase 5. Due to the scale of the proposed development, and the fact it is adjacent to Phases 3 and 4, which were subject to Environmental Impact Assessment (EIA), it is assumed that Phase 5 will also require EIA under the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (hereafter known as the 'EIA Regulations').

1.1 Scoping

On the basis that EIA will be required due to the scale of the project, a scoping opinion is sought from Marine Directorate under Part 4, Paragraph 14: 'Request for scoping opinions' of the EIA regulations. This request is sought by Affric Limited, acting as agent for PoCF for the proposed Phase 5 development at ISB. The approach to scoping is detailed in Section 5.1 of this report and ensures that all environmental topics are discussed in as much detail as possible, by utilising the descriptors as outlined in Schedule 4 of the EIA Regulations. Each environmental topic is discussed in Sections 6 to 23.

1.2 Report Purpose

The purpose of this scoping report is to allow Marine Directorate and their consultees to identify whether certain topics and/or aspects of the proposed development are to be included in the scope of the EIA process. This allows the authors of the subsequent EIA to understand where to focus their efforts during the EIA process and preparation of the resulting EIA Report (EIAR).

2 Background

2.1 Port of Cromarty Firth (PoCF)

The Cromarty Firth is situated on the east coast of the Scottish Highlands; 14 miles (22.5km) north of the city of Inverness, and 65 miles (105km) southwest of Wick. The ISB is located on the southern edge of the town of Invergordon, on the north shore of the Cromarty Firth, 7 miles (11km) west of the Sutors at the mouth of the Firth.

The Cromarty Firth provides a natural deep-water harbour, and it has long been recognised for its potential as a deep-water safe harbour and a national strategic asset. The first land reclamation took place in the 1860s and Invergordon became a 'dockyard port' for the Royal Navy in 1913. Invergordon, being the closest outcrop of land into the deep water of the Cromarty Firth, played a part in many naval conflicts; most notably during the first and second world wars. The naval base at Invergordon provided bunkering, repairs, armament, and safe anchorage facilities for the navy until its closure in 1984.

With the potential of oil reserves being discovered in the North Sea in the early 1970's, the economic opportunities for the Cromarty Firth increased. It was deemed to be in the public interest to encourage further development in the area, and an Act of Parliament formally established the Cromarty Firth Port Authority (CFPA) as a Trust Port in 1973. The Port's long history of marine engineering was easily transferred to the oil and gas industry, and the Port is now established as one of the European leaders in oil rig Inspection, Repair and Maintenance (IRM).

Since the 1970s, the Port has grown to support industrial developments in the local area, starting with the British Alcan Aluminium Smelter built in 1971 and the Nigg fabrication yard in 1972. Improvements to onshore transport links, such as the opening of the Kessock Bridge in 1982 and the Cromarty Bridge in 1979, have allowed industry on the north shore of the Cromarty Firth to prosper.

The ISB has continued to attract port users and has continually been required to meet the ever-changing demands of the energy industry. In order to support the energy industry in Scotland, in particular the oil and gas and renewables industries, the ISB has undergone 4 phases of development within the last 20 years. The most recent phases of development at the ISB, are discussed in Section 2.1.1. In line with its mission as a strategic national asset, PoCF is now pursuing its fifth development to support the deployment of offshore wind farms and enable the Scottish and UK government ambition in achieving Net Zero by 2050.

The ISB is run by CFPA, an independent statutory body administered by a Board of eight Trustees; the Board is accountable under its Trust Port Status to the Scottish Government. The trading name of CFPA is the PoCF.

Inverness and Cromarty Firth was selected to be one of Scotland's two Green Freeports in January 2023. Work is underway to build on the bid and develop the Outline Business Case and legal mechanisms to establish tax and customs sites. It is expected that the Green Freeport will be operational by January 2024. The plan is for the ISB to be one of the three tax sites within the Green Freeport. The associated tax reliefs and customs benefits this will make it highly attractive to windfarm developers/fabricators and component manufacturers.

2.1.1 Phases 1 to 4

To address the need for increased laydown space and berths required to support the Energy Sector, the port decided that a phased approach to development would help relieve the pressure on the port. The first phase was to block pave an existing rough laydown area of 1.29hectare (ha) to the north and west of the Queen's Dock (see red shading in Figure 2.1), providing a high-quality laydown space.

The second phase identified an area to the north of Phase 1 which had been reclaimed in 2000 by CFPA but was not in use. This was brought inside the site fence and block paved (Phase 2), providing an additional 1.05ha of laydown (see blue shading in Figure 2.1).

The completion of the Phase 1 and 2 works in 2012 improved and increased the area of laydown space available at the service base. However, more space and berthing were still required. With the sharp rise in demand for port support by sectors such as the leisure cruise and offshore wind farms, the ISB has undergone in the last ten years, two further phases of development, Phases 3 and 4, to provide the Port's current facilities as described in Section 2.1.2. These phases of development were required to allow the PoCF to continue to develop into a multi-sectors and user facility, by providing improved infrastructure whilst adapting to the evolving demands of the oil and gas market (decommissioning and IRM).

Figure 2.1: Phases 1 (red shading) and Phase 2 (blue shading) at the ISB

The Phase 3 development consisted of 3.6 ha of new laydown space and a 13.8m deep, 154m long berth dredged to -12m Chart Datum (CD) to the west of the Queen's Dock West Finger (see Drawing 5121683-ATK-PH4-ZZ-DR-C-0011 P0.1 and Figure 2.2).

Figure 2.2: Phase 3 at the ISB

The Phase 4 development consisted of an additional 4.5 ha of laydown space to the west of Phase 3, with construction of an additional 218m of berthing to the west of Phase 3 which was dredged to -12m CD (see Drawing 5121683-ATK-PH4-ZZ-DR-C-0200 and Figure 2.3).

Figure 2.3: Phase 3 and 4 at the ISB

The construction techniques for Phase 3 and Phase 4 were similar. The quay walls piles were installed using a combination of vibro and percussion piling techniques, and are supported by anchor blocks and piles on Phase 3 and 4 respectively. Rock armour revetments were placed around the north and west perimeters, and ggeotextile membrane placed to contain the infill material while allowing tidal water to move in and out of the area. Once the area was reclaimed, appropriate drainage, bollards and services were installed prior to surfacing. In-situ concrete pours formed the quay wall coping beam at the front of the quays and a concrete slab area was constructed on Phase 3. The remainder of the reclamation areas of Phase 3 and Phase 4 were constructed with compacted general fill and engineering fill materials and surfaced with type 1 and type 3 aggregate respectively to provide a firm but porous laydown area.

Dredging was carried out to obtain appropriate depths at the berth.

2.1.2 Present Day

With a total of 8 berths, more than 1km of quayside which provides up to 14 metres water depth to accommodate the largest vessels, and laydown areas totalling 11 ha, the ISB at the PoCF currently provides unrestricted open storage space and heavy load-bearing capacity. Activities that the ISB currently support include:

- Renewable energy industry;
- IRM of oil rigs and subsea engineering activities;
- Decommissioning of marine structures;
- Bulk cargo deliveries; and
- Support to the leisure cruise ships sector.

2.2 Need for Phase 5

The renewables energy industry's offshore wind farm sector continues to grow, and innovations in technologies result in larger components to maximise efficiency. In parallel, the requirement for large scale port facilities has also substantially increased. The development of floating wind technology allows for wind turbines to be deployed in deeper waters and hence more of the seas wind potential to be harnessed. The resultant economic opportunities could be a great benefit to local and regional economies, local content targets are in place to facilitate local benefits being realised (see Section 4.2: Policy Context). To allow the Scottish supply chain to play a part in the burgeoning offshore wind sector, there needs to be local links from land to sea. As such, the Phase 5 development at the ISB is being proposed to facilitate the realisation of these benefits.

Phase 5 will allow local input into the renewables energy sector by enabling activities such as component manufacturing (mainly foundation), marshalling, assembly, and operation and maintenance support to be undertaken in or from the Cromarty Firth. Although the reduction of Greenhouse Gas (GHG) emissions in Scotland is the main target (Scottish Government, 2020b), Scottish Ministers have also dictated that there is a need to ensure local content targets are also being met for offshore wind projects. By enabling activities such as manufacturing, production, marshalling, assembly and operation and maintenance support, Phase 5 will facilitate the work involved in offshore wind infrastructure projects being delivered in Scotland, which in turn reduces the carbon footprint attributed to product deliveries from further afield.

The location and opportunity to develop and expand the ISB at the PoCF is well-placed for supporting the expansion of the renewable energy sector, as 15 of the 20 potential offshore wind projects (both floating and fixed foundation types) linked to the ScotWind leases are in close proximity to the ISB. In addition, a number of the Crown Estate Scotland's (CES) Innovation and Targeted Oil & Gas (INTOG) offshore wind lease areas could be supported from Invergordon. Further details are provided in Section 2.2.1 below.

The transition away from fossil fuel reliance also requires increased capacity to decommission oil and gas infrastructure whilst maintaining IRM operations where necessary, and only an expansion of facilities will allow this to take place in parallel to supporting the wind sector.

Finally, expansion of the ISB in the form of Phase 5 will also allow continued support to the cruise industry and Highland's tourist industry, by providing additional berthing space to ensure all users can be accommodated.

2.2.1 Offshore Wind Sector Requirements

As the offshore wind farms move further offshore into deeper waters, floating turbine technologies are being embraced. It is envisaged that by the early 2030's, turbines which could generate up to 20MW of power and may have tip heights 330m above mean sea level, could be installed on floating bases. There are a number of different floating base designs, utilising concrete, or metal structures. Typically, turbines are installed onto floating bases in port, prior to being towed directly to the wind farm site, where they are attached to pre-installed mooring systems, which anchor the turbines to the seabed. It is envisaged that ISB could support the offshore wind sector in a number of ways, including (but not limited to):

- Manufacture of major wind turbine components (such as anchors, mooring components, or concrete gravity bases);
- Production of concrete floating substructures, with substructures being poured and built onsite;
- Final assembly of metal or concrete floating substructures, where the structures are fabricated elsewhere, delivered in several smaller parts (for ease of transport) and the assembly is completed at the ISB;
- Turbine assembly and integration, where the turbine components are manufactured elsewhere and delivered to ISB for assembly and installation onto substructures;
- Pre-commissioning and initial testing, where turbines are tested and powered up to ensure they are working effectively prior to being towed to the wind farm site; and
- Major maintenance support, where floating turbines are brought back to port for major component replacement or maintenance.

It should be noted that wet storage of turbine bases or fully assembled turbines is not part of the Phase 5 proposal, and hence impacts associated with wet storage will not be directly considered within the EIAR. If there are proposals brought forward for wet storage, then any cumulative impacts will be considered as discussed in Section 24.

2.2.2 PoCF Phase 5 Importance to Future Offshore Wind Sector Requirements

The Floating Offshore Wind (FLOW) Taskforce has identified the need for imminent port developments and have stated that:

> *'Up to 11 ports around the UK will need to be transformed as fast as possible into the new industrial hubs to enable the roll-out of floating offshore wind at scale'*

and that,

> *'There are no port facilities in the UK which fulfil integration port requirements, an industry approach towards port development is needed'* (RenewableUK, 2023).

The task force includes the UK, Scottish and Welsh Governments, the Northern Ireland Executive, major offshore wind and port developers, The Crown Estate, Crown Estate Scotland, RenewableUK, Scottish Renewables, the Offshore Renewable Energy Catapult, and other key stakeholders. The PoCF was specifically identified, by the aforementioned taskforce, as playing a role in FLOW by means of integration and renewable manufacturing, with Freeports providing a potential support option to accelerate FLOW related port infrastructure investments, through industrialised expansion. Additionally, it was recognised that the PoCF provides geographical benefits for supply and logistical demands.

Table 2.1 details the Strategic Investment Requirements for Scotland (The Floating Offshore Wind Centre of Excellence ((FOW CoE), 2022), in which PoCF Phase 5 would help to fulfil.

Table 2.1: Strategic Infrastructure Investment Requirements – Scotland (FOW CoE, 2022)

Infrastructure Application	Number of Facilities	Potential Capacity	Infrastructure Development Cost	Development Timescales
Concrete substructure construction facility	Two facilities identified and assessed	36 units / annum between both facilities	£300m between two facilities, port infrastructure only	Development activity required, full capacity potential by 2030
Steel substructure component fabrication facility and co-located steel substructure assembly facility	Two facilities identified and assessed	45 units / annum between both facilities	£200m between two facilities, port infrastructure only, manufacturing facilities themselves estimated at £150-250m each	Development activity required, capacity available between 2025 and 2027
FOWT marshalling, assembly and integration facility	Multiple facilities identified, three assessed in detail	142 units / annum	£400-500m across three facilities, port infrastructure only	Development activity required, capacity available between 2025 and 2027
All	**All**	**142 units or 2.5GW**	**£900-1,000m, port infrastructure only**	**2025-2030**

Scotland could develop ports into integration and manufacturing facilities, and available land area is the main limiting factor (FOW CoE, 2022), thus, the PoCF Phase 5 development is pivotal due to the proposed large increase in laydown space. The PoCF Phase 5 would assist Scotland in meeting its offshore wind ambitions and net zero targets by providing the facilities to contribute towards the mass deployment of offshore wind structures in the North Sea.

3 Phase 5 Development Envelope

3.1 Location

The Phase 5 development is proposed at the ISB on the northern shore of the Cromarty Firth. The Phase 5 development will be to the western end of the ISB, potentially adjoining the Phase 3 and 4 development which have a central grid reference of NH 700 684 (see Drawing 1024-PH5-015). It may include elements within the vicinity of the existing Queens Dock.

The Phase 5 development will be located within the redline boundary as shown in Drawing 1024-PH5-032. It should be noted, however, that the actual footprint is likely to be smaller than that shown. The larger envelope footprint at this stage is to provide flexibility when moving through the design stages to turn the conceptual designs into a scheme design, and then eventually a detailed design.

3.2 Design Elements

The conceptual envelope of the Phase 5 development looks to provide further expansion of the ISB and will expand upon the already developed Phases 3 and 4. Objectives of the expansion include:

- Providing additional berthing;
- Provision of an area of the quay which could be used by a Roll-on Roll-off (Ro/Ro) vessel;
- Providing additional laydown space;
- A deepwater berth;
- Heavy lift capacity;
- Increased connectivity between previous phases of development whilst maintaining suitable berthing areas to support the multiple users;

- Provision of appropriate services (lighting, water, drainage and power); and
- Provision of elements to support Offshore Wind activities, (as described below).

It is important to note however, that the proposed Phase 5 development is at the conceptual design stage and as such, the details of the project in the following sections are not fully developed. In addition, not all elements may be required. However, at this stage the intent is to keep the envelope sufficiently broad.

The actual design of Phase 5 will be influenced by the following factors:

- The findings of sediment modelling;
- Landscape and visual considerations;
- Ecological studies;
- Findings of any Ground Investigation works;
- Input from stakeholders including:
    - Current and potential clients;
    - Local residents;
    - The Highland Council; and
    - Other interested parties.

3.3 Likely Construction Techniques

Construction techniques utilised for each of the conceptual design elements for Phase 5 are likely to be similar to those undertaken during Phases 3 and 4 (see Section 2.1.1). For example, to infill the Queen's Dock and to reclaim land north of Phases 3 and 4, or to the west of Phase 4, a barrier is likely to be created through the formation of an initial bund then placement of the rock revetment and the piled quay walls. Once the bund has been created, it will be infilled prior to the materials being compacted to obtain the appropriate height and structural performance of the development. It is hoped that the majority of the material for this construction activity shall be delivered by sea.

The construction techniques that have been considered throughout this report, are as follows:

- Vibro and Impact Piling;
- Land Reclamation activities, namely Infilling and Rock Placement;
- Dredging; and
- Dredge Spoil Disposal.

It is noted that the installation of various services will also be required, however this is a relatively minor construction task and from experience is unlikely to give rise to any significant environmental effects. The service provision is however, considered where required within operations.

3.4 Operational Scenarios

As discussed in Section 2.2, Phase 5 will provide further support to the renewable energy sector, enabling a range of activities. An operational scenario has therefore, been developed for the purpose of understanding what needs to be considered within the Phase 5 EIA. Although actual operations may vary from the scenario described, they are considered to be applicable to the range of offshore wind projects which the Phase 5 development will be able to support.

Based on the potential activities outlined in Section 2.1, it has been assumed that the maximum operating envelope would be associated with concrete floating substructure production as opposed to steel substructure assembly and hence, the maximum operating envelope includes the following main activities:

- The delivery of cement dry product and aggregate by sea, for onsite storage and concrete batching.
- The production of the concrete floating substructures.
- Storage of floating bases at quayside.
- The delivery by sea of the main wind turbine components for onsite assembly and the delivery by road of other minor equipment and tools.
- Installation of the turbine components (tower, nacelle, blades) onto the concrete floating bases, utilising cranes located on the quay side or alternatively on a jack-up installation vessel.
- Wind turbine pre-commissioning and initial testing activities will be carried out at the quay side to ensure that they can safely and effectively operate.

The number of fully assembled floating turbine structures that can be accommodated at the ISB quays, is limited by the rotor diameter and need to provide sufficient space to ensure blades do not collide. Utilising the Queens Dock, Quay West 1 and 2, and new Phase 5 berths a maximum of three floating turbines could be accommodated alongside.

During the project wind farm operations phase, the port may be used for major component replacement or other maintenance activity. However, this scenario is well within the envelope of the fabrication and assembly hence, not considered as a separate operational scenario.

The scenario of activities described above will be utilised for the assessment of effects such as noise (Section 6: In-Air Acoustics) and landscape and visual (Section 14). As discussed in Section 2.2.1, wet storage is not part of the Phase 5 development and hence will not be considered unless required for cumulative impact purposes (see Section 24).

As discussed in Section 3.2 the design of the development is in the early stages. The design of the development will dictate what operations can be accommodated. As such, there is a potential that the scheme design could preclude, or limits operations presented at this stage. Hence, the EIAR will clearly define the operational scenarios being assessed within it. That operational scenario will be within the operational envelope proposed here and hence should not change the scoping opinion provided by the regulators based on this document.

4 Consenting and Policy Context

This section provides a summary of the statutory requirements, as well as highlighting the policies that may apply, for the construction of the proposed Phase 5 development.

4.1 Consenting

4.1.1 Planning Consent

It is understood that if any buildings are to be constructed on the Phase 5 development site which could give rise to the need for Appropriate Assessment under the Habitats Regulations Appraisal (see Section 4.1.4) or an EIA under the Town and Country Planning (EIA) Scotland Regulations 2017, then planning consent may be required. At this point there are no firm plans with regard to construction of buildings and hence, they are not included within this scoping report.

4.1.2 Marine Licensing

Under the Marine (Scotland) Act 2010 (hereafter, 'the Act') a number of activities listed in Part 4, Section 21 of the Act require a Marine Licence issued by the Marine Directorate Licensing Operations Team (MD-LOT). This includes any activity where the project intends to do any of the following below the Mean High-Water Springs (MHWS):

- To deposit any substance or object within the Scottish marine area, either in the sea or on or under the seabed, from any of the following:
  - a vehicle, vessel, aircraft or marine structure;
  - a container floating in the sea; or
  - a structure on land constructed or adapted wholly or mainly for the purpose of depositing solids in the sea.
- To construct, alter or improve any works within the Scottish marine area either:
  - in or over the sea; or
  - on or under the seabed.
- To use a vehicle, vessel, aircraft, marine structure or floating container to remove any substance or object from the seabed within the Scottish marine area; and
- To carry out any form of dredging within the Scottish marine area (whether or not involving the removal of any material from the sea or seabed).

The proposals for Phase 5, although not fully developed, will require:

- a licence to construct, alter or improve any works within the Scottish marine area (hereafter 'marine construction licence); and
- a licence to carry out any form of dredging and deposit any substance or object in the Scottish marine area (hereafter 'dredge-disposal licence').

The marine construction licence application will be supported by a Pre-Application Consultation (PAC) Report (see Section 4.1.3) and an EIAR as informed by the scoping opinion. The dredge-disposal licence will be supported by pre-disposal sampling analysis and a BPEO.

4.1.3 Pre-Application Consultation (PAC), Marine (Scotland) Act 2010

The Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013 prescribe the marine licensable activities that are subject to PAC and, in combination with the Marine (Scotland) Act 2010, set out the nature of the pre-application process. The PoCF Phase 5 development falls within regulation 4(d) as a construction activity within the marine area that exceeds 1,000m^2 and therefore the project is required to go through the PAC process. A consultation plan is being developed to meet the requirements of the Marine Licensing (PAC) (Scotland) Regulations 2013. Any consultation plan developed for Phase 5 will utilise the 'Successful Planning = Effective Engagement and Delivery (SP=EED)' framework.

4.1.4 Habitat Regulations Appraisal (HRA) and the Habitats Directive (92/43/EEC)

A Habitat Regulations Appraisal (HRA) is required for this development due to its proximity to multiple Natura 2000 sites. These include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). The legislative context for this requirement is based on Article 6(3) of the Habitats Directive (92/43/EEC), Article 4(4) of the Birds Directive (2009/147/EC) and is implemented in Scotland through The Conservation (Natural Habitats, &c) Regulations 1994 (the Habitats Regulations).

In Scotland, National Planning Policy ensures that Ramsar sites, which are normally included in an HRA assessment, overlap with Natura sites, and are therefore protected under the same legislation. Therefore, Ramsar sites do not need consideration separately, as part of any HRA.

An Appropriate Assessment (AA) is part of the HRA process and is to be undertaken by the competent authority. AA is required when a plan or project potentially affects a European Natura site on the basis of 'likely significant effects' (LSEs).

An AA must demonstrate that there will be no adverse effect on site integrity, nor on the conservation objectives of the designated site. Should this requirement not be satisfied, a project would only receive consent if:

- Imperative Reasons of Overriding Public Interest are proved; and
- There are not satisfactory alternatives.

4.1.4.1 Pre-Screening HRA

It is ultimately up to the competent authority, to determine whether LSE are present and therefore whether an AA is needed for each designated site. To inform this process a Pre-Screening HRA considering sites that could be affected by the Phase 5 development has been completed and included as Appendix 1. The sites thought to require AA are:

- Cromarty Firth SPA;
- Moray Firth SAC
- Moray Firth SPA;
- Inner Moray Firth SPA;
- Dornoch Firth and Morrich More SAC; and
- Dornoch Firth and Loch Fleet SPA.

Confirmation is sought with regard to the sites requiring AA, so it can be ensured that sufficient information is provided at the application stage to allow the competent authority to undertake any AA.

4.1.4.2 HRA Report

An HRA Report will be submitted at the consenting process. The HRA Report will provide information that will aid the competent authority in carrying out an AA where necessary, it may refer to the EIAR.

4.1.5 Water Framework Directive (WFD)

The Water Framework Directive (WFD) (Directive 2000/60/EC of the European Parliament) is transposed into Scottish law through the Water Environment and Water Services (Scotland) Act 2003. The directive aims to achieve a good quality status for all rivers, lochs, transitional waters (estuaries), coastal waters groundwater, and groundwater dependant wetlands. As such, the main aims of the WFD are to:

- Prevent deterioration and enhance status of aquatic ecosystems, including groundwater;
- Promote sustainable water use;
- Reduce pollution; and
- Contribute to the mitigation of floods and droughts.

To assess the impact of any development or activity on a water body, especially those which may pose a risk of reducing the quality status of a water body, a WFD Assessment is required. In a WFD assessment you must show if your activity/development will:

- Cause or contribute to deterioration of status; and/or
- Jeopardise the water body achieving good status.

A WFD Assessment will be required for the Phase 5 development. The details of the assessment are discussed in greater detail in Sections 9: Water Quality and 10: Coastal Processes & Flooding.

4.2 Policy Context

4.2.1 Scottish Government Net-Zero and Decarbonisation Targets

In 2019, Scotland committed to achieving net-zero greenhouse gas emissions by 2045. This commitment will require the decarbonisation of all sectors, including industry. To address decarbonisation in industry, initial targets up to 2032 were established in the 2018 Climate Change Plan (CCP). The current CCP identifies seven key sectors and a summary of their targets/policies to contribute towards net-zero (Scottish Government, 2020b). The sectors outlined in the CCP which are applicable to the PoCF and the proposed Phase 5 development are as follows:

- **Electricity**: Policies seek the further decarbonisation of energy generation by supporting the development of a wide range of renewable energy technologies, seeking improvements to electricity generation and network asset management, encouraging the development of a range of technologies that aid system security, flexibility, and resilience, and encouraging innovative energy systems which improve efficiencies and deliver secure, clean and affordable electricity. The overall target is to reduce emissions by 28% over the plan period (2018 – 2032).
- **Transport:** Policies seek the continued decarbonisation of transport by increasing the uptake of ultra-low carbon vehicles, reducing vehicle emissions including from heavier

vehicles such as buses, HGVs, and ferries, introducing low emission zones in larger cities, and investing more money in improving and promoting active travel. The overall target is to reduce transport related emissions by 37% over the plan period (2018 – 2032).

- **Industry:** Policies seek to reduce industry emissions through a combination of fuel diversification, cost saving energy efficiency, heat recovery and participation in the EU Emissions Trading System. Additionally, policies seek to consider emerging Carbon Capture and Storage (CCS), Carbon Capture and Utilisation (CCU) and hydrogen opportunities. The overall target is to reduce industry emissions by 21% over the plan period (2018 – 2032).
- **Waste:** Policies seek to reduce, re-use and recycle more waste and capture gases from landfill sites. This focus also aligns with Scotland's circular economy ambitions. The overall target is to reduce emissions by 52% over the plan period (2018 – 2032).

As part of the commitment to achieve net-zero, the Scottish Government has also set out short, medium and long-term goals and when they are to be achieved by in the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019. These are as follows:

- The Scottish Ministers must ensure that the net Scottish emissions account for the year:

  (a) 2020 is at least 56% lower than the baseline;
  (b) 2030 is at least 75% lower than the baseline; and
  (c) 2040 is at least 90% lower than the baseline.

Each of the sectors outlined in the CCP, are required to contribute to achieving the targets as set out by Scottish Ministers in the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

4.2.2 Local (UK) Content Targets

As aforementioned in Section 2.2, as the amount of local content provided by Scottish offshore wind infrastructure projects has been deemed insufficient by politicians and union representatives, there is a need to ensure that there are increased opportunities and benefits to the communities and businesses where an infrastructure project is taking place.

The Offshore Wind Sector Deal builds on the United Kingdom's global leadership in offshore wind, maximising the advantages for UK industry from the global shift to clean growth (UK Government, 2019). Within this deal, the sector is committed to increase local (UK) content to 60 per cent by 2030, including increases in the capital expenditure phase. This includes improving access for Small-Medium Enterprises (SMEs) and the need for increasing the number of highly skilled workers in manufacturing areas throughout the supply chain.

4.2.3 Scottish National Marine Plan (NMP)

As the project is below MHWS and within 12 nautical miles (NM) of the Scottish Coastline, it falls within the remit of the Marine (Scotland) Act 2010. The 2015 Scottish National Marine Plan (NMP) covering inshore waters is a requirement of the Act. The NMP lays out the Scottish Minister's policies for the sustainable development of Scotland's seas and provides General Planning Principles (GENs), some of which apply to the construction and operations of the Phase 5 concept design. Many GENs are specific to environmental topics and as such, those which are being considered by the project are identified as follows:

- GEN 2: Economic benefits;
- GEN 3: Social benefits;
- GEN 4: Co-existence;
- GEN 5: Climate Change;
- GEN 7: Landscape/seascape;
- GEN 8: Coastal process and flooding;
- GEN 9: Natural Heritage;
- GEN 10: Invasive Non-Native Species;
- GEN 15: Planning Alignment A;
- GEN 17: Fairness;
- GEN 18: Engagement;
- GEN 19: Sound Evidence;
- GEN 21: Cumulative Impacts;
- Objective 1;
- Objective 2; and
- TRANSPORT 5.

It is noted that work has started on NMP2, but it is unlikely to be adopted by the time the marine licence application is ready for submission. The status of NMP2 will be monitored and if there are any new, or different policies relevant to the development then these will be considered within the EIAR.

4.2.4 Planning Policies

Although the construction of Phase 5 will not be subject to planning consent, due to the close proximity to land, it is deemed appropriate to take account of the planning policy context. The development plan system in Scotland, which provides the framework for considering planning applications, is made up of two main documents:

- The National Planning Framework 4 (NPF4); and
- Local Development Plans (LDPs).

The National Planning Framework (NPF) is a requirement of the Planning (Scotland) Act 2006 and sets out the strategy for long-term development within Scotland. The third NPF (NPF4), was adopted in February 2023, and sets out the strategy for development in Scotland to 2045 (Scottish Government, 2023).

In 2012 the Highland Council adopted the Highland wide Local Development Plan (HwLDP) (Highland Council, 2012) and in 2015 the Inner Moray Firth Local Development Plan (IMFLDP) (Highland Council, 2015b). With the adoption of NPF4, for the first time the NPF will be part of the Development Plans. This will likely lead to a reduction in the number and range of policies that are required in Local Development Plans and therefore there will be a review of the HwLDP under the new arrangements for Local Development Plans.

The IMFLDP2 was submitted to Scottish Ministers for examination in March 2023 (Highland Council, 2023), it is assumed that it will be adopted prior to the completion of the EIAR. The Phase 5 concept design is immediately adjacent to the area noted as IG05 Invergordon Harbour Area in the IMFLDP2, and it is assumed that the requirements laid out within the relevant section of the IMFLDP2 will be applicable to the Phase 5 concept design and will be taken into account.

As the updated HwLDP is unlikely to be adopted in the marine licence submission timelines, it is proposed that the focus is put on considering policies laid out in NPF4 and the IMFLDP2.

The Scottish Government also provides advice and technical planning information in the form of Planning Advice Notes (PANs). Relevant PANs for this Phase 5 development which will be used to support the EIA are identified in Sections 6 to 23 where appropriate.

5 The EIA Process

One of the main purposes of the EIA process is to influence and improve design through iteration. Environmental impacts will be considered throughout the project and wherever possible, environmental considerations will be incorporated into the design.

To allow the design to be developed, an envelope footprint larger than the final development size has been considered within this scoping assessment (see Section 3.1: Location and Drawing 1024-PH5-032G), and a Rochdale envelope will be utilised throughout the EIA process.

The project design will seek to avoid and minimise impacts wherever possible and, as such, identify embedded ‘primary mitigation measures’ to avoid or reduce negative effects.

The initial focus of development design will be to ensure that the shape of the proposed reclaimed area can be accommodated within the marine environment and with minimal impact on coastal processes (including sediment movements). This will be undertaken through sediment modelling in the first instance. However, as it is likely that the design will be influenced by a myriad of other environmental factors such as ornithological, landscape, visual and potential noise issues associated with the development, the envelope will be reduced as the design matures.

5.1 Overview of Scoping Approach

It is predicted that many of the construction techniques utilised, and operational activities planned for Phase 5, will not differ notably from those considered for Phases 3 or 4 (see Section 2.1.1 and 2.1.2). It is therefore envisaged that the potential impacts of Phase 5 on various environmental topics associated with the development, will be largely indistinguishable from those associated with Phases 3 and 4. As such, the potential impacts assessed as part of the Phase 3 and 4 EIAs, have been used to inform this scoping exercise. Where assessments have been previously completed and shown that effects are non-significantly in EIA terms without or with mitigation, then topics can be scoped out on the basis that the appropriate mitigation is employed. The exception to this is where Phase 5 could be adding to an effect associated with the previous project phases, and cumulatively could give rise to a significant effect (for example landscape and visual).

The aim of the approach is to focus the EIAR onto the topics which require further consideration to understand their effects, to allow negative effects to be minimised as far as practicable and beneficial effects to be maximised.

5.2 Methodology

The methodology proposed to inform the scoping exercise is based on the source-pathway-receptor model (Figure 5.1). Where the construction and operational activities are the sources, and the baseline of each EIA chapter topic provides receptor information.

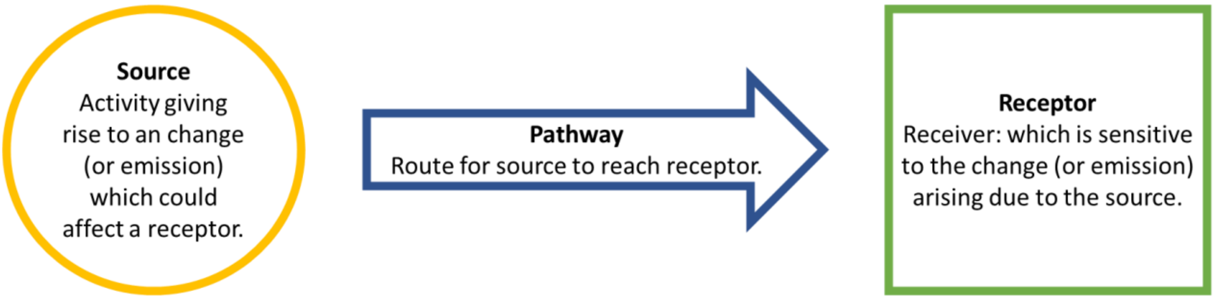

Figure 5.1: Source → Pathway → Receptor Model

Mitigation is utilised to minimise the change or emissions associated with the activity or to break or reduce the pathway to the receptors.

As the Phase 3 and 4 developments were required to undergo the EIA process, the significance of the potential effects on the environment and the appropriate measures/mitigation to avoid, prevent or reduce environmental harm/damage for the Phase 5 concept design and its likely construction methodologies and operations are already well understood. Therefore, a 'Source → Pathway → Receptor' model was followed to identify whether the impacts identified as part of Phases 3 and 4 are likely to change when considering the construction and operational activities likely as part of Phase 5. This included:

- Firstly, looking at the baseline information already acquired (i.e., the understanding of receptor), to identifying whether the receptors previously assessed could have changed and need to be reconsidered, or whether existing information is likely to be adequate;
- Secondly, identifying whether the source of impacts on a given receptor for Phase 5 are the same/similar as those assessed for Phases 3 or 4; and
- Thirdly, looking at the mitigation that was previously employed, and whether it would still be applicable, in that it either avoids or reduces the source or breaks/reduces the pathways associated with adverse impacts; and
- Finally, consideration is given as to whether Phase 5 could be additive to previous phases and hence be significant when considered in combination with Phases 3 and 4.

Where there is a change to the source, pathway or receptor, or if in combination effects could occur, consideration is given to whether there is a potential significant effect for Phase 5 taking account of any reasonable mitigation, and if so, the proposed assessment methodology.

Where an environmental topic is proposed to be scoped out of the EIA on the basis of mitigation, the mitigation is included in the Initial Schedule of Mitigation (Section 25). The mitigation outlined in Section 25 shall be included in any Construction Environmental Management Document (CEMD) authored for the Phase 5 development.

5.3 Topic Considerations

It is recognised that both Phase 3 and 4 EIAs were completed in line with the Marine Works (EIA) (Scotland) Regulations 2007, and as such did not necessarily cover all the topics required by the 2017 EIA Regulations. Table 5.1 provides an overview of all the current EIA topics along with details as to whether they were considered for various construction activities and operations within the Phase 3 and 4 EIAs. Sections 6 to 24 of this scoping report will discuss each topic in detail, and whether or not they are planned for inclusion in future assessments.

Table 5.1: Topics Included as Part of Phase 5 Scoping Report, and the Relevant Construction Techniques Associated with Each Topic

Environmental Topics	Construction Technique					Operations
	Piling	Land Reclamation	Infill/Rock Dump	Dredge	Dredge Disposal	
In-Air Acoustics	X	X	X	X		X
Air Quality (Dust Only)		X	X			
Air Quality (GHG Emissions Only)	X	X	X	X	X	X
Water Quality		X	X	X		X
Coastal Processes & Flooding		X	X			X
Ground Conditions and Contamination		X		X		X
Ornithology		X	X			
Otter		X	X			
Benthic Ecology		X	X	X		
Marine Mammals	X			X	X	
Fish Ecology	X			X	X	
Landscape & Visual		X	X			X
Materials & Waste		X	X	X		
Navigation						X
Traffic & Transport		X	X			X
Socioeconomics (Local Community and Economics)						X
Archaeology & Cultural Heritage						X
Climate Change	Previously only GHG emissions considered Air Quality.					
Major Accidents & Natural Disasters	Considered as part of other chapters such as Coastal Process and Flooding.					
Human Health	As part of Local Community but not as in depth as 2017 Regulations require.					
Aviation	Not previously relevant but could be to Phase 5 operations.					

6 In-Air Acoustics

6.1 Policy Frameworks & Legislation

Relevant policy and guidance includes:

- PAN 1/2011: Planning and Noise (Scottish Government, 2011a);
- BS 5228-1:2009, Code of practice for noise and vibration control on construction and open sites –Part 1: Noise (+A1:2014) (British Standard Institute, 2014);
- BS4142+A1:2019: Methods for rating and assessing industrial and commercial sound (British Standards Institute, 2019); and
- BS7455-1:2003 Description and Measurement of Environmental Noise (British Standard Institute, 2003).

6.2 Baseline

The PoCF is an industrial port used for the servicing and decommissioning of oil and gas related structures and vessels and, in recent years, supporting the renewable energy sector. Furthermore, cruise ships also dock at the Port, therefore, the noise environment in the area is already influenced with Port and industrial activities. Other local noise sources in the area are predominantly road and rail traffic and general commercial and residential activities.

6.2.1 Noise Sensitive Receptors (NSRs)

The closest NSRs to the northern extent of the Phase 5 concept design are approximately 200m away from the northern boundary, in the form of residential properties on King George Street and Cromlet Drive. Residential NSRs are also located to the south across the Cromarty Firth approximately 1200m away in Balblair. As the ISB is located directly across the water, the existing noise environment at Balblair is likely to be influenced to some degree by operations from the wider site.

The NSRs identified during the Phase 4 are outlined in Table 6.1. Each NSR assessment group has been allocated a Noise Assessment Location (NAL), the point at which noise emission levels have been calculated.

Table 6.1: Phase 4 NSRs and Their Locations for Noise Monitoring Assessment

NSR (NSR ID & NSR Name)		NAL (Grid Ref)	Descriptor
NSR01	King George Street	NH69874 68902	Representing NSRs at the western end of King George Street
NSR02	King George Street / Cromlet Drive	NH70078 68823	Representing NSRs at the eastern end of King George Street
NSR03	Cromlet Drive	NH70210 68732	Representing NSRs on Cromlet Drive
NSR04	High Street	NH70392 68505	Representing NSRs at the western end of High Street and Clyde Street
NSR05	Shore Road	NH70548 68464	Representing NSRs between Shore Road and Clyde Street

NSR (NSR ID & NSR Name)		NAL (Grid Ref)	Descriptor
NSR06	Outram Street	NH70659 68431	Representing NSRs between Ferry Road and Outram Street
NSR07	Balblair	NH70613 67132	Representing NSRs to the south at Balblair

For the Phase 3 EIA, a greater number of receptors were identified including a number around the main site entrance to the east of the development phases. These were included to aid in the understanding of effects of traffic noise. As the bulk of traffic accessing the west end of the ISB is now through the entrance directly onto Phase 2 (constructed in the early stages on Phase 3), these properties are no longer deemed as key NSR.

6.2.2 Noise Monitoring

Attended sound level monitoring has been completed to inform both the Phase 3 and 4 EIAs and has been undertaken during construction. However, the operations of Phases 3 and 4 may have changed their baseline noise levels. As such noise monitoring will be required for Phase 5 to understand current noise levels, and to provide a baseline for any in-air noise impact assessment to be undertaken (see Section 6.5.1: Proposed Environmental Impact Assessment).

6.3 Previous EIA – Impacts and Mitigation

A summary of the construction and operational impacts identified and any specific mitigation from the Phase 3 and 4 EIAs are provided in this section. The assessment for Phases 3 and 4 considered the existing noise environment at local residential receptors and presented the anticipated construction and operational noise emission levels for a number of construction stages and operational scenarios.

6.3.1 Construction

Baseline noise level monitoring identified that the Category A threshold values were appropriate for all of the NSRs, therefore the strictest of the predicted noise are used for impact assessment. Accordingly, the thresholds for significance were:

- 65dB $L_{Aeq(t)}$ for weekdays (07:00 – 19:00) and Saturday mornings (07:00 – 13:00);
- 55dB $L_{Aeq(t)}$ for evenings (19:00 – 23:00), Saturday (13:00 – 19:00) and all-day Sunday; and
- 45dB $L_{Aeq(t)}$ for night-time (23:00-07:00).

The assessment of construction noise on nearby residential receptors was undertaken following the guidance contained within BS5228. All predictions assumed that all plant was operating concurrently in full operational mode within the closest areas to each receptor in order to provide a worst-case scenario (whereas in reality only a proportion of the plant may be operating for a small proportion of time).

The construction noise levels at all of the assessed receptors during all individual assessed construction stages were found to be below the daytime, weekend, evening and night-time thresholds adopted, taking account of mitigation including restriction on activities based on time of day.

6.3.2 Operational

The assessment of operational noise levels during Phase 4 was undertaken in accordance with BS4142: 2014 for the Offshore Renewables Scenario and against fixed guideline noise levels, as detailed in BS8233 and by the World Health Organisation (WHO) for the Offshore Renewables Scenario and Cruise Scenario. The operational scenarios assessed were as follows:

- Offshore Renewables – associated with 'load-in', assembly, and 'load-out';
- Cruise Ship Scenarios – associated with berthed vessels and traffic movements picking up passengers; and
- Oil and Gas – berthed rigs for IRM.

The assessment of operational noise for Phase 4 was undertaken against 'fixed levels' (i.e., external limits). The strictest of the residential daytime and night-time noise levels were defined within the World Health Organisation (WHO) and BS8233 documents as:

- An internal noise level of 35dB $L_{Aeq(16hour)}$ during the day; and
- 30dB $L_{Aeq(8hour)}$ at night.

WHO guidance, however, suggests that an allowance of 15dBA for the attenuation of a partially open window is reasonable in order to convert between internal and external noise levels and limits. Therefore, an assessment of the impact of operational noise from Phase 4 was compared with an external noise level limit of 15dB above the internal guideline values (i.e., 50dBA during the day, 45dBA during the night). The noise levels at all of the assessed receptors during all individual assessed operational scenarios were found to be below the thresholds adopted.

6.4 Potential Impacts from Phase 5

6.4.1 Construction

Although the construction techniques to be used during the establishment of Phase 5 are expected to be largely indistinguishable from Phases 3 and 4, construction activities are likely to occur at differing distances to some noise sensitive receptors (NSRs). Therefore, there is potential for the significance of previously identified potential impacts to alter, and reassessment is required (see Section 6.5.1).

6.4.2 Operations

As per previous noise monitoring data at the PoCF, operational noise is largely variable and will be dependent on the activities being carried out at the time. However, the construction and establishment of Phase 5 will potentially introduce new operational activities associated with an offshore renewables' scenario. As Phase 5 will be established to primarily facilitate offshore wind activities such as manufacturing, production, marshalling and assembly, these activities should be subject to an in-air noise assessment.

6.5 Scoping Assessment

It is proposed that In-Air Noise is **scoped-in** to the Phase 5 EIA for both construction and operations, as there is potential for the significance of previously identified impacts to alter due to:

- the potential for differing distances between construction works and NSRs; and
- new operational activities at the port.

6.6 Proposed Impact Assessment

Baseline noise monitoring will be undertaken at the same NMLs as the Phase 4 EIA (see Table 6.1). Noise monitoring is particularly important with regards to operations, as the baseline background sound levels may have changed from what as previously recorded. Noise monitoring will be undertaken in line with methodologies outlined in BS4142: 2014, in accordance with guidance outlined in BS7445-1: 2003, taking precautions outlined in BS4142: 2014 to avoid interference from wind, heavy rain and electrical interference.

An assessment of construction noise will be carried out in line with BS5228-1: 2009 (+A1+2014) and appropriate mitigation measures identified, this is likely to include implementation of construction best practice and limiting working hours for the noisier construction activities.

Noise modelling will be required to support any construction noise and operational noise scenario impact assessment.

Separate applications under Section 61 of Control of Pollution Act 1974 (as amended) (COPA) for an agreement on limits and mitigation methods for noise during construction will be made where necessary.

7 Underwater Noise

An understanding of underwater noise sources and the output of the underwater noise assessments undertaken for the Phase 3 and 4 developments have been provided in this section. These have been compared with the potential noise sources and impacts associated with the Phase 5 development to identify if underwater noise will require modelling and assessment as part of the Phase 5 considerations.

The significance of the impacts of underwater noise on various ecological receptors can be found in Fish Ecology (Section 13.3) and Marine Mammals (Section 13.4) although ranges for auditory injury are described here.

7.1 Baseline

The underwater soundscape in the Cromarty Firth will be influenced by water movement due to the combination of River ingress at the western end of the Firth and tidal movements. Anthropogenic noise sources are associated with the movement of vessels, and equipment such as anchor chains in the water.

7.2 Previous EIA – Impacts and Mitigation

7.2.1 Piling

During the construction of Phases 3 and 4, piling noise was considered as part of the EIA consenting process. Within the Phase 4 EIA in particular, cylindrical piles with a pile internal diameter of 2m were used in the underwater noise modelling process. A pile diameter of 2m is the largest pile size modelled across both EIAs and as such, the outputs of underwater noise modelling of a 2m internal diameter pile driven into the seabed by impact piling, are utilised in this baseline as a worst-case scenario.

Precautionary models for impact piling of a 2m internal diameter pile were applied to underwater noise models in the Phase 4 EIA. This provided estimates for unweighted sound pressure levels (SPL_{peak}) and the squared pressure over the duration of a sound event (i.e., Sound Exposure Level (SEL)) for impact piling. The resultant values were as follows:

- 217.7dB re 1 µPa SPL_{peak} (Cylindrical piles - 500kJ hammer energy); and
- 192.8dB re 1 µPa^2 s SEL (Cylindrical piles -500kJ hammer energy).

The SPL_{peak} noise level from impact piling for 2m internal diameter cylindrical piles using a hammer energy of 500kJ during the construction of Phase 4, represents the worst-case scenario for underwater noise (see Figure 7.1).

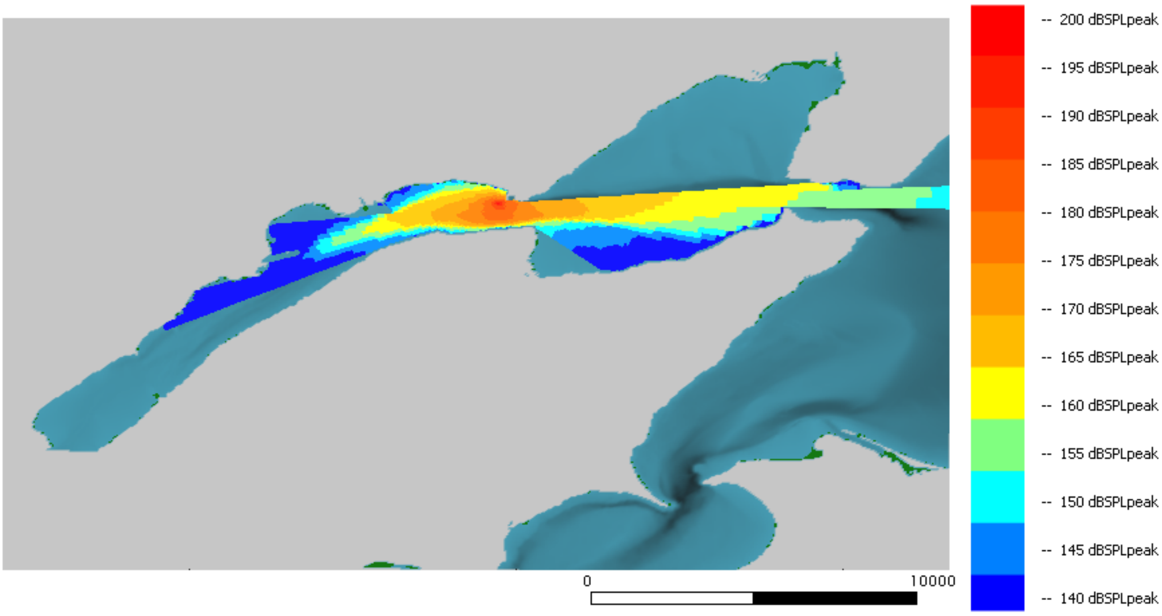

Figure 7.1: Impact Piling (2m Cylindrical Pile, 500kJ Hammer Energy), Unweighted SPL_{peak}

Modelled noise emission levels from piling were used in conjunction with published injury criteria for marine mammals and fish (Tables 7.2 and 7.3, respectively), to provide predicted impact ranges resulting from the piling operations.

Impacts of underwater noise from piling on fish and marine mammal receptors were summarised into three categories:

- Physical injury and fatality;
- Auditory injury (Permanent (PTS) and Temporary (TTS)); and
- Disturbance.

As the noise from impact piling is a multiple pulse source, frequency weighted cumulative SEL values were calculated assuming piling lasting 1 hour (based on a very conservative estimate of 3600 pile strikes at 1s intervals). Table 7.1 presents the impact ranges for marine mammals assuming an animal fleeing away from the piling at a speed of 1.5m/s, whilst Table 7.2 present the impact ranges assuming a continuous exposure of 1 hour (3600 pile strikes) for a stationary fish.

Table 7.1: Weighted SEL_{cum} Injury Criteria for Marine Mammals from Impact Piling Noise from 2m Diameter Piles (500kJ) Assuming a Fleeing Animal (1.5m/s) and 1 Hour of Piling Based on the Maximum Level in the Water Column

Threshold	Criteria SEL_{cum} (weighted)	Impact Piling (500 kJ) SEL_{cum} (1 hour) Maximum Range	Bearing of Maximum Range (degrees)	Area of Exceedance (km^2)
Low Frequency (LF) Cetaceans TTS	168 dB re $1\mu Pa^2s$	7.0km	088	7.34
Mid Frequency (MF) Cetaceans TTS	170 dB re $1\mu Pa^2s$	< 10m	-	< 0.01
High Frequency (HF) Cetaceans TTS	140 dB re $1\mu Pa^2s$	2.7km	086	2.75
Phocid Pinnipeds (PW) (underwater)TTS	170 dB re $1\mu Pa^2s$	690m	084	0.46
LF Cetaceans PTS	183 dB re $1\mu Pa^2s$	690m	084	0.12
MF Cetaceans PTS	185 dB re $1\mu Pa^2s$	< 10m	-	< 0.01
HF Cetaceans PTS	155 dB re $1\mu Pa^2s$	690m	084	0.12
PW Pinnipeds PTS	185 dB re $1\mu Pa^2s$	90m	066	< 0.01

Table 7.2: Unweighted SEL_{cum} Injury Criteria for Species of Fish from Impact Piling Noise from 2m Diameter Piles (500kJ) Assuming a Stationary Animal and 1 hour of Piling Based on the Maximum Level in the Water Column

Threshold	Criteria SEL_{cum} (unweighted)	Impact Piling (500 kJ) SEL_{cum} (1 hour) Maximum Range
Fish (no swim bladder) mortality and potential mortal injury	219 dB re $1\mu Pa^2s$	< 10m
Fish (no swim bladder) recoverable injury	216 dB re $1\mu Pa^2s$	10m
Fish (with swim bladder not involved in hearing) mortality and potential mortal injury	210 dB re $1\mu Pa^2s$	30m
Fish (with swim bladder involved in hearing) mortality and potential mortal injury	207 dB re $1\mu Pa^2s$	50m
Fish (with swim bladder) recoverable injury	203 dB re $1\mu Pa^2s$	100m

The significance of these impacts is outlined in Sections 13.3 and 13.4 respectively. In addition, the mitigation employed to reduce the significance of the impacts described in Tables 7.1 and 7.2 can be found in Sections 13.3 and 13.4.

It is noted that the Phase 3 development utilised HZM King and AZ sheet piles, noise measurements taken during the construction works showed them to have source noise levels of 183.7 and 196.7dB re1 μPa peak to peak respectively (Affric Limited, 2015). As such the 2m piles modelled as part of the Phase 4 development remain the worst-case scenario modelled to date.

7.2.2 Other Construction Techniques

The underwater noise emission levels resulting from dredging (including backhoe and suction hopper dredgers), and rock revetment construction (including the placement of rock armour) were assessed during the Phase 3 Development of the ISB. The measured source underwater noise levels for these activities are provided in Table 7.3. As the noise sources for these activities were found to be continuous and not impulsive, the root-mean-squared (RMS) metric is used.

Table 7.3: Measured Underwater Noise Source Levels Resulting from Dredging and Rock Revetment Construction During the Phase 3 Development (Affric Limited, 2015)

Activity	Metric	Source Sound Pressure Level (RMS, dB re 1µPa)
Dredging (Backhoe and Suction Hopper)	RMS	144
Rock Revetment Construction (including Rock Armour Placement)	RMS	157

The United States National Marine Fisheries Service (NMFS) propose a conservative threshold of 160dB re 1µPa for the onset of behavioural disturbance in marine mammal species (NMFS, 2016). Therefore, the measured underwater sound pressure levels resulting from dredging and rock revetment construction (see Section 7.1.2) did not exceed the NMFS marine mammal disturbance threshold. The significance of these impacts is outlined in Sections 13.3 and 13.4 respectively.

7.2.3 Boat Movements – Construction and/or Operations

Although there is no data available on the baseline ambient underwater noise levels in the Cromarty Firth, Bailey et al. (2010) recorded baseline levels in the wider Moray Firth as being between 104 – 119 dB re 1 µPa at 30s RMS. Ambient noise levels in the presence of increased vessel traffic for the construction of offshore windfarm developments were closer to 138 dB re 1 µPa.

The maximum predicted increase in vessel movements once the Phase 4 development became operational was 300 per year. This figure, however, was extremely pessimistic and the real increase in vessel movements were likely to be significantly lower. Therefore, the potential effects on marine mammals with regards to disturbance from an increase in vessel movements was deemed non-significant**.**

7.3 Potential Impacts from Phase 5

Although the Phase 5 development is not yet fully designed, it is assumed that piles of 2m internal diameter or less will be utilised for the construction of any quayside(s)/berthing line(s).

Potential impacts, in terms of significance with regards to underwater noise, are addressed in the following Sections Fish Ecology (Section 13.3) and Marine Mammals (Section 13.4) of this report. It should be noted however, that in Sections 13.3 and 13.4, only impacts of a 2m internal diameter pile utilised in the construction of Phase 4 and conservatively modelled are considered, as this represents the worst-case scenario in terms of impacts of underwater noise.

Smaller diameter piles, or alternative piles (for example HZM King/AZ Sheet) would give rise to lower underwater noise levels.

As the PoCF is an active port, with many boat movements throughout the year (see Section 16: Navigation), it is anticipated that construction and/or operational underwater noise levels associated with boat movements to and from the ISB in the Cromarty Firth, may be similar to those described by Bailey et al. (2010) in Section 7.2.3.

7.4 Scoping Assessment

Although the piling activities proposed for Phase 5 will be performed in a different location to those undertaken for the construction of Phases 3 and 4 at the ISB, it will be undertaken in a similar position within the Cromarty Firth channel, and at similar water depths. In addition, it is not envisaged that the diameter of piles used in the construction of Phase 5, shall exceed 2m internal diameter.

The impact ranges modelled for impact piling of a 2m internal diameter pile are therefore applicable to the proposed Phase 5 development, as the both the bathymetry and seabed sediment characteristics will strongly influence the dissipation of sound in the same way for Phase 5, as they did Phases 3 and 4. As such, remodelling of acoustic outputs are not required.

This scoping exercise therefore concludes that underwater noise should be **scoped-out** of the EIA based on the Phase 5 concept design. However, should the scheme design of Phase 5 propose pile sizes which exceed 2m internal diameter, then the underwater noise model may require updating, as there is a risk that the impacts will differ.

8 Air Quality

The focus of this section is on fugitive dust emissions associated with the construction of the Phase 5 development. Greenhouse Gas (GHG) Emissions associated with the project during construction and operations are covered in Section 19: Climate Change.

8.1 Policy Frameworks & Legislation

Relevant policy and guidance related to Air Quality includes:

- Guidance on the Assessment of dust from demolition and construction (IAQM, 2014);
- Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites (IAQM, 2018); and
- Pollution Prevention Guideline 6 (PPG6): Working at Construction and Demolition Sites: (Environment Agency, NIEA & Scottish Environment Protection Agency (SEPA)., 2012).

The Scottish Government has released general policies as part of the Scotland's National Marine Plan in favour of sustainable development and use of the marine environment which include:

- **GEN 14 Air quality:** Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits (Scottish Government, 2015).

8.2 Baseline

8.2.1 Air Quality Management Areas (AQMA)

The Air Quality in Scotland website provides a centralised source of air quality information for Scotland. Data and maps on Local Air Quality Management parameters and Air Quality Management Areas (AQMA) are provided (Air Quality in Scotland, 2022).

Invergordon is not designated as an AQMA, and the nearest designated area is the city centre of Inverness. Inverness is 15 miles south of Invergordon; therefore, is not affected by the Phase 5 Development.

8.2.2 Other Receptors

The Phase 4 EIA states that there were no new hospitals, schools or other potentially sensitive receptors close enough to be significantly impacted by construction dust. It was however, recognised that linear park and the Cromarty Firth Site of Special Scientific Interest (SSSI), SPA and Ramsar are located adjacent to the access to the west end of the ISB, and as such could be affected by track out. In addition, other receptors on the ISB, although less sensitive could be affected by dust. The previously identified receptors for Phase 4 are applicable to the Phase 5 development.

8.3 Previous EIA – Impacts and Mitigation

A summary of the construction and operational impacts identified and any specific mitigation from the Phase 4 EIA are provided in this section. Only Phase 4 was considered in this section, as Air Quality was not considered as part of the Phase 3 EIA.

8.3.1 Construction

A summary of the construction impacts and those requiring specific mitigation during Phase 4, as specified in the EIA, are detailed in Table 8.1.

It should be noted that the Institute of Air Quality Management (IAQM) guidance on the assessment of dust from demolition and construction, was utilised in the Phase 4 EIA to determine the significance of impacts. The guidance methodology, however, does not take into account primary or tertiary mitigation measures. Thus, the impacts assessed prior to secondary mitigation measures being proposed, are likely to be significant in many instances.

Table 8.1: Summary of Construction Impacts & Mitigation from Phase 4

Impact	Magnitude & Significance of Impact Without Mitigation	Mitigation	Significance of Residual Impact/ Residual Risk
Dust on ISB Workers	Moderate, Significant	• Dust Management Plan • Good material management • Dampening	Minor: Non-Significant
Track Out on ISB Workers	Moderate, Significant	• Dust Management Plan • Covered Delivery Vehicles • Specific Routes • Road Sweeping	Minor: Non-Significant
Track Out on Linear Park	Moderate, Significant	• Dust Management Plan • Covered Delivery Vehicles	Minor: Non-Significant

Impact	Magnitude & Significance of Impact Without Mitigation	Mitigation	Significance of Residual Impact/ Residual Risk
		• Specific Routes • Road Sweeping	
Track out on the Cromarty Firth SSSI, SPA & Ramsar	Minor: Non-Significant	• Dust Management Plan • Covered Delivery Vehicles • Specific Routes • Road Sweeping	Negligible: Non-Significant

Regular checks by an Environmental Clerk of Works (ECoW) during all construction activities for Phase 4 ensured that dust was not an issue. In addition, during the construction of Phase 4, no complaints were received regarding construction dust.

8.3.2 Operational

The Phase 4 EIA considered three scenarios that would occur at the development:

- Offshore Renewables Scenario;
- Oil & Gas Scenario; and
- Cruise Scenario.

When considering impacts on air quality, impacts associated with the three scenarios were examined with regard to greenhouse gas emissions, as each of the activities would not give rise to significant dust impacts. These are considered specifically in Section 19: Climate Change.

8.4 Potential Impacts from Phase 5

8.4.1 Construction

As the construction methodology is likely to be indistinguishable from the Phase 4 development, it can be assumed that the impacts will be the same for the Phase 5 development. The impacts assumed, are as detailed below:

- Dust on ISB Workers;
- Track Out on ISB Workers;
- Track Out on Linear Park; and
- Track out on the Cromarty Firth SSSI, SPA & Ramsar.

8.4.2 Operational

As discussed in Section 3.4, the operations carried out on Phase 5 could include the delivery of cement dry product and aggregate by sea, for onsite storage and use in concrete batching plant. Dry cement products can be a source of dust, however as the quantities of materials will be significant, they will be delivered, moved, stored and handled utilising appropriately contained systems and as such are highly unlikely to have a pathway into the atmosphere under normal operating conditions to give rise to significant dust issues.

It is noted that if cement related works are to be carried out on the ISB, then a permit will be required under the Pollution Prevention and Control (Scotland) Regulations 2012 (PPC), as the works are a Part B activity under:

> *Section 3.1a(ii) blending cement in bulk or using cement in bulk other than at a construction site, including the bagging of cement and cement mixture, the batching of ready-mixed concrete and the manufacture of concrete blocks and other cement products.*

The PPC permit will require Best Available Techniques (BAT) to be implemented to prevent and minimise emissions. As such, significant effects on air quality during the operational phase are highly unlikely.

8.5 Scoping Assessment

Construction activities conducted during Phase 4 at the PoCF were deemed to have no significant impact of dust on air quality, with the appropriate implementation of mitigation measures. As the construction techniques and design elements of the Phase 5 development will be almost identical to that assessed as part of Phase 4, and given that the baseline information has not changed, it can be assumed that the impacts are indistinguishable from those already assessed. As such, it is recommended that construction Air Quality is **scoped out** of the EIA process, on the premise that the mitigation proposed in Section 8.6 is implemented.

It is recognised that the potential for cement-based fabrication works during the operations could introduce a source of dust during the operational stage of Phase 5. However, on the basis that a PPC permit will be required and BAT utilised, no significant effects are predicted, hence, operational air quality impacts can be **scoped out**.

It is noted that effects associated with GHG are considered in Section 19 Climate Change.

8.6 Proposed Mitigation

8.6.1 Construction

A Dust Management Plan will be developed for the Phase 5 construction works and included within the CEMD, similar to that utilised for Phase 4. All vehicles transporting potentially dusty materials to or from the Phase 5 site will be required to be covered and follow designated routes over made surfaces, as far as is practically possible. Road sweeping will be undertaken as necessary to prevent track-out from the Phase 5 site through the ISB or onto the public road. The mitigation that will be adopted for Phase 5 is outlined in Section 25 of this scoping report.

8.6.2 Operations

If cement-based fabrication is to be undertaken, then a Part B PPC permit will be sought prior to activities commencing. Operations of the cement plant will be undertaken in accordance with BAT in alignment with the PPC permit requirements, to ensure significant effects on air quality are prevented.

9 Water Quality

9.1 Policy Frameworks & Legislation

Relevant policy and guidance includes:

- European Water Framework Directive (European Parliament, 2000);
- Water Environment and Water Services (Scotland) Act 2003 (Scottish Parliament, 2003);
- PAN 79: Water and Drainage (Scottish Government, 2006);
- Guidance for Pollution Prevention (GPP) 5: Works and Maintenance in or Near Water (Environment and Heritage Service, SEPA & Environment Agency, 2017);
- Pollution Prevention Guideline Note (PPG) 6: Work at Construction and Demolition Sites (Environmental Agency, NIEA & SEPA 2012); and
- Guidelines for the Control and Management of Ships Biofouling to Minimize the Transfer of Invasive Aquatic Species (Marine Environment Protection Committee, 2011).

Relevant legislation includes:

- The International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004; and
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR).

The Scottish Government has released general policies as part of the Scotland's National Marine Plan in favour of sustainable development and use of the marine environment which include:

- **GEN 10 Invasive Non-Native Species:** Opportunities to reduce the introduction of invasive non-native species to a minimum or proactively improve the practice of existing activity should be taken when decisions are being made (Scottish Government, 2015).
- **GEN 12 Water Quality and Resource:** Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive or other related Directives apply (Scottish Government, 2015).

The Scottish government has released a series of good environmental status descriptors within Scotland's National Marine Plan. These include:

- **GES 5:** Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms, and oxygen deficiency in bottom waters; and
- **GES 8:** Concentrations of contaminants are at a level not giving rise to pollution effects (Scottish Government, 2015).

9.2 Baseline

9.2.1 Cromarty Firth

The transitional water body surrounding the Phase 5 development is classified as the Inner Cromarty Firth (ID: 200443) which has an area of 35.9km^2. In 2020, the area was classified as having good overall ecological status, with a pass chemical status. The water body to the east of the site is classed as the Outer Cromarty Firth (ID: 200442), which has an area of 41.4km^2. In 2020, this area was also classified as good overall and ecological status, with a pass chemical status (SEPA, 2022b).

9.2.2 Shellfish Water

The closest protected shellfish waters to the development are across the water, around 5km away from the development, in Cromarty Bay (ID: SWPA11). Cromarty Bay was classified as having fair status in 2014 (SEPA, 2022b).

9.2.3 Rivers

The River Conon and several burns flow into the Cromarty Firth and as such, water flows and sediment movements in the Firth are influenced by fluvial processes. In 2020, the river was classified as having good overall ecological status, with a pass chemical status.

9.2.4 Marine Non-Native Species (MNNS)

During a benthic survey carried out prior to the Phase 4 development (See Appendix 2 for further detail), no MNNS were identified within the vicinity of the development and there is only one record of MNNS in the Cromarty Firth; the Acorn barnacle. Further detail is provided in Section 13.2.1: Benthic Ecology. Red algae have been identified in the adjacent Moray Firth, but this is not known to be present in the Cromarty Firth.

9.3 Previous EIA – Impacts and Mitigation

A summary of the construction and operational impacts identified and any specific mitigation from the Phase 3 and 4 EIAs are provided in this section. The potential impacts assessed as part of the Phase 3 and 4 EIAs, have been used to inform this scoping exercise.

9.3.1 Construction

A summary of the construction impacts identified and requiring specific mitigation during Phase 4, as specified in the EIA, is detailed in Table 9.1.

Table 9.1: Summary of Construction Impacts & Mitigation from Phase 4 of PoCF

Impact	Significance of Impact	Mitigation	Significance of Residual Effect
Increased Sediment in Water Column from Infilling Works	Moderate: Significant	Appropriate isolation of area from the Cromarty Firth; and Ongoing observations made by the ECoW, with works being stopped and improved as necessary.	Minor: Non-significant
Increased Sediment in Water Column from Dredging	Minor: Non-Significant	No specific mitigation required.	Minor: Non-Significant
Increased Sediment in Water Column from Dredge Disposal	Minor: Non-Significant	No specific mitigation required.	Minor: Non-Significant
Loss of Containment (terrestrial and marine plant): Refuelling, Fuel Storage, Hydraulic Fluid Leak & Plant, Caustic cement washings.	Minor: Non-significant	Appropriate spill prevention and response procedures; and ECoW auditing compliance.	Negligible: Non-Significant
Introduction of MNNS	Minor: Non-significant	All plant and equipment thoroughly cleaned and dried prior to mobilisation to site; and Follow best practice and guidance.	Minor: Non-significant

Mitigation implemented during Phase 4 to manage water quality were effective. In addition, the pollution prevention measured in place ensured that any spillages were minor, and promptly dealt with, such that there were no impacts on water quality.

9.3.2 Operations

A summary of the operational impacts identified and requiring specific mitigation during Phase 4, as specified in the EIA, is detailed in Table 9.2.

Table 9.2: Summary of Operational Impacts & Mitigation from Phase 4 of PoCF

Impact	Significance of Impact	Mitigation	Significance of Residual Effect
Increased Sediments in the Water Colum – Maintenance Dredging and Disposal	Minor: Non-significant	No specific mitigation measures identified.	Minor: Non-significant
Loss of Containment: Refuelling, Fuel Storage, Hydraulic Fluid Leak & Plant etc.	No change from baseline identified, hence no impacts anticipated.		
Surface Water Discharges resulting in reduction of water quality	Minor: Non-significant	No specific mitigation required.	Minor: Non-significant
Introduction of MNNS	Moderate: Significant	Follow best practice and guidance. No site-specific mitigation required.	Minor: Non-significant

9.4 Potential Impacts from Phase 5

The design elements that are relevant to water quality include: land reclamation to create additional laydown areas, dredging and spoil disposal.

As the construction methodology is expected to be largely indistinguishable from Phases 3 and 4 it is expected that the construction and operational impacts will be the same as those previously assessed. The proposed location for Phase 5, is unlikely to make any difference to the impacts previously assessed.

9.4.1 Construction

The potential construction impacts assumed for Phase 5 are identified as:

- Increased sediment in water column from infilling works;
- Increased sediment in water column from dredging;
- Increased sediment in water column from dredge disposal;
- Loss of containment (terrestrial and marine plant): refuelling, fuel storage, hydraulic fluid leak, caustic cement waters etc.; and
- Introduction of MNNS.

Dredging also has the potential to increase contaminants (if present, see Section 11) in the water column however, this is not discussed within this section and will be discussed in Section 11: Ground Conditions and Contamination.

The measures outlined in Phase 4 to mitigate these impacts, will be appropriate to mitigate impacts during Phase 5 construction. Mitigation is discussed further in Section 9.6.

9.4.2 Operations

The potential operational impacts associated with Water Quality include those considered in previous phases namely:

- Increased sediments in the water column – maintenance dredging;
- Loss of containment: refuelling, fuel storage, Hydraulic fluid leak & plant;
- Introduction of MNNS due to marine vessel movements; and
- Increased suspended solids from laydown area runoff.

These impacts represent a ‘business as usual’ scenario, which are managed by the Port’s own environmental management systems. As such, the measures outlined in Phase 4 to mitigate these impacts, will also mitigate these impacts during the operations of Phase 5. Mitigation is discussed further in Section 9.6.

If on site cement batching is undertaken, then there will be cement washings generated on site, where these cannot be reused within the process they will need to be treated prior to discharge.

If onsite treatment cement washings are required, then it is likely that the resultant effluents will be discharged to sea. Discharges to sea will need an authorisation under the CAR from the SEPA. SEPA will require any effluents to be appropriately treated to meet water quality standards and as such the design of treatment facilities will need to ensure all requirements can be met.

The risk associated with the introduction of MNNS will be activity specific as they are related to where the machinery and vessels are coming from. It can be assumed that all vessels will be compliant with the relevant requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 and where appropriate follow Guidelines for the Control and Management of Ships Biofouling to Minimize the Transfer of Invasive Aquatic Species (Marine Environment Protection Committee, 2011). Furthermore, compliance with the Scottish Government's (2012) Non-native species: Code of Practice, will minimise risk from machinery.

9.5 Scoping Assessment

Construction and operational activities conducted during Phase 4 at PoCF were deemed to have no significant impact on water quality, with the appropriate implementation of mitigation measures. As the construction techniques and design elements of the Phase 5 development will be almost identical to Phase 4, it can be assumed that the impacts are indistinguishable from those already assessed, and hence with mitigation do not need to be considered further. As such construction impacts on water quality can be **scoped out**.

If there is a need to include cement washing facilities within the design of Phase 5 as it develops, then these will be presented within the EIA. It can be assumed that they will be designed to ensure that the appropriate CAR licences can be achieved and hence water quality impacts will be non-significant and hence do not need to be considered and are **scoped out**.

As aforementioned in Section 4.1.5, a WFD Assessment will be required for the Phase 5 development. However, as there may not be a need for a Water Quality section of the EIA, and as changes are more likely to be related to changes to the physical environment, the WFD Assessment will be discussed in Section 10: Coastal Processes and Flooding.

9.6 Proposed Mitigation

Mitigation previously utilised to ensure water quality with regard to sedimentation, spill plans and to protect against MNNS introduction, coupled with appropriate material management (see Section 15.5) will minimise adverse construction and operational impacts on water quality. The proposed mitigation is detailed in Section 25.

Construction mitigation measures will be incorporated into the CEMD produced following the EIA stage.

10 Coastal Processes and Flooding

10.1 Policy Frameworks & Legislation

The Scottish Government has released general policies as part of the Scotland's National Marine Plan in favour of sustainable development and use of the marine environment which include:

- **GEN 8 Coastal Process and Flooding:** Developments and activities in the marine environment should be resilient to coastal change and flooding, and not have unacceptable adverse impacts on coastal processes or contribute to coastal flooding.

The Scottish government has released a series of good environmental status (GES) descriptors within Scotland's National Marine Plan. These include:

- **GES 7:** Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.

Other relevant policy and guidance includes:

- **PAN 79:** Water and Drainage; and
- The Highland Council's Supplementary Guidance: Flood Risk and Drainage Impact Assessment (Highland Council, 2013a).

10.2 Baseline

Baseline information on coastal processes and flooding at the PoCF are well described through Affric's pre-existing work on the Phase 3 and 4 EIAs. As such, this section outlines the resources which have previously been used to inform the coastal processes and flooding baseline associated with the Phase 5 concept design.

10.2.1 Cromarty Firth

The Cromarty Firth is an extensive elongated water body, 30km long and typically between 1km and 2km wide. The Firth has a total surface area of over 3700 Ha (JNCC, 2001). There is a major expansion of the Firth at its eastern end and two shallow embayment's just before it constricts once again at the Sutors of Cromarty. The Sutors is a relatively narrow channel which protects the Cromarty Firth from the full force of offshore sea conditions in the Moray Firth.

As discussed in Section 9.2 the River Conan flows into the Cromarty Firth at its western end. As such water flows and sediment movements are influenced by both fluvial and tidal processes.

The existing ISB is located approximately 11km westwards from the Sutors and some 13km eastwards from the A9 road bridge, which marks a broad transition from deep to shallower water in the Firth. The central channel of the Firth in its eastern reaches is 20m deep and around 800m wide. Shallows border this channel along both the northern and southern coasts.

As shown in Drawing 5121683-ATK-PH4-ZZ-DR-C-0200, the ISB is reclaimed out towards the deeper waters of the channel, to facilitate berthing. The western end of the ISB has Phases 3 and 4, which have been reclaimed in front of the coastline.

10.2.2 Flood Risk

Limited sections of the B817, a road network which runs parallel with the ISB from the east towards the entrance to the PoCF, are subject to a mixture of low, medium, and high likelihood of coastal flooding. The coastal waters around the PoCF development have a high likelihood of flooding, with the exception of the shoreline to the west of the site, which has a medium likelihood of flooding (SEPA, 2022c). SEPA's flood risk assessment shows that less than ten residential properties and twenty non-residential properties are at risk of coastal flooding in Invergordon (Figures 10.1 & 10.2). It's important to note that the flood risk map in Figure 10.2 was prepared before Phases 3 and 4 were built.

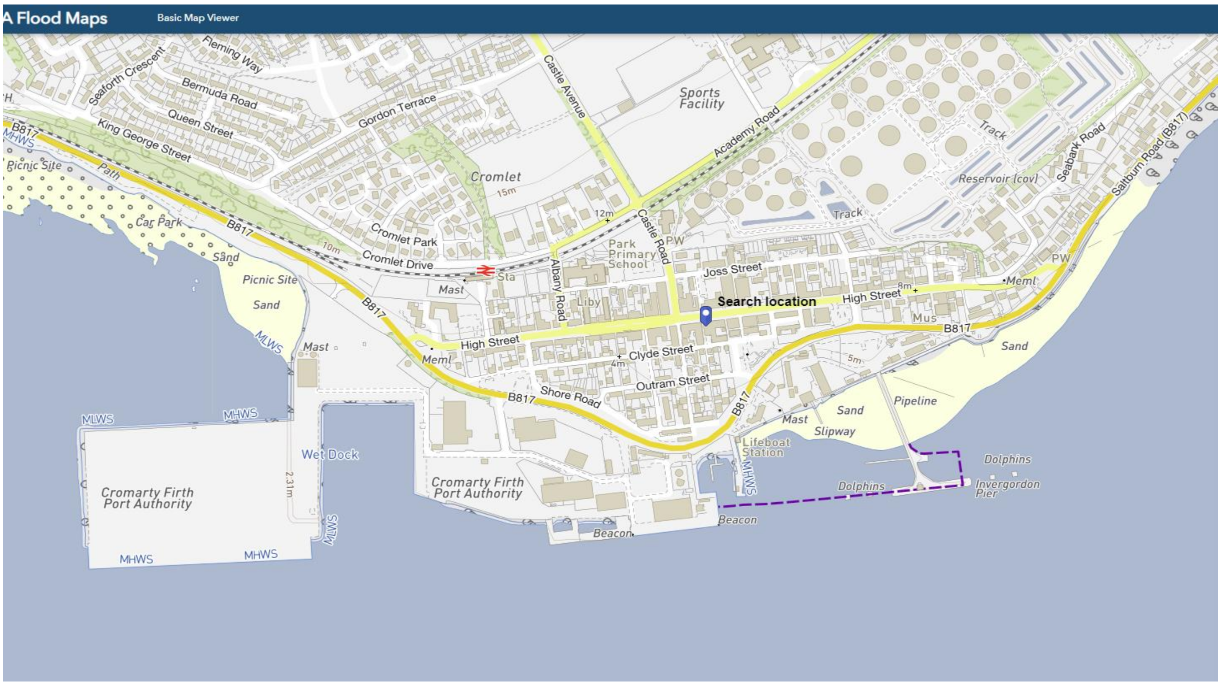

Figure 10.1: Map of Invergordon Without Coastal Flooding

Figure 10.2: Map of Invergordon Detailing Areas at Risk of Coastal Flooding (SEPA, 2022c)

SEPA notified Affric in 2018 that for the ISB, the 1 in 200 year coastal still water flood level is 3.41m Above Ordinance Datum (AOD) (5.51 m CD) while the 1 in 1000 year flood level is 3.57m AOD (5.67m CD) (Haslam, 2018).

10.2.3 Coastal Processes

The baseline information provided here was gleaned from the Phase 4 EIA.

10.2.3.1 Wave Regime

Given the relatively sheltered location, any wave action will be from local wind-generated waves rather than open sea waves or swells. The longest fetch exists to the west, but the shallow gradient associated with the foreshore, intertidal area and shallows along the northern coast of the Firth mean that waves tend to refract onto the beach. Near shore waves break once they reach a modest size. Waves building in the core of the channel may be expected to reach 2-3m in size during storm conditions.

10.2.3.2 Currents

The water circulation within the body of the Cromarty Firth, and in particular within the vicinity of Phase 4 at the ISB, is not particularly strong, with peak ebb speeds of 1 to 1.1meters per second (m/s) in the centre of the channel between the ISB and Balblair.

10.2.3.3 Sediment Transport

The impacts associated with sediment transport were considered as part of the Phase 4 EIA. Sediment transport modelling as part of the Phase 4 EIA indicated increases in bed thickness due to mud movements around the edges of the Cromarty Firth which includes all the berths of the ISB. There is also an area of scour in the middle of the channel between the ISB and Balblair, which coincides with the fastest current movements.

10.3 Previous EIA – Impacts and Mitigation

A summary of the construction and operational impacts identified and any specific mitigation from the Phase 3 and 4 EIAs are provided in this section.

10.3.1 Construction

As the area around the ISB was characterised by low wave and current regimes, the following mitigation measures were implemented to limit the impact of sediment plumes (see Section 9: Water Quality) on the local environment:

- The construction contractor will specify that the reclamation construction method should use appropriate quality material with a minimum fines content; and
- Reclaimed material will be clean granular material free from contaminants and will be well graded to allow suitable compaction (Ground Conditions and Contamination are discussed further in Section 11).

As sediment plumes were not of a scale to cause significant water quality issues during the construction of Phases 3 and 4, sediment transport around the ISB during construction did not cause any significant changes to coastal processes.

10.3.2 Operations

For Phases 3 and 4, it was identified that annual changes in sediment levels are not attributed to erosion or sedimentation in intertidal areas, nor is there any coastal squeeze (i.e., loss of intertidal habitat). Thus, no impacts were identified, and no specific mitigation was required.

10.4 Potential Impacts from Phase 5

10.4.1 Construction

As the final design of the Phase 5 development is most likely to generate changes to sediment transport (i.e., once constructed), rather than the construction activities involved in creating the Phase 5 development, there are no construction issues associated with coastal processes and flooding.

10.4.2 Operations

As aforementioned, the Phase 5 development will alter the dimensions of the Cromarty Firth. This could give rise to:

- Changes to current or wave regime and associated sediment transport which could have knock on implications to the beach to the north which is part of the Cromarty Firth SPA/SSSI/Ramsar (see Section 12.2); and
- Increased sedimentation along the berthing line which could also impact upon operational dredging requirements.

As it is recognised that the location and shape of the development will influence sediment transport, and thus, coastal processes and potentially flooding, modelling of concept designs is required to identify areas of potential impact and refine design. Current and flow regimes will be utilised to understand sediment transport processes.

10.5 Scoping Assessment

Although no significant impacts were identified during the Phase 3 or 4 EIAs, the Phase 5 concept design is an expansion to the ISB and will further alter the dimensions of the Cromarty Firth. As such, it is proposed that Coastal Processes and Flooding is **scoped-in** to the Phase 5 EIA.

Sediment modelling is required to understand the potential impacts of the Phase 5 concept design on sediment transport and the potential knock-on effects on coastal processes and flooding. It will also provide an indication of the need for maintenance dredge activities. The outputs of any modelling would be presented in the EIA. This is discussed further in Section 10.6.

10.6 Proposed Impact Assessment

The sediment model from previous development phases will be updated to include the Phase 5 concept design and to provide an understanding of the hydrological impacts, associated sediment movements, and need for maintenance dredging. The modelling will be utilised as part of an iterative process in the finalisation of the design layout for the Phase 5 development. This is to ensure impacts (such as overtopping) are designed out, or minimised where possible.

The design will also take account of the tidal levels to identify an appropriate height above sea level for the land reclamation, to minimise surface flooding risks. Appropriate drainage design will ensure that the surface waters are effectively managed to prevent flooding. The drainage will be relatively simple, as such the production of a Drainage Statement in line with The Highland Councils Supplementary Guidance (Highland Council, 2013a) is deemed proportionate to the development. It will outline the proposals for the drainage of permeable and impermeable areas including how surface water on the site will be treated and discharged.

10.6.1 Water Framework Directive (WFD) Assessment

A Water Framework Directive (WFD) assessment will be completed for the Phase 5 development. The WFD assessment will support any marine licence application and will explore the physical characteristic changes of the Cromarty Firth as a result of the Phase 5 development. As stated in the WFD, temporary effects due to short-duration activities like construction or maintenance do not count as deterioration if the water body would recover in a short time without any restoration measures. Therefore, the WFD assessment concentrates on permanent impacts associated with construction and operation, such as changes to the physical environment due to development design.

11 Ground Conditions

The focus of this section is on the potential impacts associated with ground conditions at the proposed Phase 5 development. The need to understand the ground conditions at the proposed Phase 5 development is paramount, as this forms the basis for:

- Understanding how sediments may be transported around the ISB and wider Cromarty Firth (see Section 10); and
- Producing a detailed development design.

Impacts associated with the Phase 3 and 4 EIAs have also been considered here, as Ground Investigations (GI) and pre-sampling analysis of seabed material is required prior to most marine developments. Although the impacts associated with ground conditions from Phases 3 and 4 cannot be directly related to Phase 5, the impacts identified are likely to be the same.

11.1 Baseline

Based on the information collated for the Phase 3 and 4 developments, the ground conditions in and around the ISB are well understood. Regular sampling has been undertaken to inform both previous construction projects and regular maintenance dredge licences.

For Phases 3 and 4, GI and pre-sampling analysis (with core samples being taken at a depth up to -30m CD) of seabed material identified that dredge material would be made up of cohesive marine beach deposits comprising of:

- Very loose to medium dense, slightly gravelly, very silty sands; and
- Very soft to firm grey, slightly clayey, sandy silts.

Neither of which were suitable for reuse in construction.

Although no contamination issues were identified for the GI samples taken as part of the Phase 4 development (which is to the west of Phase 3), maintenance dredge samples from the more easterly Queen's Dock and Berth 4 have identified heavy metal occurrences previously. This material, however, has been deemed suitable for disposal at the Sutors Disposal Ground (CR019). This presence of contaminants in seabed material located at the Queen's Dock is likely attributed to the dock's uses as an IRM dock for the oil and gas industry. As IRM activities have not taken place at either Phase 3 or 4, it is expected that the further west samples are taken at the ISB, the cleaner the material.

11.2 Previous EIA – Impacts and Mitigation

11.2.1 Construction

As part of the Phase 4 EIA only the disturbance of the seabed during construction works, primarily dredging, was identified as have any potential significant impact. This is because dredging has the potential to give rise for any contamination present in the seabed to be re-released, moving or spreading contaminated sediment, and/or polluting the seawater. However, extensive sampling of the Phase 4 Development construction identified no signs of a contamination issue, as stated in Section 11.1. As such, it was assessed that there would be a negligible, non-significant impact, with no mitigation required.

11.2.2 Operations

No operational impacts associated with ground conditions were identified for Phases 3 or 4.

11.3 Potential Impacts from Phase 5

11.3.1 Construction

11.3.1.1 Contamination

The disturbance of the seabed during construction works could give rise to re-suspended solids and thus:

- Encourage any contamination present in the seabed to be re-released;
- Encourage the movement or spreading of contaminated sediment; and/or
- Pollute the seawater.

Pre-sampling analysis will be required to understand whether there are any changes from the pre-existing baseline, and whether there are any contaminants present in the seabed material.

As discussed in Section 11.1, it is anticipated that seabed material to the west of Phase 4, where Phase 5 may be located, will not be contaminated. Whilst at the Queen's Dock, there is the possibility for seabed material to be contaminated.

As dredging may be required to facilitate the land reclamation or to obtain appropriate depths at the proposed berths, there is the potential to re-release contaminants into the water column specifically through dredging. If the Queen's Dock is infilled as part of the Phase 5 concept rather than dredged, then construction activities are unlikely to cause the re-release of contaminated sediments.

11.3.1.2 Ground Conditions

GIs has been undertaken to understand the sediment size distribution of the seabed deposits and to inform the detailed development design. The sediments in the dredge pocket have a high silt content and hence are unlikely to be suitable for reuse in the reclamation infill areas. As such, subject to Best Practicable Environmental Option (BPEO) findings it is likely that a Marine License will be sought for dredged spoil disposal at the Sutors Disposal Ground (CR019).

11.3.2 Operations

Maintenance dredging may also be required as part of Phase 5 operations, to ensure that the required seabed depth is maintained. As discussed in Section 10.6 sediment modelling will help to understand the need for maintenance dredging once Phase 5 becomes operational. The disturbance of the seabed during dredging, could give rise to the potential for any contamination present in the seabed that were not previously identified, to be re-released.

Any newly dredged areas and those requiring maintenance will be bathymetrically surveyed at least once every 4 years and dredged as required to maintain safe operational draft depths. Maintenance dredges will be subject to marine licensing which will be informed by sediment sampling and BPEO assessments.

11.4 Scoping Assessment

A ground investigation including core sampling and sample analysis in line with the Pre-Disposal Sampling Guidance (Marine Scotland, 2017) has been carried out during Spring 2023. The results of which will inform the design of the development including pile length and suitability of dredged seabed material for reuse in reclamation. The particle size analysis results will also be utilised in the sediment modelling (see Section 10.6). The pre-disposal sample chemical analysis will identify any pollutants present.

As the GI and contamination results will be included as part of a BPEO Report which will support the marine licence applications, it is not necessary for them to be included in the EIA. As such, this scoping exercise therefore concludes that Ground Conditions & Contamination should be **scoped out** of the EIA for the Phase 5 development.

11.5 Best Practicable Environmental Option (BPEO) Report

The outputs of the GI and sample chemical analysis will be outlined within a BPEO which will be produced to support the dredge and disposal marine licence application under the Marine (Scotland) Act 2010. The purpose of the report will be to identify and assess the available options for the use and disposal of dredged materials based on the results of the GI and the pre-disposal sampling chemical analysis. If the sediments that need to be dredged are of a suitable quality, they will be utilised within the infilling of the land reclamation.

12 Biodiversity - Terrestrial

This section outlines the relevant plans and policies, describes the baseline conditions, and assesses the potential terrestrial ecology impacts. As there are minimal land-based works, terrestrial ecology receptors are limited to birds and otters.

12.1 Policy Frameworks & Legislation

Relevant general policy and guidance for ecological features includes:

- **GEN 9: Natural heritage:** development and use of the marine environment must:
- Comply with legal requirements for protected areas and protected species;
- **GEN 10 Invasive non-native species:** opportunities to reduce the introduction of invasive non-native species to a minimum or proactively improve the practice of existing activity should be taken when decisions are being made;
- **GEN 13** Noise: Development and use of the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects;
- **GEN 21 Cumulative Impacts:** Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation (Scottish Government, 2015);
- **Highland Council Policy:**
    - **58**: Protected Species; in the context of the Phase 5 Development, the species on the European Protected Species or Wildlife and Countryside Act 1981 (as amended) are noted in Appendix 1 of the policy for mammals (including otters) and Appendix 2 of the policy for various bird species (Highland Council, 2012, 2013b);
    - **59**: Other Important Species (Highland Council, 2012); and
    - **60**: Other Important Habitats (Highland Council, 2012).
- **PAN 60:** Planning for Natural Heritage (Scottish Government, 2008); and
- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Chartered Institute of Ecology and Environmental Management (CIEEM), 2018).

12.2 Ornithology

12.2.1 Baseline

12.2.1.1 Designated Sites

The Cromarty Firth and adjacent areas are designated for the large number of wintering and migratory wildfowl present in the region. The statutory designated sites of relevance to Phase 5 and designated for ornithology are listed in Table 12.1. These sites are included in the Pre-Screening HRA (Appendix 1).

Table 12.1. Statutory Designated Sites for Ornithological Features Within 20 km of the Development Area.

Site	Designation	Distance and Direction to Phase 5	Feature Category/Feature
Cromarty Firth	SSSI & SPA	Directly adjacent to proposed development site.	Breeding Common Tern (*Sterna hirundo*) Osprey (*Pandion haliaetus*) Wintering Bar-tailed Godwit (*Limosa lapponica*) Whooper Swan (*Cygnus cygnus*) Greylag Goose (*Anser anser*) Red-breasted Merganser (*Mergus serrator*) Redshank (*Tringa tetanus*) Wigeon (*Anas penelope*) Waterfowl assemblage
Rosemarkie to Shandwick Coast	SSSI	9km southeast	Cormorant (*Phalacrocorax carbo)* (Breeding)
Nigg and Udale Bays	National Nature Reserve (NNR)	3km south (Udale Bay), 7km east (Nigg Bay)	Bays sit within the Cromarty Firth SSSI and therefore any assessment of this nature reserve falls within the SPA/SSSI's assessment
Moray Firth	SPA	12km east	Non-breeding Great northern diver (*Gavia immer*) Red-throated diver (*Gavia stellata*) Slavonian grebe (*Podiceps auratus*) Eider (*Somateria mollissima*) Migratory Greater scaup (*Aythya marila*) Common eider (*Somateria mollissima*) Long-tailed duck (*Clangula hyemalis*) Velvet scoter (*Melanitta fusca*) Common scoter (*Melanitta nigra*) Common goldeneye (*Bucephala clangula*) Red-breasted merganser European shag (*Phalacrocorax aristotelis*)
Loch Eye	SPA/SSSI	16km northeast	Greylag Goose (*Anser anser*) (wintering) Whooper Swan (*Cygnus cygnus*) (wintering)
Inner Moray Firth	SPA/SSSI	16km south and southwest	Breeding Common Tern (*Sterna hirundo*) Osprey (*Pandion haliaetus*)

Site	Designation	Distance and Direction to Phase 5	Feature Category/Feature
			Wintering Bar-tailed Godwit (*Limosa lapponica*) Curlew (*Numenius arquata)* Goldeneye (*Bucephala clangula)* Goosander (*Mergus merganser)* Greylag Goose (*Anser anser*) Oystercatcher *Haematopus ostralegus* Red-breasted Merganser (*Mergus serrator*) Redshank (*Tringa tetanus*) Scaup (*Aythya marila)* Teal (*Anas crecca)* Wigeon (Anas penelope) Waterfowl assemblage
Dornoch Firth and Loch Fleet	SPA	18km northeast	Breeding Osprey (*Pandion haliaetus*) Wintering Wigeon (Anas penelope) Waterfowl assemblage Dunlin (*Calidris alpina)* Bar-tailed Godwit (Limosa lapponica) Curlew (Numenius arquata) Greylag Goose (Anser anser) Teal (Anas crecca) Oystercatcher (Haematopus ostralegus)

12.2.1.2 Wintering and Breeding Bird Surveys

Wintering bird surveys in 2012 – 2013 and 2018, breeding bird surveys in 2015, and eider and tern surveys in 2016 and 2017 were undertaken to inform the ornithological baseline for the Phase 3 and 4 EIAs. However, since the Phase 4 EIA, further breeding and wintering bird surveys have been conducted in the PoCF and ISB areas.

Breeding bird surveys conducted between June - July 2022, identified only two species of bird listed as Annex 1 / Schedule 1 species: arctic and common tern. Common tern was confirmed to be nesting on the purpose-built tern nesting raft to the east of the ISB. These nesting rafts are put in place by the PoCF at the start of each breeding bird season and are to be removed at the end of every breeding bird season, as raft deployment is seasonal. The provision of nesting rafts for common tern is included within the PoCF's environmental management plan.

Arctic tern was confirmed as nesting on buildings at the port. The 'Breeding Bird Survey Results' Drawing (see Drawing 19410/OR/002a) outlines the other species which were confirmed as breeding on site. These include herring gull and oystercatcher. Eider was identified as probable breeders on the site within the rock revetment around the Queen's Dock.

Supplementary wintering bird count surveys were conducted between November 2020 – March 2021, and encompassed foreshore areas between the Invergordon Boating Club and Phases 3 and 4 at the ISB (Figure 12.1). Survey results indicated that of all the species which are protected within the designated sites, as outlined in Table 12.1, oystercatcher was the most commonly counted at all tidal levels (Table 12.2). Wintering bird surveys have been completed for the 2022/23 wintering bird season, and breeding bird surveys were completed in 2023 which will augment further understanding.

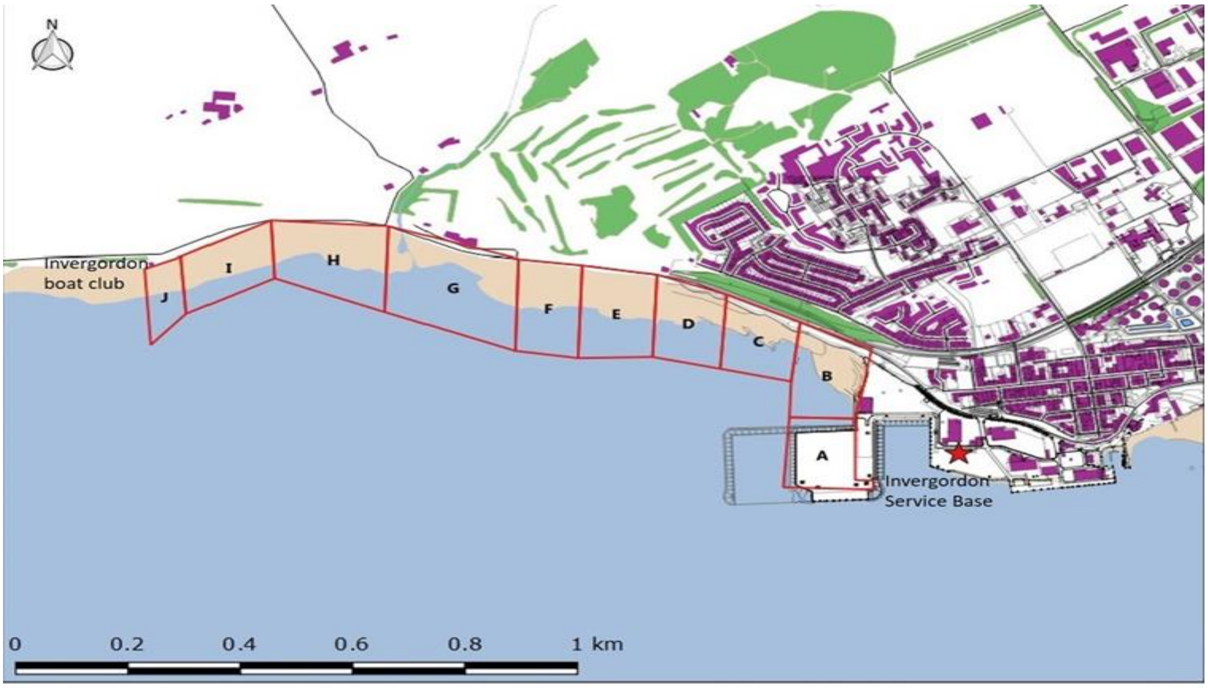

Figure 12.1: Winter Bird Survey Sections A-J from Invergordon Service Base to the Invergordon Boat Club

Table 12.2: Combined Average Wintering Bird Counts Between November 2020 – March 2021

Tide	Species	No. Individuals Counted (Average)				
		November 2020	December 2020	January 2021	February 2021	March 2021
Low	Oystercatcher	34	41	24	28	26
	Curlew	4	9	9	4	6.5
	Redshank	4	0	2	0	0
	Wigeon	0	0	0	0	0.5
Medium	Oystercatcher	44	44	21	22	26.5
	Curlew	14	5	10	1	3.5
	Redshank	0	0	2	0	4
	Wigeon	0	0	0	0	0.5
High	Oystercatcher	52	66	28	39	28
	Curlew	3	0	1	1	2
	Redshank	1	0	0	0	4
	Wigeon	0	0	0	0	0.5

12.2.1.3 Prey Items Survey

Following advice from NatureScot, a marine invertebrate inter-tidal survey was conducted as part of the Phase 4 consenting process to assess the prey availability of the habitats adjacent to the development. The survey area was described as gently sloping shallow beach consisting of multiple sediments, including small boulders, pebbles, and areas of rippled and sandy mud. The results of the survey are summarised in Table 12.3. The results identified several invertebrate species from sediment samples that are known prey for wading birds, including lugworm (*Aernicola marina*) and sand mason worms (*Lanice conchilega*) (Goss-Custard & Jones, 1976; Petersen & Exo, 1999; Yates et al., 1993). The overall diversity was low; however, species were abundant (Atkins, 2016). No species of conservation importance were identified.

Table 12.3. Inter-tidal Survey Results Conducted as Part of Phase 4 Consenting Process.

Survey area	Biotope	Species identified
High shore	Littoral sands and muddy sands (LS.La) Littoral coarse sediments (LS.LC) Strandline (LS.LSa.St) Large cobbles, pebbles with small areas of coarse sand, pebbles, and shell fragments (LS.LCS) Some sheltered marine shore (LR.LLR.F)	No invertebrates identified. Fucoids: *Fucus vesiculosus, Fucus serratus, Fucus spiralis, Ascophyllum nodosum*
Mid shore	Littoral mixed sediments (LS.LMx) Littoral sands and muddy sands (LS.LSa) Some sheltered marine shore (LR.LLR.F)	Lugworm (*A. marina*), sand mason worms (*L. conchilega*) Fucoids: *F. vesiculosus, F. serratus, F. spiralis, A. nodosum, Polysiphonia lanosa.*
Low shore	Mixed sediments including pebbles, gravel, sand, mud, clay and shell fragments (LS.LMx) Littoral mud (LS.LMu) Littoral sands and muddy sand (LS.LSa)	Lugworm (*A. marina*), sand mason worms (*L. conchilega*) Fucoids: *F. vesiculosus, F. serratus, F. spiralis* 2x cockles (*Cerastoderma edule*) 1x brown shrimp (*Crangon crangon*)

12.2.2 Previous EIA – Impacts and Mitigation

12.2.2.1 Construction

An EIA conducted for Phase 3 and 4 of the PoCF development at ISB identified several possible impacts to birds from construction activities, and assessed their significance (Affric Limited, 2013; 2018).

The main impacts associated with construction were:

- Habitat loss from land reclamation works and the creation of rock revetment;
- Disturbance from piling, dredging, vessels, pollution, increased vessel/plant activity;
- Vessel movement causing displacement from feeding habitat;
- Accidental nest destruction during rock revetment removal;
- Water quality changes/sediment loading causing indirect changes on foraging/prey species; and
- Water quality change due to release of contaminants.

The significance of impacts varied from species to species and were dependent on which seasons specific construction activities occurred.

12.2.2.2 Operations

Operational activities associated with Phases 3 and 4 were assessed for their impacts on habitats and species.

The main impacts associated with operations were:

- Disturbance from increased vessel movements through navigation channel;
- Disturbance from operational activities (dredging, disposal, machinery use);
- Increased sedimentation of shoreline changing foraging opportunities;
- Modification of water movements leading to increased shoreline debris;
- Water quality effects during maintenance dredging; and
- Increased predation risk from additional perches for avian predators.

Again, the significance of impacts varied from species to species.

12.2.3 Potential Impacts from Phase 5

The potential impacts arising from Phase 5 are outlined in Sections 12.2.3.1 & 12.3.2.2.

12.2.3.1 Construction

The identified construction impacts relevant to Phase 5 are as follows:

- Temporary loss of breeding habitat; primarily for eider; through removal of rock revetment to facilitate construction of Phase 5;
- Disturbance from piling, dredging, vessel movement, and increased activity. Disturbance of arctic tern could be of particular concern during the bird breeding season if works are carried out in the Queen's Dock area. This is because the Queen's Dock is located close to the area where arctic tern is known to nest; and

Water quality changes from sediment loading, accidental release of hazardous substances could in theory affecting foraging. These will be prevented and minimised by the mitigation identified in Section 9.6 and hence do not need considered further.

12.2.3.2 Operations

The operational activities that may have an impact during Phase 5 are identified as:

- Changes to coastal processes which may impact upon the Cromarty Firth SPA immediately adjacent to Phase 5 (see Section 10: Coastal Processes and Flooding), and therefore impact upon foraging;
- Modification of water movements leading to increased shoreline debris;
- Disturbance associated with operational activities (human presence, machinery movements, noise, and lighting); and
- Potential interaction with wind turbines.

The design will determine whether changes to coastal process and water movements could cause a change to foraging habitat and shoreline debris. As discussed in Section 10, the intent is to utilise modelling to inform the design to minimise effects, however, due to sensitivities and designations to protect ornithological features the potential knock-on effects on birds will need to be fully understood.

Potential disturbance effects of the operational site need to be understood to allow appropriate design mitigation measures to be implemented, for example appropriate lighting design.

It is recognised that the main driver for further developing the ISB, is to facilitate the offshore wind sector. As discussed in Section 3.4, wind turbines are likely to be assembled and subject to pre-commissioned alongside the quays. There will be a maximum of three floating wind turbines being assembled on the quay at any one time. They are likely to be at different stages of assembly but for the purpose of worst-case assessment it is assumed that all three are fully assembled.

Negative ornithological impacts associated with the erection of wind turbines are associated with the risk of birds colliding with the rotary blades of the turbines (Cook, et al., 2018). Although there is evidence to suggest that birds do collide with stationary objects (Smallwood & Bell, 2020), the risk of birds colliding with wind turbines is linked with the speed at which the blades are rotating. This is likely due to birds' ability to actively avoid collision with turbines (Martin & Banks, 2023). For the most part, the turbines at the dock will be in assembly and hence, stationary. Nonetheless, as some activities at the docks will require the temporary rotation of the blades, the potential for negative ornithological impacts associated with bird collision risk have been considered in more detail here.

Once a turbine is assembled the rotor will be allowed to yaw in all directions and will rotate at less than one rotation per minute (RPM). Some pre-commissioning and initial testing activities will require the rotor to rotate up to 7RPM for 4 to 6 hours, with occasional short overspeed tests increasing the rotational speed up to 12RPM for a maximum of 1 minute. Only one turbine will be tested at a time, and assuming there are no issues each turbine will be tested on one occasion. No more than two turbines are likely to be tested in any one day (8-12hours of testing), and testing is unlikely to take place for more than two consecutive days.

The number of hours of testing required will be determined by the throughput of the assembly line. Initially it may take a few weeks for each floating turbine to be fully assembled, but as the process matures, it is envisaged that a turbine could be assembled within a week. As deployment to windfarm sites will be weather dependant, it is presumed full assembly will avoid the winter months, although preparatory works will be completed year-round. Hence, it is predicted that in the region of 25 to 40 turbines could be assembled per year, so there will be between 20 and 40 days in which turbines could be turning at greater the 1RPM a year.

Bird collision risk is dependent on several factors, including rotor speed (Balmori-de la Puente & Balmori, 2023), number of blades (Chamberlain, *et al*., 2006; Scottish National Heritage, 2017b; and Band, 2012), flight hight vs. minimum blade clearance from sea level (Band, 2011; Cook et al., 2012 and Furness, Wade & Masden, 2013), bird species (i.e. size and flight speed) (Masden, *et al*., 2021; Eichhorn, *et* al., 2012; Scottish National Heritage, 2017b; and Chamberlain, *et al*., 2006) and visibility (May, *et al*., 2020). Thus, each of these factors has been considered to anticipate whether the pre-commissioning and initial testing of wind turbines at the PoCF is likely to result in a significant ornithological affect.

The flight height of a particular bird species in considered to be one of the key factors in determining the risk of collision with wind turbines (Band, 2011; Cook et al., 2012 and Furness, Wade & Masden, 2013). Bird species that fly below the minimum blade clearance from the sea are unlikely to collide with the rotors. A study by Johnston, *et al*., 2014 was undertaken to model flight heights of marine birds to assess collision risk with offshore wind turbines. The results of the study found that the majority of marine bird species fly within 5m of the sea surface. Whilst gulls fly more regularly at 20m off the sea surface. Ultimately, for all species of bird included within the assessment, the majority of flights were within 20m of the sea surface (Johnston, *et al*., 2014). The turbines to be commissioned at the PoCF, are anticipated to have a minimum blade clearance of 22m from the sea to comply with Safety of Navigation Guidance (Maritime & Coastguard Agency, 2021). Therefore, it would be considered justifiable to assume that the majority of marine bird species will fly below the rotary blade and avoiding interaction with moving blades, without the need for additional exertion or behavioural changes.

In the instance that birds fly above the minimum blade clearance other factors influencing collision risk have been considered such as, visibility. A study by Vattenfall, 2023 determined that there is a very low risk of marine birds colliding with offshore wind farms during daylight hours. During the study, marine birds were recorded avoiding turbines within <100m using three different behaviours. Changing flight height, reducing flight speed and changing the direction of travel in relation to the orientation of the moving rotor (Vattenfall, 2023). Similar results were recorded in Larsen & Guillemette, 2007, where the effects of wind turbines on common eider (*Somateria molissima*) were assessed. The results implied that collision risk is negligible in good visibility conditions (Larsen & Guillemette, 2007). The wind turbines assessed during these studies were at full power.

Even during pre-commissioning and initial testing works the blades will be rotating at relatively low speeds for short periods of time, with full speed only being reached for a matter of minutes. Furthermore, the testing works where turbines could be rotating at greater than 1RPM, are anticipated to primarily be undertaken during daylight hours. Therefore, should a bird fly above 22m (the minimum blade clearance from the sea), it is probable that it will be able to suitably avoid the turbine due to visibility and reduced speeds (in comparison to operational turbines).

Ultimately, bird collision risk due to turbine pre-commission and testing works which will result in 240 hours of daylight, single turbine rotation of >1RPM, is considered to be negligible. Thus, impacts associated with collision are not anticipated to have any significant effect on local bird populations.

Impacts associated with remobilisation of sediments and sediment-bound contaminants/hazardous substances through maintenance dredging are not considered to be an issue. This is because newly dredged areas, and those requiring maintenance, will be subject to pre-disposal sediment sampling, to ensure that the material is safe to dredge and be disposed of (see Section 11.5 for further detail).

12.2.4 Scoping Assessment

It is recognised that there are high value ornithological receptors in the vicinity of the Phase 5 development, which could be subject to disturbance during the construction and operational stages of the project. In addition, the development has the potential to change the habitat utilised by birds by changing the coastline foraging habitats and water movements. As such, effects need to be **scoped-in** to the EIA.

12.2.5 Proposed Impact Assessment

The ornithological baseline is well understood, with the most recent wintering bird survey having been completed in the 2022-2023 season. Breeding bird surveys undertaken in summer 2022 and 2023. As such it is not proposed that any additional bird surveys are undertaken.

Disturbance affects associated with both construction and operations will be considered however, it is not proposed that collision analysis is undertaken for windfarm collision due to the lack of predicted significant effects.

Impacts associated with coastal processes on the bird habitat will be considered taking account of the output of the coastal process modelling (proposed in Section 10.6).

Sufficient detail on Natura Sites, which have the potential to be affected by the proposed development and designated for ornithological features, will be included within a HRA (see Section 4.1.4). Sufficient information to allow the competent authority to carry out an AA, if necessary, will be provided within the HRA Report and EIAR as part of the Marine Licence application submission.

12.3 Otter

12.3.1 Baseline

Otters are known to frequent the ISB, and their presence has been established during baseline surveys conducted for Phases 3 and 4. These included aerial surveys to identify potential breeding sites, and visual surveys and use of camera traps prior to and during each phase.

Table 12.4. Results of Otter Surveys Conducted for Phases 3 & 4 of PoCF.

Survey	Location	Signs identified
[Redacted]		
Camera trap surveys prior to Phase 3 construction (Wildlife Survey Unit, 2014)	Previous western part of Queen's Dock. Rock armour to west and north of Phase 3.	No holts, lay-ups, or couches present.
Physical checks prior to Phase 3 construction (Affric Limited, 2018)	Rock armour on western part of Queen's Dock.	No evidence of holts or couches.
Physical signs survey (Affric Limited, 2016) Phase 4	Eastern, southern, northern, and western rock revetment surrounding Phase 3. West of Invergordon Service Base.	Significant sprainting and feeding remains on large rock armour. Possible lay-up on east side. Numerous signs of use on northwest corner of rock armour. No evidence elsewhere on site. Evidence of lay-up and feeding area along the shoreline, close to the road, to the west of the Service Base.

[Redacted]

12.3.2 Previous EIA Impacts and Mitigation

A summary of the construction and operational impacts identified and any specific mitigation from the Phase 3 and 4 EIAs are provided in this section.

12.3.2.1 Construction

Several activities were identified within both Phase 3 and Phase 4 EIAs (Affric Limited, 2013; 2018) that may have impacted otters. These are outlined in Table 12.5. However, otters were observed to be using the PoCF area during both the construction of and post-construction on Phases 3 and 4. This, along with evidence of spraints, suggested that otter continued to transit through the site.

Table 12.5: Summary of Construction Impacts & Mitigation for Otter from Phase 3 & 4 of PoCF

Impact	Significance of Impact (Absence of Mitigation)	Phase	Mitigation	Significance of Residual Effect
Habitat loss/habitat fragmentation	Negative, short-term, permanent Negligible, Non-Significant (Phase 3) Short-term Negligible, Non-Significant (Phase 4)	3 & 4	ECoW to search site for sign of otter prior to/during construction. Compliance with best environmental guidance/practice (CIRIA, SEPA, and SNH), the Schedule of Mitigation, the CEMD and associated CEMP and Habitat and Species Protection Plan (HSPP). Regular site monitoring. Discourage use of structures that may be resting sites. Species protection plan (SPP) implemented. Works delayed if a natal holt found.	Negligible, Non-Significant (Phase 3) Negligible, Non-Significant (Phase 4)
Habitat creation	Low, positive, permanent Minor, Non-Significant	4	No specific mitigation.	Minor, Non-Significant (Phase 4)
Disturbance from construction, piling, dredging and increased vessel movement	Negative, short-term, permanent Negligible, Non-Significant (Phase 3) Low, medium-term Minor, Non-Significant (Phase 4)	3 & 4	Buffer zone from active resting/breeding sites to avoid disturbance. If otter start to use areas within 200 m of the construction site, NatureScot will be consulted, and disturbance licence will be obtained before any works commence and/or continue.	Negligible, Non-Significant (Phase 3) Minor, Non-Significant (Phase 4)
Damage to holt or lay-up	Medium Moderate, Significant	4	Pre-construction survey within 200m of construction site. Surveys discussed with NatureScot.	Minor, Non-Significant

Impact	Significance of Impact (Absence of Mitigation)	Phase	Mitigation	Significance of Residual Effect
			EPS licence applied for, if required.	
Release of hazardous substances	Medium Moderate, Significant	4	Mitigation for water quality described in Section 9: Water Quality	Minor, Non-Significant
Increased sediment loading	Minor, low Minor, Non-Significant	4	Mitigation described in Section 9: Water Quality	Minor, Non-Significant

12.3.2.2 Operations

The operational impacts and mitigation identified for Phase 3 are summarised in Table 12.6. Operational impacts were not specifically detailed in the EIA report for Phase 4 (Affric Limited, 2018).

Table 12.6: Summary of Operational Impacts & Mitigation for Otter from the Phase 3 EIA.

Impact	Significance of Impact (Absence of Mitigation)	Phase	Mitigation	Significance of Residual Effect
Habitat loss	Negative, long-term, permanent (Phase 3)	3	Best practice procedures during operations.	Non-Significant (Phase 3)
Habitat creation	Positive, long-term, permanent (additional rock armour- Phase 3)	3	Best practice procedures during operations.	Positive (additional rock armour- Phase 3)
Maintenance dredging	Negative, long-term, permanent (Phase 3)	3	Best practice procedures during operations.	Non-Significant (Phase 3)
Increased vessel movements	Negative, long-term, permanent (Phase 3)	3	Best practice procedures during operations.	Non-Significant (Phase 3)

12.3.3 Potential Impacts from Phase 5

12.3.3.1 Construction

As construction techniques between Phases 3 and 4, and Phase 5 will be largely indistinguishable, the identified construction impacts relevant to Phase 5 are as follows:

- Foraging habitat loss from land reclamation works and removal of any rock revetment;
- Disturbance from piling, dredging, vessel movement, pollution, increased activity;
- Accidental holt/lay-up destruction; and
- Water quality changes from sediment loading, accidental release of hazardous substances.

Water quality changes from sediment loading, accidental release of hazardous substances could in theory be affecting otters directly and indirectly. These will be prevented and minimised by the mitigation identified in Section 9.6 and hence do not need considered further.

12.3.3.2 Operations

In addition, the operational activities that may have an impact during Phase 5 are identified as:

- Increased disturbance from vessel movements/increased capacity at the site;
- Increased disturbance from dredging, machinery, disposal; and
- Water quality impacts from maintenance dredging.

Impacts associated with remobilisation of sediments and sediment-bound contaminants/hazardous substances through dredging are not considered to be an issue. This is because newly dredged areas, and those requiring maintenance, will be subject to pre-disposal sediment sampling, to ensure that the material is safe to dredge and be disposed of (see Section 11.5 for further detail).

12.3.4 Scoping Assessment

Construction and operational activities conducted during Phases 3 and 4 at PoCF were deemed to have no significant impact on otters with the appropriate implementation of mitigation measures. In addition, otters were observed onsite during the construction of, and post-construction of both Phases 3 and 4, highlighting that the mitigation implemented was proportionate and worked. Therefore, it is proposed the topic of otter are **scoped out** of the Phase 5 EIA.

Based on our understanding of otter activity in the area, along with the knowledge that otter activity can change over time, pre-construction surveys will be required to be carried out to ensure otter are not present or using any structures onsite for resting/shelter. If otter are using structures onsite for resting/shelter NatureScot will be contacted and a licence will be applied for (this will include an up-to-date survey report, numbers of otter potentially affected, and a species protection plan). This mitigation will be adopted for Phase 5 and is also outlined in Section 25 of this scoping report.

12.3.5 Proposed Mitigation

Mitigation previously utilised for the previous phases shall be implemented to avoid and minimise impacts. These have been included in the Initial Schedule of Mitigation (see Section 25) for the proposed Phase 5 development, and include mitigation identified for water quality which will protect otter from water-quality related impacts. If the pre-construction survey identifies an otter resting place that could be affected by the works, then an EPS licence application will be submitted to NatureScot.

13 Biodiversity - Marine

This section considers the potential impacts on Marine Ecology from the Phase 5 concept design. The assessment to decide whether any of the topic specifics (Benthic, Fish and Marine Mammals) of Marine Ecology should be scoped in or out of the EIA is based on the potential impacts arising from the design elements and construction techniques of the proposed Phase 5 development (see Sections 3 & 5).

This section outlines the relevant plans and policies, describes the baseline conditions for each specific topic, and considers the potential impacts.

13.1 Policy Frameworks & Legislation

Relevant general policy and guidance for marine ecological features includes:

- **GEN 9 Natural heritage:** development and use of the marine environment must:
    - Comply with legal requirements for protected areas and protected species;
    - Not result in significant impact on the national status of Priority Marine Features (PMF); and
    - Protect and, where appropriate, enhance the health of the marine area (Scottish Government, 2015).
- **GEN 10 Invasive non-native species**: opportunities to reduce the introduction of invasive non-native species to a minimum or proactively improve the practice of existing activity should be taken when decisions are being made (Scottish Government, 2015).
- **GEN 13 Noise:** Development and use of the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects (Scottish Government, 2015).
- **GEN 21 Cumulative Impacts:** Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation (Scottish Government, 2015).
- **Highland Council Policy:**
    - **58**: Protected Species; in the context of the Phase 4 Development, the species on the European Protected Species or Wildlife and Countryside Act 1981 (as amended) are noted in Appendix 1 of the policy for mammals (including dolphins, porpoises, whales, and otters) and Appendix 2 of the policy for various bird species (Highland Council, 2012, 2013b);
    - **59**: Other Important Species (Highland Council, 2012); and
    - **60**: Other Important Habitats (Highland Council, 2012).
- **PAN 60:** Planning for Natural Heritage (Scottish Government, 2008); and

- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018).

Several other policy frameworks apply to guide the assessment of potential impacts of the Phase 5 concept design on benthic and fish ecology, in addition to marine mammals. These are listed below:

- The UK Marine Policy Statement (MPS) provides a framework for preparing Marine Plans, and subsequently guiding decisions that affect the marine environment. Following the exit of the UK from the European Union, from 2021, references within the Policy Statement to EC or EU legislation are termed references to retained EU law.
- UK Biodiversity Action Plan (BAP) species are those species identified as threatened and requiring conservation efforts. BAP species help guide the lists of priority species required by Section 2(4) of the Nature Conservation (Scotland) Act 2004.
- The Scottish Biodiversity List is a list of species and habitats that Scottish Ministers consider to be of high importance for conservation efforts in Scotland.
- The Priority Marine Feature (PMF) compiled by NatureScot and the Joint Nature Conservation Committee (JNCC) lists habitats and species that require conservation and consideration in marine planning.
- The Convention for Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention 1992) guides international cooperation between 15 western European governments for the conservation of the North-East Atlantic region and its resources.

13.2 Benthic Ecology

13.2.1 Baseline

The location of the Cromarty Firth, including natural landmass distribution and deep waters, has resulted in the development of different estuarine habitats, such as sandflats, shingle banks, saltmarsh, mudflats, mussel beds and coastal lagoons. There are several designated sites for benthic ecological features present near and adjacent to the ISB (Table 13.1).

Table 13.1: Statutory Designated Sites for Benthic Ecological Features Within 10 km of Phase 5.

Site	Designation	Distance and Direction to Phase 5	Feature Category/Feature
Cromarty Firth	SSSI	Immediately adjacent	Marine mudflats and sandflats.
Cromarty Firth	Ramsar	Immediately adjacent	Marine mudflats and sandflats.
Moray Firth	SAC	~ 5.5km E	Marine subtidal sandbanks.

Benthic survey transects and grab samples (see Figure 13.1) were conducted as part of the consenting process for Phase 4 (Fugro, 2017). Analysis of the video transects identified a heterogeneous benthic habitat present in the development area, characterised by a mix of mud and sand with gravel and shell fragments, but also including pebbles and cobbles (full details of the benthic surveys are included in this document in Appendix 2. The macrofauna species and sediments identified are listed in Table 13.2.

It should also be noted that a marine invertebrate inter-tidal survey was conducted as part of the Phase 4 consenting process to assess the prey availability for waterfowl within the habitats adjacent to the development. Thus, an understanding of the benthic environment to the north of Phases 3 and 4 has already been captured. The species identified as part of these surveys are captured in Table 12.3 in Section 12.2.1.3: Prey Items Survey.

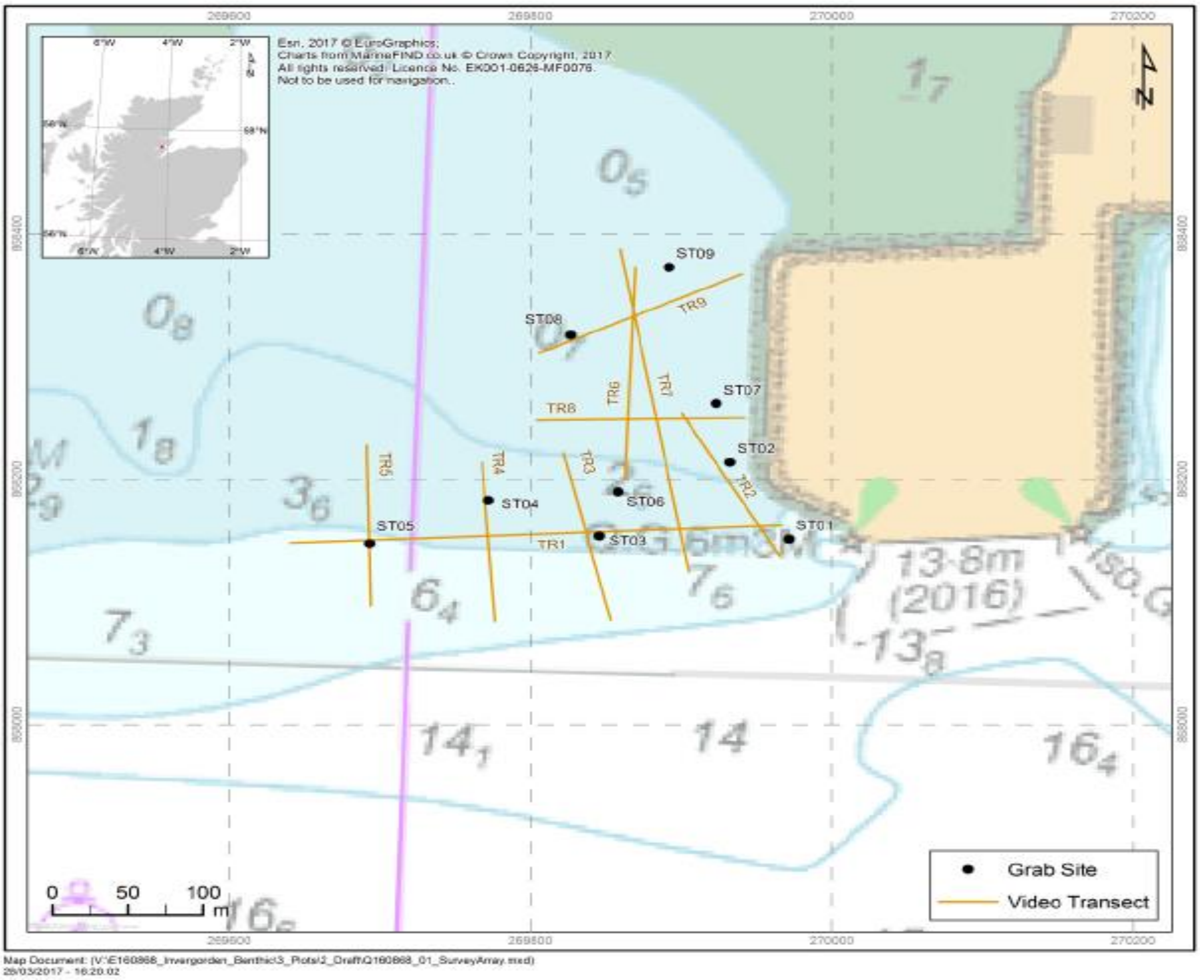

Figure 13.1: Benthic Survey Transects Undertaken to Inform Benthic Baseline for Phase 4.

Table 13.2. Benthic Habitats and Species Identified During Benthic Surveys Conducted for Phase 4 (Fugro, 2017).

Sample type	Feature identified	Protections/Designations
Grab sample	Gravelly muddy sand (gmS)	Not of conservation importance.
Grab sample/Video footage	**Widespread-**Infralittoral mixed sediment (SS.SMX.IMx) **Localised-**infralittoral muddy sand (SS.SSA.IMuSa)	Not of conservation importance.
Video footage (Macrofauna/flora)	Kelp (*Laminaria* sp.) Common starfish (*Asteria rubens*) Brittlestar (*Ophiura albida*) Sea urchin (*Echinus esculentus*) Polychaeta (*Spirobranchus* sp.) Blue mussel (*Mytilus edulis*) Hermit crab (*Pagurus bernhardus*)	Kelp beds and blue mussels beds are Priority Marine Feature (PMF) species. Blue mussel beds are a protected habitat under UK

Sample type	Feature identified	Protections/Designations
	Shore crab (*Carcinus maenas*) Plumose anemone (*Alcyonium digitatum*) Hydroid/Bryozoa Maerl fragments (*Lithothamnion* sp.) European plaice (*Pleuronectes platessa*) Dragonet (*Callionymus* sp.)	Priority Habitats and listed on the OSPAR List. Blue mussels and kelp were sparsely found and did not constitute beds and hence are not deemed to be PMF's.

Although two important species were identified; kelp and blue mussels (Fugro, 2017), their extents were sparse. As such, no habitats of conservation importance were identified within the proposed development area, as they were not representative of PMFs (see Figure 13.2).

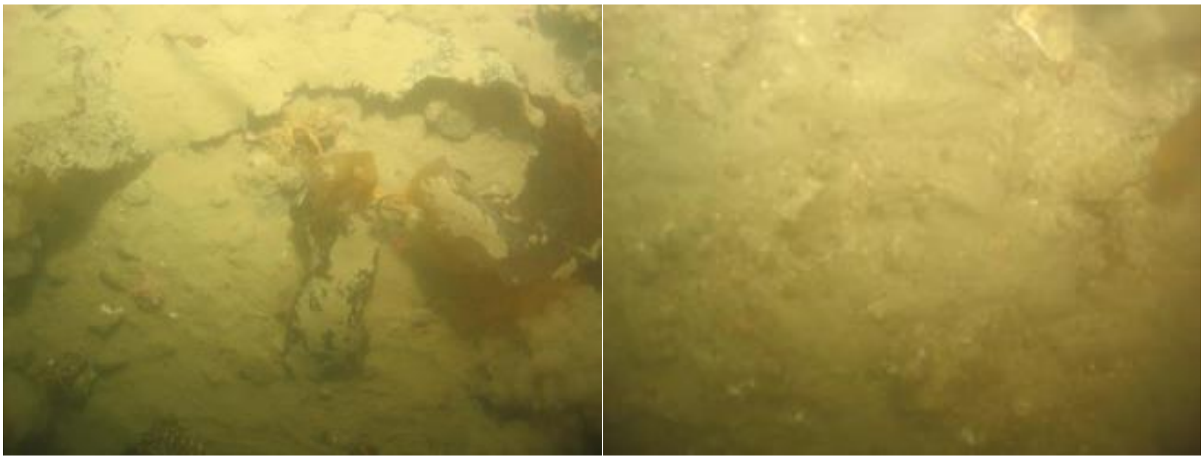

Figure 13.2: Left Image; Kelp Found Within Survey Area. Right Image; Blue Mussels Found in Survey Area.

No non-native marine species were identified during the benthic surveys (see also Section 9). However, the literature review identified populations of Darwin's barnacle or Acorn barnacle (*Austrominius modestus*) inhabiting the Invergordon harbour area (most recent record 2012), Cromarty Bay and the rocky subtidal zones of Balintore (NBN Atlas, 2022a). Red algae (*Heterosiphonia japonica*) were also identified in the Moray Firth, first recorded in 2008, with the most recent record being at the Cromarty Sutors in 2012 (SNH, 2017a; NBN Atlas, 2022b).

Parts of the Phase 5 area were included in the Phase 4 surveys, initial ground investigation works in the Phase 5 area are showing similar sediment types to those previously found. Hence, areas further west and north of the areas previously surveyed are predicted to include the same habitat types. The Queens Dock is subject to regular maintenance dredges, as such is highly unlikely to provide high quality benthic habitat.

13.2.2 Previous EIA – Impacts and Mitigation

Impacts on benthic ecology were only assessed as part of Phase 4 and therefore, only Phase 4 is considered here.

13.2.2.1 Construction

The potential impacts on the benthic ecology of the Phase 4 development are outlined in Table 13.3. None of the impacts were significant and hence no benthic ecology specific mitigation was proposed, noting that mitigation identified to minimise risks and impacts on water quality and legal compliance with would also protect benthic ecology.

Table 13.3: Summary of Construction Impacts & Mitigation for Benthic Ecological Habitats and Species.

Impact	Significance of Impact, Probability & Magnitude (Absence of Mitigation)
Habitat loss from land reclamation, dredging, and spoil disposal.	Low and permanent (land reclamation) Minor: Non-Significant Low and medium term, Minor: Non-Significant (dredging) Negligible and medium term, Minor: Non-Significant (spoil disposal)
Remobilisation of sediments and sediment-bound contaminants from surface runoff, rock revetment, infilling, dredging and spoil disposal.	None (surface runoff) Negligible, short term and reversible, Minor, Non-Significant (rock revetment, infilling, dredging, spoil disposal)
Release of hazardous substances from loss of containment.	Negligible, short term and reversible Minor, Non-Significant
Introduction of MNNS from construction machinery, ballast water release.	Negligible, short term and reversible Minor, Non-Significant

13.2.2.2 Operations

Operational activities associated with Phase 4 were assessed for their impacts on receptor benthic habitats and species and are summarised in Table 13.4. No significant effects were identified hence similar to construction no specific benthic mitigation was employed, mitigation to manage water quality were recognised as also protecting the benthic habitat.

Table 13.4: Summary of Operational Impacts & Mitigation for Benthic Ecological Habitats and Species.

Impact	Significance of Impact, Probability & Magnitude (Absence of Mitigation)
Habitat modification from changes to coastal processes: dredging and land reclamation.	Negligible and permanent Minor: Non-Significant
Remobilisation of sediments and sediments bound contaminants from surface runoff, maintenance dredging.	None (surface runoff) Negligible, long term, reversible Minor: Non-Significant (maintenance dredging)
Release of hazardous substances.	None

13.2.3 Potential Impacts from Phase 5

As highlighted previously, construction and operational activities for PoCF Phase 5 are likely to be similar to those identified during Phases 4. As such, the impacts to benthic receptors will be comparable and unlikely to be significant.

13.2.3.1 Construction

For construction these include:

- Loss of gravelly muddy sands, infralittoral mixed sediment and infralittoral muddy sand habitats from land reclamation, dredging and spoil disposal;
- Remobilisation of sediments and sediment-bound contaminants (if present) through seabed disturbance from land reclamation and dredging activities;
- Release of hazardous substances through seabed disturbance from land reclamation and dredging activities; and
- Introduction of MNNS from plant and vessel movements.

Although it is recognised that habitat will be lost due to the construction of Phase 5, the low value of receptors makes it unlikely to significant in EIA terms.

Accidental release of hazardous substances which are miscible with water could affect benthic ecology. Appropriate mitigation is identified within the water quality and ground conditions Sections 9.6 and 11.5 to ensure that pollution incidents are prevented or minimised, and that contaminated sediments (if present) are not remobilised. As such they do not specifically need considered under benthic ecology.

MNNS introduction is associated with the movement of vessels or floating structures from areas where species not native to Scotland are present and by plant items entering the water which has been transport to site by road which have MNNS on them. MNNS can outcompete local species and hence impact upon benthic ecology, mitigation laid out in Section 9.6 to ensure plant is clean prior to transport to site and that vessels follow the relevant ballast water management and biofouling guidelines will minimise the risk of MNNS being introduced.

13.2.3.2 Operations

And for operations include:

- Habitat modification from changes to coastal processes;
- Introduction of MNNS from vessel movements;
- Remobilisation of sediments and sediment-bound contaminants (if present) through port related activities; and
- Release of hazardous substances through port related activities.

As discussed in Section 10 Phase 5 will be designed to minimise effects on coastal processes it is however, as such any modification to the benthic habitat will be minimal.

As per construction the mitigation identified in Section 9.6 and 11.5 is appropriate to manage risks associated with MNNS, remobilisation of sediments and hazardous substances.

13.2.4 Scoping Assessment

Based on the existing baseline information it is highly unlikely that there are any PMF or protected benthic species within the Phase 5 area. As such there is no need for additional baseline survey works to understand the benthic ecology of the area. The majority of effects will be mitigated by mitigation identified in other Sections, namely 9.6: Water Quality, 10: Coastal Processes and 11.5: Ground Conditions.

As such it is proposed that Benthic Ecology is **scoped out** of any further assessments.

13.2.5 Proposed Mitigation

No benthic specific mitigation is proposed, however mitigation that protects water quality, and minimises negative impacts on coastal processes and ground conditions will also protect benthic ecology.

13.3 Fish Ecology

13.3.1 Baseline

There are two categories of diadromous fish, anadromous and catadromous. Anadromous fish reproduce in freshwater rivers but spend the rest of their adult lives in salt water, while catadromous fish reproduce in saltwater, and spend the rest of their lifecycle in freshwater. Diadromous fish are specifically considered in this scoping report, as several species in Scotland are protected by law as they are rare, or vulnerable to certain activities. These species and associated protections identified in the Phase 3 and 4 EIA process (Affric Limited, 2013; 2018) and relevant to the Phase 5 development are listed in Table 13.5. There are no statutory designated sites within 10 km of the proposed development.

Table 13.5: Nationally and Internationally Protected Diadromous Fish Species Identified in EIA Processes for Phases 3 & 4 of PoCF

Species	Protections
Atlantic salmon (*Salmo salar*)	Atlantic salmon are a Schedule 3 listed species under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) where they are protected in freshwater only. Multi-sea-winter salmon are listed as UK Biodiversity Action Plan priority fish species in the List of UK Priority Fish (2007).
Brown and sea trout (*Salmo trutta*)	Both trout ecotypes are listed as UK Biodiversity Action Plan priority fish species in the List of UK Priority Fish (2007).
River lamprey (*Lampetra fluviatilis*)	River lampreys are protected as Schedule 3 listed species under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). They are also listed as UK Biodiversity Action Plan priority fish species in the List of UK Priority Fish (2007).
Sea lamprey (*Petromyzon marinus*)	The sea lamprey is listed as UK Biodiversity Action Plan priority fish species in the List of UK Priority Fish (2007).
European smelt (*Osmerus eperlanus*)	The species is listed as UK Biodiversity Action Plan priority fish species in the List of UK Priority Fish (2007).
Twaite shad (*Alosa fallax*)	Twaite shad are protected as Schedule 3 listed species under the Conservation (Natural Habitats, &c.) Regulations

Species	Protections
	1994 (as amended). They are also partially protected under Schedule 5, which regulates how they are killed or taken.
Allis shad (*Alosa alosa*)	Allis shad are protected as Schedule 3 listed species under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). They are also partially protected under Schedule 5, which regulates how they are killed or taken.
European eel (*Anguilla anguilla*)	The European eel is listed as Critically Endangered by the International Union for Conservation of Nature (IUCN). The species is listed as UK Biodiversity Action Plan priority fish species in the List of UK Priority Fish (2007). They are also protected by the Fish Conservation (Prohibition on Fishing for Eels) (Scotland) regulations 2008 and Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003.

An updated desk-based review was conducted to assess the occurrence and habitat use of diadromous fish near the Phase 5 PoCF development. Several resources were examined, including the scientific literature, the National Biodiversity Network (NBN), the Scottish National Marine Plan Interactive (NMPi) and fishery board reports (Cromarty Firth Fishery Board Monthly reports). Fish community assessments conducted by the Scottish Environment Protection Agency (SEPA) between 2005-2018 found 35 fish species within the Cromarty Firth. However, of the 35 species captured, only small numbers of diadromous fish were captured, and these were sea trout, Atlantic salmon, and European eel (O'Reilly et al., 2021).

Overall, it was found that no changes to the baseline information presented within the EIA reports for Phase 3 & 4 had occurred. In general, diadromous fish species presence within 5 km of the development and within the inflowing tributaries of the Cromarty Firth includes Atlantic salmon, sea trout, and European eel.

13.3.2 Previous EIA – Impacts and Mitigation

A summary of the construction and operational impacts identified and any specific mitigation from the Phase 4 EIA are provided in this section.

13.3.2.1 Construction

Table 13.6 provides summary of the construction effects on diadromous fish identified in the Phase 4 EIAs and the mitigation measures put in place to minimise impacts. The only significant effects identified without mitigation was on Atlantic Salmon it specifically related to increased sediment loading in the water column from dredging during the smolt run, avoiding dredging in May to avoid the smolt run was sufficient to reduce effects levels to non-significant.

Table 13.6: Summary of Construction Impacts & Mitigation from Phases 4.

Impact	Significance of Impact, Probability & Magnitude (Absence of Mitigation)	Mitigation	Significance of Residual Effect
Disturbance / foraging impairment / disruption of migration	Low, short term, and reversible	• Dredging Prohibited	Minor: Non-Significant (All Species)

Impact	Significance of Impact, Probability & Magnitude (Absence of Mitigation)	Mitigation	Significance of Residual Effect
due to increased sediment loading from dredging and spoil disposal.	**Moderate: Significant (Atlantic Salmon)** Negligible, short term, and reversible Minor: Non-Significant (Sea Trout & European Eel)	During the Month of May	
Remobilisation of sediment bound contaminants during rock revetment construction, infilling works, dredging and spoil disposal operations	Negligible, short term, and reversible Minor: Non-Significant	• No specific mitigation required	Minor: Non-Significant
Injury/Disturbance/ disruption of migration due to underwater noise from piling operations.	Negligible, short term, and reversible Minor: Non-Significant	• No specific mitigation required	Minor: Non-Significant

13.3.2.2 Operations

The potential impacts of operational activities for Phase 4 following construction on fish receptor species are considered in Table 13.7. Phase 3 is not considered in this section, as operational impacts were not considered as part of the Phase 3 EIA. As with construction there were no significant effects identified without mitigation and the implementation of mitigation reduced effects levels further. No significant effects were identified without mitigation; hence no fish specific mitigation was implemented.

Table 13.7: Summary of Operational Impacts & Mitigation for Phase 4.

Impact	Significance of Impact, Probability & Magnitude (Absence of Mitigation)
Increased sediment loading and remobilisation of sediment bound contaminants from surface water runoff and maintenance dredging	None (Surface water- Phase 4) Negligible, long term, reversible Minor: Non-Significant (Maintenance dredging- Phase 4)
Release of hazardous substances	None

13.3.3 Potential Impacts from Phase 5

As previously identified, the works proposed for Phase 5 development are likely to be similar to those undertaken during Phases 3 and 4 (see Section 2.2: Previous PoCF Developments). As such, the impacts to diadromous fish receptors will be comparable.

13.3.3.1 Construction

For construction these include:

- Sediment loading from rock revetment construction, infilling works, dredging and spoil disposal operations;
- Site surface water runoff;
- Remobilisation of sediments and sediment-bound contaminants (if present); and
- Underwater noise from piling.

Accidental release of hazardous substances which are miscible with water could affect fish ecology. Appropriate mitigation is identified within the water quality and ground conditions Sections 9.6 and 11.5 to ensure that pollution incidents are prevented or minimised, and that contaminated sediments are not remobilised. As such they do not specifically need considered under fish ecology.

The avoidance of dredging during the month of May to avoid the smolt run will avoid potentially significant effects on Atlantic Salmon.

With regards to underwater noise, maximum impact ranges for TTS and PTS will be the same as those assessed for Phase 4, on the basis of impact piling a 2m internal diameter pile represents the worst-case scenario (see Section 7). For installation of cylindrical piles, assuming a hammer energy of 500 kJ and a 2m internal diameter, maximum impact ranges are as follows:

- PTS could occur at distances up to 50m; and
- TTS impacts could be expected to a maximum range of 1,400m.

As with the Phase 4 assessment the underwater noise levels are not expected to have a significant impact upon fish.

13.3.3.2 Operations

For operations, potential impacts include:

- Increased sediment loading and remobilisation of sediment bound contaminants (if present) from surface water runoff and maintenance dredging; and
- Release of hazardous substances.

As per construction no fish specific mitigation is required with regard to potential pollution incidents and remobilisation of contaminated sediments.

13.3.4 Scoping Assessment

As there have been no changes to the baseline information presented, it is assumed that with the appropriate mitigation measures in place it is unlikely that the impact significance assessments would change for fish ecology receptors. In addition, it is not anticipated that the engineering design of Phase 5 will utilise pile sizes which exceed 2m in internal diameter and therefore impacts of underwater noise should not require reassessment (see Section 7.3 & 7.4). As such, this scoping exercise concludes that Fish Ecology should be **scoped out** of the EIA for the proposed Phase 5 development.

As discussed in Section 7, should the scheme design of Phase 5 propose pile sizes which exceed 2m, then the underwater noise model may require updating, as there is a risk that the impacts will differ. If this is required, the effects of underwater noise on fish will be reviewed and presented appropriately.

13.3.5 Proposed Mitigation

Mitigation associated with safeguarding water quality discussed in Section 9.6 will protect fish from sediment and pollution issues. Fish specific mitigation is limited to the avoidance of dredge works during the month of May; this has been included within the Initial Schedule of Mitigation in Section 25. This will be incorporated into the CEMD produced for the Phase 5 development.

13.4 Marine Mammals

All cetacean (whale and dolphin) species listed are classed as European Protected Species (EPS) and are protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). Grey and common seals (pinnipeds) are not listed as Annex IV EPS species under the Habitats Directive, however, both species are included in Annex II, meaning that their core habitat must be protected under the Natura 2000 Network and managed in accordance with their ecological requirements. Under the Marine (Scotland) Act 2010, it is an offence to kill, injure or take a seal, as well as to deliberately or recklessly harass a seal at a significant haul out site.

13.4.1 Baseline

Several species of marine mammal are found within the Cromarty Firth and adjacent waters. There is also one designated site within 10 km of the ISB which is relevant to the proposed Phase 5 development (Table 13.8).

Table 13.8. Statutory Designated Sites for Marine Mammal Species Within 10 km of the Development Area.

Site	Designation	Distance and Direction to Phase 5	Feature Category/Feature
Moray Firth	SAC	6km East	Bottlenose dolphins and subtidal sandbanks.

The species most common within the area and most likely to be impacted by the proposed development include; harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), minke whale (*Balaenoptera acutorostrata*), grey seal (*Halichoerus grypus*), and common seal (*Phoca vitulina*) (Affric Limited, 2013; 2018).

Cetacean occurrence data is available for the ISB and adjacent areas from marine mammal monitoring conducted for Phase 3. The monitoring schedule resulted in six months of Passive Acoustic Monitoring (PAM), combined with 267 hours of visual observations (Affric Limited, 2015). The results of this monitoring are summarised in Table 13.9. It is noted that since the publication of Marine Mammal Noise Exposure Criteria: updated Scientific Recommendation for Residual Hearing Effects was published in 2019 hearing groups have been changed. Cetaceans previously classed as MF and HF are now being noted as HF and Very High Frequency (VHF) respectively to better reflect their regions of best hearing sensitivities (Southall *et al, 2019*). Table 13.9 details the current hearing groups.

Table 13.9: Summary of Passive Acoustic Monitoring (PAM) and Visual Surveys Conducted for Phase 3 of PoCF Between June-December 2014

Species	Hearing Group	Monitoring type	Monitoring summary
Harbour porpoise (*P. phocoena*)	VHF	PAM/Visual	Most frequently detected and observed species. 181 detections across monitoring period. Peak in detections between August-October. Diel variation observed, most detections made during the late evening to early morning, with fewer detections during the day regardless of whether construction activities were ongoing.
Bottlenose dolphin (*T. truncatus*)	HF	PAM/Visual	Not regularly present, 34 PAM detections across monitoring period. Most frequently detected between July-September. Most detections made during daylight hours.
Harbour seal (*P. vitulina*)	Pinniped	Visual	Second most frequently observed marine mammal. 95 sightings made during visual scans.
Grey seal (*H. grypus*)	Pinniped	Visual	1 sighting made during visual scans.
Minke whale (*B. acutorostrata*)	LF	Visual	No sightings of species made during visual scans.

Very similar results were recorded during observations carried out for the Phase 4 piling operations (Roadbridge, 2022).

In addition, within the Cromarty Firth, a recent study based on shore surveys conducted by citizen observers indicated that nearby Chanonry Point had one of the highest probabilities of bottlenose dolphin sightings between 2005-2018, compared to other shore-watching locations in Scotland (Gutiérrez-Muñoz et al., 2021). For grey and harbour seals, the most recent report provided by the Special Committee on Seals (SCOS) suggests that harbour seal numbers in the Moray Firth (of which the Cromarty Firth is a part) are considered stable, and grey seal numbers have increased since 1996, but declined slightly in the periods between 2011-2015 and 2016-2019 (SCOS, 2020).

During the dredge disposal operations at the Sutors during the Phase 4 construction works, there were 54 recorded sightings of marine mammals including:

- Harbour porpoise spotted on nine occasions with no more than two at any time;
- Bottlenose dolphin 32 sightings with group sizes between 2 and 20;
- Seal seven sightings, three of which were identified as grey, maximum of 2 individuals at a time;
- Minke whale, five sightings with a total of ten individuals were spotted, and
- One sighting of an individual fin whale (Roadbridge, 2022a).

13.4.2 Previous EIA – Impacts and Mitigation

A summary of the construction and operational impacts identified and any specific mitigation from the Phase 3 and 4 EIAs are provided in this section.

13.4.2.1 Construction

In the EIA reports for Phase 3 and 4, several possible impacts related to construction were identified. As discussed in Section 7 underwater noise monitoring completed during the Phase 3 construction work identified that noise levels associated with rock revetment construction and dredging were not at a level that would cause marine mammal disturbance. Piling mitigation was effective, and in the case of seals the mitigation zone was reduced for Phase 3 as it was demonstrated that seals chose to enter the mitigation zone while piling works were ongoing and hence were not being disturbed as much as had been predicted. The significance of the impacts on the receptors, the mitigation actions taken, and the overall significance of the effect are listed in Table 13.10 for Phase 4.

Table 13.10: Summary of Construction Impacts & Mitigation from Phase 4

Impact	Significance of Impact, Probability & Magnitude (Absence of Mitigation)	Mitigation	Significance of Residual Effect/ Residual Risk
Disturbance due to vessel movement associated with increased activity due to construction.	Negligible, short term, and reversible Minor: Non-Significant	Follow guidance set out in Scottish Natural Heritage 'Scottish Marine Wildlife Watching Code' (2017).	Minor: Non-Significant
Disturbance/Injury due to underwater noise from impact/vibro piling.	Negligible, short term, and reversible Minor: Non-Significant (Minke whale) Low, short term, reversible **Moderate: Significant** (Bottlenose dolphin/harbour porpoise/common seal/grey seal)	Piling Marine Mammal Protocol implemented.	Minor: Non-Significant (all species)
Disturbance/ foraging impairment due to increased. sediment loading from rock revetment	Negligible, short term, reversible Minor: Non-Significant	Management of site surface water runoff.	Minor: Non-Significant

Impact	Significance of Impact, Probability & Magnitude (Absence of Mitigation)	Mitigation	Significance of Residual Effect/ Residual Risk
construction, infilling, dredging.			
Disturbance/ foraging impairment due to increased sediment loading from spoil disposal.	Low, short term, reversible **Moderate: Significant**	Dredge Disposal Marine Mammal Protocol implemented.	Minor: Non-Significant
Injury/ displacement due release of hazardous substances from spills.	Negligible, short term, reversible Minor: Non-Significant		Minor: Non-Significant
Physical injury from dredged spoil disposal.	Low and short term **Moderate: Significant**	Dredge Disposal Marine Mammal Protocol implemented.	Minor: Non-Significant

13.4.2.2 Operations

The potential impacts of operational activities conducted during Phase 4 following construction on marine mammal receptor species are examined in Table 13.11, no significant effects were identified, hence no specific mitigation measures were required. Although mitigation to protect water quality was recognised to minimise risks to marine mammals.

Table 13.11: Summary of Operational Impacts & Mitigation for Marine Mammals from Phase 4

Impact	Significance of Impact, Probability & Magnitude (Absence of Mitigation)
Habitat loss resulting from reclamation.	Negligible Negative Permanent, Minor: Non-Significant
Disturbance due to vessel movements	Negligible, Negative Long Term Reversible, Minor: Non-Significant
Disturbance/ foraging impairment due to increase maintenance dredging requirements.	Negligible, negative, long term, reversible Minor, Non-Significant

13.4.3 Potential Impacts from Phase 5

As highlighted previously, construction and operational activities for PoCF Phase 5 are likely to be similar to those identified during Phases 3 and 4. As such, the impacts to marine mammal receptors will be comparable.

13.4.3.1 Construction

For construction these include:

- Disturbance due to vessel movement associated with increased activity due to construction;
- Disturbance / foraging impairment due to increased sediment loading from rock revetment, construction, infilling and dredging;
- Disturbance / displacement due to accidental release of hazardous substances from spills;
- Disturbance / injury due to underwater noise from impact/vibro piling;
- Disturbance / foraging impairment Increased sediment loading from spoil disposal; and
- Physical injury from dredged spoil disposal.

Consideration has also been given to increased vessel movements within the Firth during construction as it could have the potential to increase disturbance and collision risks with marine mammals. However, as with Phase 4, all vessel movements associated within the Cromarty Firth, will be operated in line with existing PoCF procedures for vessel management. This involves vessels being required to transit within specific navigational channels and at set speeds. Thus, collisions with, and disturbance of, marine mammals shall be avoided and/or minimised.

Accidental release of hazardous substances which are miscible with water could affect marine mammals and their pre-species. Appropriate mitigation is identified within the water quality and ground conditions Sections 9.6 and 11.5 to ensure that pollution incidents are prevented or minimised, and that contaminated sediments (if present) are not remobilised. As such they do not specifically need considered under marine mammals.

With regards to underwater noise, maximum impact ranges for TTS and PTS will be the same as those assessed for Phase 4, with the basis of impact piling being a 2m diameter pile which represents the worst-case scenario (see Section 7). For installation of cylindrical piles, assuming a hammer energy of 500 kJ and a 2m internal diameter, maximum impact ranges are the same as those presented in Table 7.1. For clarity, taking account of the change in hearing groups (Southall *et al,* 2019) the distances are as follows:

- Low frequency cetaceans (e.g., minke whales): PTS could occur up to 690 m and TTS could occur up to 7,000 m from the piling;
- High frequency cetaceans (e.g., bottlenose dolphin): both PTS and TTS are unlikely to occur except in very close proximity (<10 m) to the piling;
- Very High frequency cetaceans (e.g., harbour porpoise): PTS could occur up to 690 m and TTS could occur up to 2,750 m from the piling; and
- Pinnipeds (e.g., harbour seal): PTS could occur up to 90 m and TTS could occur up to 690 m from the piling in water.

A marine mammal protocol will therefore be employed to prevent acoustic injury and minimise disturbance as was the case for Phase 3 and 4. Similarly a marine mammal protocol will be utilised to ensure that no mammals are in the vicinity of the dredge vessel during disposal operations to avoid direct injury.

With the mitigation measures employed (see Section 13.4.5), all impacts will remain non-significant.

13.4.3.2 Operations

For operations potential impacts include:

- Loss of habitat;
- Disturbance due to vessel movement associated with increased activity during operational phase; and
- Disturbance/ displacement due to release of hazardous substances from spills.

The area associated with the Phase 5 development is not prime marine mammal habitat due to its shallow depths, in addition the actual area involved is minimal in marine terms and hence will not constitute a significant effect.

Consideration has also been given to increased operational vessel movements within the Firth as a result of additional berthing space at the ISB, as increased operational vessel movements have the potential to increase disturbance and collision risks with marine mammals. However, as with Phase 4, operational vessel movements within the Cromarty Firth, will be operated in line with existing PoCF procedures for vessel management. This involves vessels being required to transit within specific navigational channels and at set speeds. Thus, disturbance of and collisions with marine mammals shall be avoided and/or minimised.

As per construction no marine mammal specific mitigation is required with regard to potential pollution incidents.

13.4.4 Scoping Assessment

Changes to the occurrence and distribution of Marine Mammals around the ISB and in the wider Cromarty Firth have not been identified since the Phase 4 EIA was completed. In addition, it is not anticipated that the engineering design of Phase 5 will utilise pile sizes which exceed 2m internal diameter and therefore impacts of underwater noise should not require reassessment (see Section 7.3 & 7.4). Mitigation measures previously identified are therefore considered applicable to Phase 5 and the significance of the residual impacts are likely to be the same.

It is noted that prior to any piling and dredge disposal operations commencing, an EPS licence application to disturb cetaceans shall be applied for. This will be supported by a risk assessment and mitigation plans. As such, this scoping exercise concludes that Marine Mammals should be **scoped out** of the EIA for the proposed development.

As discussed in Section 7, should the scheme design of Phase 5 propose pile sizes which exceed 2m, then the underwater noise model may require updating, as there is a risk that the impacts will differ. If this is required, similar to fish the effects of underwater noise on marine mammals will be reviewed and presented appropriately.

Although the 'Marine Mammals' topic is proposed to be scoped out of the EIA, sufficient detail on the Moray Firth SAC and its qualifying features (bottlenose dolphins) will be provided to allow the competent authority to carry out an Appropriate Assessment (see Appendix 1).

13.4.5 Proposed Mitigation

The mitigation utilised for the previous phases including marine mammal protocols for dredging and piling, alongside water quality mitigation discussed in Section 9.6 will be sufficient to negate the impacts on marine mammals. As discussed in Section 13.4.4, the piling and dredge disposal works will be subject to EPS licencing, hence the marine mammal protocols will be agreed with the Marine Directorate with input from NatureScot via this route. These measures will be incorporated into the CEMD for Phase 5 and are included in Section 25 of this scoping report.

During operation of the proposed Phase 5 facility, existing PoCF procedures for vessel management, in addition to water quality mitigation detailed in Section 9.6, will be employed. These are as detailed in Section 25.

14 Landscape and Visual

This section considers the potential landscape and visual effects of the Phase 5 concept design. The assessment to decide whether landscape and visual impacts should be scoped in or out of the EIA is based on the potential design elements and construction techniques of the proposed Phase 5 development (see Section 5).

This section outlines the relevant plans and policies, describes the baseline conditions, and assesses the potential impacts.

14.1 Policy Frameworks & Legislation

Relevant policy and guidance which should be taken into account for any Landscape and Visual Impact Assessment (LVIA) includes:

- **GEN 7**: Landscape/seascape: Marine planners and decision makers should ensure that development and use of the marine environment take seascape, landscape and visual impacts into account (Scottish Government, 2015);
- Practice Advice Note, Photography and photomontage in Landscape and Visual Impact Assessment. Advice Note 01/11 (Landscape Institute, 2011); and
- **Policy 61:** Landscape (Highland Council, 2015b).

14.2 Baseline

Baseline information on the existing landscape and visual amenities at the PoCF are well described through Affric's pre-existing work on the Phase 3 and 4 EIAs. As such, this section outlines the resources which have previously been used to inform the existing landscape and visual conditions, and the current conditions of landscape character and visual amenity associated with the Phase 5 concept design.

Information pertaining to the existing landscape resource for the development of Phase 3 was collected by reference to Local Plans (Ross and Cromarty Landscape Character Appraisal (SNH, 1999); Inner Moray Firth Landscape Character Appraisal (SNH, 1998)) and Ordnance Survey Maps (OS 1: 50000 map sheet 21; OS 1: 25000 map sheets 432 and 438).

Information pertaining to the existing landscape resource for the development of Phase 4 was more developed than Phase 3 and included information on National Scenic Areas (NSAs), Special Landscape Areas (SLAs), Wild Land Areas (WLAs), Zone of Theoretical Visibility (ZTV) Studies, the Local Plans used in Phase 3, Ordnance Survey (OS) maps used in Phase 3 and other relevant documents.

It is noted that NatureScot updated the Landscape Character Assessment in 2019 and hence the descriptions of some Landscape Character Types (LCT) have changed since Phases 3 and 4 were completed (NatureScot, 2019).

14.2.1 National Scenic Areas (NSA)

The Dornoch Firth NSA lies ~22km to the north of the Phase 5 concept design at its closest point. As part of the previous Phase 4 EIA, it was identified that there was no theoretical visibility from this NSA, although this cannot currently be confirmed for Phase 5 operational scenarios.

14.2.2 Designed Landscapes

As part of the previous Phase 4 EIA, it was identified that there are twenty-six sites on the Inventory of Gardens and Designed Landscapes in Scotland within the 35km of the PoCF. These are shown on Drawings 30.16.7 and 30.16.8. These sites are still present at the time of writing this screening-scoping report for the Phase 5 concept design.

Of the sites, only 3 were considered in the EIA. These were Balnagown Castle, Cromarty House and Novar. The others had no theoretical visibility from the Phase 4 works but may from Phase 5 operational scenarios.

14.2.3 Special Landscape Areas (SLA)

As part of the previous Phase 4 EIA, it was identified that seven SLAs designated by The Highland Council and one Area of Great Landscape Value (AGLV), designated by Moray Council, lie within the 35km of the PoCF. These are shown on Drawings 30.16.7 and 30.16.8. These sites are still present at the time of writing this scoping report for the proposed Phase 5 development.

Many of these areas had no, to limited views of the proposed development as a result of limited theoretical visibility and distance. Only the Sutors of Cromarty, Rosemarkie and Fort George SLA were taken forward for assessment, as these SLAs are situated approximately 8km southeast of the Phase 4 development at its closest point. As Phase 5 is proposed to be constructed and immediately linked to the north and west of Phases 3 and 4, it is assumed that there will be some visibility from these SLAs. As such, these SLAs will need to be considered.

14.2.4 Wild Land Areas (WLA)

Wild Land Areas (WLAs) (NatureScot, 2020) are shown on Drawing 30.16.7 and 30.16.8. These sites are still present at the time of writing this scoping report for the proposed Phase 5 development.

As part of the Phase 4 EIA, it was identified that the Fannichs, Beinn Dearg and Glencalvie WLA will lie ~18km to the west of Phase 4 at its closest point. Theoretical visibility was mostly limited to some east facing slopes below Ben Wyvis, mostly over 20km from the proposed development. Taking into account the very limited theoretical visibility, the extremely minor proportion of the WLA with any potential views, the urbanised context within which the proposed development would be seen, and the large distance involved, no significant effects were judged likely for Phase 4 and the WLA was consequently scoped out of the assessment, although this cannot be confirmed for Phase 5 operational phases.

14.3 Previous EIA – Impacts and Mitigation

For the construction of Phases 3 and 4 at the PoCF, landscape and visual impacts and the associated mitigation were assessed and based on the proposed, permanent design elements of each phase. Design elements used to assess landscape and visual impacts were as follows:

- **Phase 3:**
    - The constructed elements of the project only, without items placed on the laydown or vessels alongside.
- **Phase 4:**
    - The constructed elements of the project only, without items placed on the laydown or vessels alongside;
    - Operational scenario of a berthed cruise ship of up to 72m in height;
    - Operational scenario of wind turbine assembly with tower height of 100 – 120m;
    - Operational scenario – oil and gas.

Maps showing the ZTV, created by computer manipulation of a digital terrain model, indicate areas from which the proposed development may theoretically be seen and enable the study area to be focused upon those locations that are most likely to be significantly affected. Photomontages were also used to inform the assessment.

14.3.1 Landscape Effects

14.3.1.1 Phase 3

In appraising the effect of Phase 3, on the landscape resource of the study area (see Section 14.2.4), the following impacts were identified:

- A total of three LCTs will be impacted from the permanent construction of Phase 3 these were enclosed farmland landscapes, the enclosed Cromarty Firth, and open farmland slopes;
- Of the three LCTs that were to be impacted, enclosed farmland landscapes were to experience slight adverse direct impacts, and the Cromarty Firth and open farmland slopes were to experience slight adverse direct impacts;
- A total of two coastal LCTs will be impacted during construction, these were the already developed coastline, and soft coastal shorelines;
- Of the two coastal LCTs that were to be impacted, each would experience moderate adverse impacts to their viewpoints, whilst moderate adverse impacts were anticipated for the soft coastal shoreline; and
- Overall, it was considered that the proposed development will have a slight adverse effect on the landscape resource of the study area during construction.

14.3.1.2 Phase 4

In appraising the effect of Phase 4, on the landscape resource of the study area (see Section 14.2.4), the following impacts were identified:

- No significant impacts on designated landscapes;
- No significant impacts on SLAs;
- Four significant impacts on Inner Moray Firth LCTs (enclosed farm landscapes and the enclosed firth) associated with the permanent construction of Phase 4 and offshore renewable structures during operations; and
- No significant impacts on Ross & Cromarty LCTs.

Each of the significant impacts identified were classified as localised, moderate-major.

14.3.2 Visual Effects

14.3.2.1 Phase 3

In appraising the effect of Phase 3 on visual amenities, bare ground and screened ZTVs were undertaken. These were the B817 at Invergordon, King George Street in Invergordon, Near Balblair, Fyrish, and Newhall. It was considered that the proposed development would result in a slight adverse effect for the visual amenity of the study area with localised substantial adverse impacts at King George St, Invergordon (0.392km distant) and moderate adverse impacts for the viewpoints near Balblair (1.234km distant) and on the B817 (0.572km distant).

14.3.2.2 Phase 4

In appraising the effect of Phase 4 on visual amenities, bare ground and screened ZTVs were undertaken. These were the B817 at Invergordon, the A9 west of Tomich, the B9163 east of Balblair, various Invergordon dwellings, Near Balblair, Jemimaville, and Alness. The following impacts were identified:

- Nine significant impacts on key settlements (Invergordon dwelling within 0.6km of the development with direct views, Invergordon dwelling within 0.6km of the development with partial views, and Near Balblair) associated with the construction of Phase 4, cruise ship berthing or the presence of offshore renewable structures; and
- Five significant impacts on key roads (B817 within 1.7 km west of Invergordon, and B9163, 0.4 km section east of Balblair) associated with the permanent construction of Phase 4, cruise ship berthing or the presence of offshore renewable structures.

Each of the significant impacts identified were classified as moderate-major.

14.3.3 Mitigation

Several embedded mitigation measures were employed as part of Phases 3 and 4 to reduce the visibility of the permanent elements from the centre of Invergordon. This included reducing the effects of lighting by minimising the number of active luminaires and for Phase 4 specifically, designing the proposed development to reflect the shape and materials of Phase 3, particularly the colour and texture of the rock armour.

Primary mitigation measures such as good housekeeping were also employed to reduce effects during construction wherever possible.

14.4 Potential Impacts from Phase 5

14.4.1 Construction

It is recognised that the construction stage will have temporary landscape and visual impacts similar to those associated with the Phase 5 development proposed, permanent elements as outlined in Section 3.2. The storage of material and presence of plant items during construction and general neatness of the site will determine the landscape effects of construction.

14.4.2 Operational

The permanent elements associated with the Phase 5 development do not differ dramatically from those in Phases 3 and 4 and a similarly low-lying area, with the lighting columns being the highest elements. However, due to the slight change in location it could potentially be viewed from slightly more locations. In addition, the affects are additive to those associated with Phase 3 and 4 hence, could give rise to new or greater landscape and visual impacts on local receptors discussed in Section 14.2.

As described in Section 3.4, the intent would be for the Phase 5 development to be utilised by the offshore wind sector. As such there is a potential for large components to be present on the land reclamation area and up to three turbines being assembled on the Invergordon quaysides. The fully assembled turbine heights could be two or three times taller than the hub heights previously considered as part of the Phase 4 development (note previously considered fixed bottom turbines, with blades being installed at the windfarm). As such there is a potential to effect sensitive receptors much further from the ISB than previously considered.

14.5 Scoping Assessment

Due to the operational landscape and visual impacts affecting receptors not previously considered, and the potential increase in significance to the effects experienced at previously considered receptors, it is proposed that a LVIA is **scoped-in** to the EIA for Phase 5.

14.6 Proposed Impact Assessment

The LVIA will be completed by a Chartered Landscape Architect, who will carry out their fieldwork in clear weather conditions. In addition to carrying out the assessment, the Landscape Architect will work with the design team, to identify ways in which to minimise landscape and visual impacts and where possible identify enhancement.

It is recognised that the development could have multiple uses; these will be driven by client demand, however the worst-case scenario in this instance is associated with the fabrication, marshalling and assembly of floating wind components, and as such this will be the basis for the operational scenario assessment. The assessment will therefore consider:

- The permanent elements of the project only, without items placed on the laydown or vessels alongside; and
- Operational scenario of wind turbine assembly with components present in the laydown area and up to three fully assembled floating turbines located on the quaysides, with a maximum tip height of 330m above mean sea level.

It is recognised that the operational scenario includes wind turbines which:

- Are of considerable height and hence may be visible from a significant distance;
- Are designed for offshore locations but are located adjacent to shore and hence onshore windfarm LVIA guidance maybe more applicable;
- They are not distributed like an operational wind farm as they are located immediately adjacent to each other; and
- Furthermore, they are temporary in nature being built up to full height, and then would undergo pre-commissioning and initial testing before being moved away from the berth.

Scottish Natural Heritage (now known as NatureScot) guidance on Visual Representation of Wind Farms (2017c) includes a section on offshore wind however, the specific considerations for offshore are not necessarily applicable in this instance due to their nearshore location. It is also noted that the Highland Council have their own Visualisation Standards for Wind Energy Developments (Highland Council, 2016) as the development is within their council area, this guidance also needs to be considered.

Once the development layout is further developed the Zone of Theoretical Visibility maps (ZTVs) bare earth and screened will be generated for the layout of the permanent development, this will consider the highest permanent components (the lighting columns). The permanent development ZTV's will identify the potential extent of visibility over a 10km radius study area. To consider the operational scenario ZTV's will have a larger study radius of 45km to align with the Scottish Natural Heritage Guidance (2017c).

A desk-based appraisal will be undertaken to define landscape character to identify landscape designations and relevant government policy. This will take account of the 2019 LCT (NatureScot, 2019) and Highland Councils (2017) Onshore Wind Energy Supplementary Guidance, Part 2B- Landscape Sensitivity Appraisal: Black Isle, Surrounding Hills and Moray Firth Coast Caithness. The output of which along with the ZTV's will be utilised to identify viewpoints to be utilised for the LVIA to represent the key receptors for Phase 5. Once the Landscape Architect has identified their proposed viewpoints, they will be presented to Marine Directorate and their statutory consultees including the Highland Council landscape expert for agreement.

At this point it is assumed that the viewpoints will include those identified for Phases 3 and 4 (see Table 14.1). There may also be a need to add one or two from further away as previous ZTV were completed to 35km and were for smaller tower sections only, hence there could be new relevant viewpoints for the operational scenario, potentially further north on the B9167 and from a location on the east, in the Sutors or Cromarty area.

Table 14.1: Phase 4 Viewpoints

Ref	Name	NGR	Receptors
1	B817 Invergordon	NH 6969 6888	Recreational users of Linear Park and nearby car parks, road users on the B817.
2	King George Street, Invergordon	NH 7001 6882	Residents in Invergordon, road users.
3	High Street	NH 7053 6856	Residents in Invergordon, road users.
4	Near Balblair	NH 7055 6705	Residents and road users on the north shore of the Black Isle.
5	A9/B9176 Junction	NH 6306 6762	Road users on major tourist route.
6	Fyrish	NH 6077 6974	Visitors to the monument on Fyrish Hill.

Photomontage images will be prepared for the permanent elements of the development and for the wind turbine operational scenario. As the development is within the Highland Council area it is proposed that they are presented in line with Visualisation Standards for Wind Energy Developments (Highland Council, 2016).

The assessment of impacts will be based on the Guidelines for Landscape and Visual Impact Assessment (Landscape Institute and Institute of Environmental Assessment, 2013) and will take account of:

- Assessing Impacts on Wild Land Areas – Technical Guidance (NatureScot, 2020); and
- Onshore Wind Energy Supplementary Guidance as Amended (Highland Council 2016a & 2017).

It is recognised that other offshore wind related activities may be planned for the Moray Firth which could give rise to cumulative landscape and visual impacts, these will be considered as part of the cumulative assessment as discussed in Section 24.

15 Materials and Waste

Only impacts assessed as part of the Phase 4 EIA have been used to inform this scoping exercise on materials and waste, as this topic was not considered during the EIA process for the Phase 3 development.

15.1 Policy Frameworks & Legislation

Relevant policy and guidance include:

- **GEN 11 Marine Litter:** Developers, users and those accessing the marine environment must take measures to address marine litter where appropriate. Reduction of litter must be taken into account by decision makers (Scottish Government, 2015);
- **PPG6:** Work at Construction and Demolition Sites (NetRegs, 2012);
- **GPP2:** Above ground oil storage tanks (NetRegs, 2017); and
- Guidance on Applying the Waste Hierarchy (Scottish Government, 2017).

Relevant legislation includes:

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR);
- Section 34 of the Environmental Protection Act 1990 (as amended) (UK Government, 1990); and
- Control of Substances Hazardous to Health (COSHH) Regulations 2002 (UK Government, 2002).

It is recognised that other waste management legislation may be applicable to specific waste items and activities, these would be considered on a case-by-case basis.

15.2 Previous EIA – Impacts and Mitigation

During the Phase 4 EIA, it was deemed inappropriate to assess materials and waste on a significance basis. Instead, materials and waste were identified and quantified in terms of volume, and an understanding of the environmental impacts associated with the materials provided to facilitate the consideration of effects.

15.2.1 Construction

15.2.1.1 Materials

The materials used in the construction of Phase 4 were all finite, such as aggregates, metals, concrete, and plastics. They were however, selected due to their durability and lack of degradation. Metals are a finite resource; however, it is noted that most metals are readily recycled, with the majority of steel produced having a significant recycled component (British Steal, 2023). It was recognised that materials such as metals, plastics and cements have an intrinsic carbon cost, and that the carbon cost associated with the transport of materials depends on their source and mode of transport hence information on materials was utilised to inform the Air Quality section.

The plant and machinery used for the development required on-site refuelling. Therefore, it was a necessity to store diesel on site. Vessels used in the construction of Phase 4 that required refuelling used the existing bunkering services at the ISB. Delivery vehicles refuelled at offsite locations. The impacts of fuel and hazardous material storage were discussed in the Water Quality section of the Phase 4 EIA.

The electricity and water required for the welfare and office facilities were provided through the permanent services source for ISB, with the volumes deemed unlikely to be significantly more than what were used prior to Phase 4. Water was also used for the dowsing of construction materials to suppress dust.

Rock armour removed from Phase 3 to facilitate the construction of Phase 4 was reused in the development.

15.2.1.2 Wastes

The majority of waste produced from the Phase 4 development arose from dredging activities. A Best Practice Environmental Option (BPEO) Report (LEAPMOOR, 2018) was produced and determined that the best option would be to dispose of the material at Sutors Disposal Ground (CR019). It was at the engineer's discretion whether any material would be suitable for reuse in the land reclamation area, however, for the purpose of the EIA, it was pessimistically assumed that between 40,000m^3 and 60,000m^3 of spoil would require to be disposed of as waste.

Additional waste generated by Phase 4 included cement washings and various other miscellaneous materials, such as wood for shuttering, off-cuts from rebar metals and packaging materials associated with the construction works and welfare facilities. All waste was segregated to facilitate appropriate reuse or recycling, in line with the waste hierarchy. The potential for littering to give rise to marine pollution including issues associated with plastics was also recognised.

15.2.1.3 Construction Mitigation

It was recognised that the minimisation of material and waste impacts could best be achieved during the design and procurement stages. Measures including the procurement of materials such as steel with a high recycled content, or sourcing infill materials from other projects which could meet the required engineering standards were promoted.

The preference for just-in-time delivery was highlighted as it minimised the need to store material such as aggregate on site which could give rise to dust or silty water runoff and potential nesting/resting habitat for birds and otters. During construction the appropriate storage and handling of materials and waste was observed, including compliance with the COSHH Regulations 2002, the Oil Storage (Scotland) Regulations 2006[1] and best practice on refuelling and cement washings, to minimise risks of containment loss.

Waste segregation aligning with the waste hierarchy was implemented using a Site Waste Management System. Steps to discourage littering included training, provision of appropriate waste receptacles and a ban on single use plastic utensils in the welfare facilities.

15.2.2 Operational

A summary of the operational impacts identified during Phase 4, as specified in the EIA, are detailed in this section. The majority of maintenance activities were identified to be limited with negligible material usage and waste generation.

15.2.2.1 Materials

The Phase 4 EIA identified that over time, surfacing materials may be required for reclamation areas to even out the surface following settlement. Surfacing materials will also have been required to repair any areas of the land reclamation area which have been subject to general

[1] The Oil Storage (Scotland) Regulations 2006 were revoked by the Water Environment (Miscellaneous) (Scotland) Regulations 2017, oil storage is now covered by the Water Environment (Controlled Activities)(Scotland) Regulations 2011 as amended.

wear and tear. The volumes of material involved are trivial in comparison to initial construction volumes.

Electricity and water supplies were also required to support the operations carried out on Phase 4, whereby connections were made into the existing services.

15.2.2.2 Wastes

The Phase 4 EIA identified the need for maintenance dredge operations to be carried out at the ISB. The Phase 4 EIA identified that any dredge arisings originating from maintenance dredge operations would be required to be disposed of (under licence) at the Sutors Disposal Ground (CR019) unless an alternative use for the material can be found.

As with existing activities carried out at the ISB, and in alignment with waste regulations, the waste producer is responsible for their own waste management. However, PoCF can facilitate services via the local supply chain to ensure appropriate arrangements are in place to allow the waste hierarchy to be employed.

15.2.2.3 Operational Mitigation

The Phase 4 Development once completed, fell under PoCF's operational management system, which includes procedures for the safe storage of oils and chemicals, refuelling and on-site waste management.

15.3 Potential Impacts from Phase 5

For the proposed Phase 5 development materials and waste impacts shall also be associated with:

- Construction materials;
- Material and fuel storage and handling (during construction and operations); and
- Dredge waste (construction/capital and maintenance dredges).

15.3.1 Construction

15.3.1.1 Materials

Large volumes of materials will be required to construct Phase 5. The bulk materials likely to be required (but not limited to) are as detailed in Table 15.1.

Table 15.1: Material Requirements

Material	Use
Rock	Rock Armour
Sand/gravel	Infill material
Metal	Piles, quay furniture (ladders and bollards etc)
Cement	Surfacing/ Quay and Bollard Bases
Hydrocarbons: fuels, oils, and hydraulic fluids	Plant, equipment and vessel operations

The risks associated with the storage of wastes and materials including dust from dry materials and spillages of hydrocarbons are discussed in Section 8: Air Quality and Section 9: Water Quality, respectively. Appropriate storage and management of aggregates which can be a source of dust, and potential pollutants (chemicals and hydrocarbons) is imperative (see Section 15.5).

As with Phase 4, it is anticipated that many of the materials used in the construction of Phase 5 will be finite. As such, consideration needs to be given to the intrinsic carbon costs associated with the travel distances for material transportation, based on realistic assumptions of where materials may be sourced from. The impacts of traffic and transport are discussed in Section 17, whilst carbon costs are discussed in Section 19: Climate Change.

15.3.1.2 Waste

Waste arising during construction may include:

- Cement washings;
- Arisings from welfare facilities (i.e., litter and/or sewage); and
- Various other miscellaneous materials which will be segregated to facilitate recycling.

In addition, dredging operations will give rise to dredge-spoil. It will be determined by the pre-sampling analysis whether dredge material is chemically and physically suitable for reuse (see Section 11.5). Should the spoil be unsuitable for reuse, it will most likely be disposed of at Sutors Disposal Ground (CR019). Impacts of spoil disposal have been discussed in Section 9: Water Quality and Section 11: Ground Conditions of this report.

The proposed mitigation employed to minimise impacts of waste throughout the construction phase of the Phase 5 Development are outlined in Section 15.5.

15.3.2 Operational

The Phase 5 development, once operational will fall under the PoCF's operational management system, which includes:

- Procedures for the safe storage of oils and chemicals;
- Refuelling procedures;
- Strategies for connecting into existing services (i.e., water and electricity);
- Sewage routing; and
- Appropriate on-site waste management.

As such, they do not require specific consideration here, and no specific mitigation is identified.

Materials associated with concrete batching would be subject to PPC permitting as discussed in Section 8: Air Quality, which would require the appropriate storage and management of the dry cement materials. Furthermore, any resultant wash waters would need to be collected, treated and appropriately discharged under a CAR consent as discussed in Section 9: Water Quality. Hence, concrete batching and cement washings do not need to be considered further here, and no specific mitigation is identified.

There may be the need for maintenance dredge operations to be carried out at the ISB. The operational harbour areas are surveyed at least once every 4 years and dredging is completed as required to maintain safe operational draft depths. Following the construction of Phase 5, any dredge arisings originating from maintenance dredge operations would require to be disposed of (under licence) at the Sutors Disposal Ground (CR019) unless an alternative use for the material could be found.

15.4 Scoping Assessment

The transport, storage and use of materials, the production of waste and associated risks cross over into other topic areas namely, Air Quality, Water Quality, Navigation, Traffic and Transport, and Climate Change (see Sections 8, 9, 16, 17 and 19 respectively). As such it is proposed that with mitigation measures to ensure minimisation of material use and waste production, and appropriate storage, treatment and handling measures similar to those utilised during previous phases (see Section 15.5), Materials and Waste is **scoped out** of the Phase 5 EIA.

15.5 Proposed Mitigation

As with previous phases minimisation of material and waste impacts are best achieved during the design and procurement stages of the project. Measures including the procurement of materials such as steel with a high recycled content and use of dredge spoil as infill are promoted, providing the required engineering standards are met.

Practical mitigation for material and waste management previously applied and outlined in Section 15.2.1: Construction and Section 15.2.2: Operations remains appropriate and hence has been incorporated within the Initial Schedule of Mitigation detailed in Section 25. This includes compliance with current legislation regarding chemicals and oils.

As aforementioned in Section 11: Ground Conditions, a BPEO shall be produced to support any dredge and disposal marine licence applications made under the Marine (Scotland) Act 2010.

16 Navigation

This section considers the potential navigational impacts associated with the proposed Phase 5 development. It outlines the relevant plans and policies, describes the baseline conditions, and assesses the potential impacts relative to those previously assessed as part of the Phase 4 EIA.

16.1 Policy Frameworks & Legislation

Relevant policy and guidance which should be considered for navigational assessments include:

- Port Marine Safety Code (PMSC) – which requires harbour authorities to develop a risk assessment based on safety management systems for the safe operation of their harbours;
- International Regulations for Preventing Collisions at Sea as amended (International Maritime Organization, 1972); and
- Scottish National Marine Plan (Scottish Government, 2015).

The Scottish NMP has a section on Transport and the following policies are relevant to proposed Phase 5 Development:

- **TRANSPORT 1**: Navigational safety in relevant areas used by shipping now and in the future will be protected, adhering to the rights of innocent passage and freedom of navigation contained in UN Convention on the Law of the Sea (UNCLOS). The following

factors will be taken into account when reaching decisions regarding development and use:
  - The extent to which the locational decision interferes with existing or planned routes used by shipping, access to ports and harbours and navigational safety. This includes commercial anchorages and defined approaches to ports.
  - Where interference is likely, whether reasonable alternatives can be identified.
  - Where there are no reasonable alternatives, whether mitigation through measures adopted in accordance with the principles and procedures established by the International Maritime Organization (IMO) can be achieved at no significant cost to the shipping or ports sector.
- **TRANSPORT 4:** Maintenance, repair and sustainable development of port and harbour facilities in support of other sectors should be supported in marine planning and decision making.
- **TRANSPORT 7:** Marine and terrestrial planning processes should co-ordinate to:
  - Provide co-ordinated support to ports, harbours, and ferry terminals to ensure they can respond to market influences and provide support to other sectors with necessary facilities and transport links; and
  - Consider spatial co-ordination of ferries and other modes of transport to promote integrated and sustainable travel options (Scottish Government, 2015).

16.2 Baseline

16.2.1 Vessel Movement Records

The PoCF undertakes continual monitoring of vessel movements within the Cromarty Firth. At present, the most up to date vessel movement records held by the PoCF are for 2017 – 2021. These are outlined in Table 16.1.

Current PoCF facilities include Berths 1-5, the Queen's Dock and Saltburn Pier. The facility named 'Firth' within Table 16.1 refers to vessels which do not actually berth, for example tugs brought in to move oil and gas related assets in the Firth, in addition to assets anchored within the Port limits.

Table 16.1: Vessel Movements in the Cromarty Firth (2017 – 2021)

Facility	2017	2018	2019	2020	2021	Average
PoCF	277	388	358	240	153	**283**
Firth	90	113	105	12	77	**79**
Admiralty Pier	81	42	28	22	12	**35**
Highland Deephaven	4	3	5	3	2	**3**
Nigg Energy Park	150	234	179	258	212	**206**
Nigg Jetty	6	1	0	1	0	**2**
Grand Total	**608**	**781**	**675**	**536**	**456**	**611**

It should be noted that a reduction in vessel movements from 2019 – 2021 could be attributed to the COVID-19 pandemic, as the cruise industry came to a halt. Thus, the figures presented in Table 16.1 are not representative of typical annual vessel movements within the Firth and the year of 2019 may represent the most appropriate baseline of vessel movements within the PoCF's harbour limits. In addition, these figures are likely to include vessel movements associated with the construction of Phase 4, which began in 2019 and was completed in early 2022.

16.3 Previous EIA – Impacts and Mitigation

A summary of the construction and operational navigational issues identified, and any specific mitigation associated with Navigation from the Phase 4 EIA are provided in this section.

16.3.1 Construction

As part of the construction of Phase 4, a total increase of 150 vessel movements were predicted. Increased vessel movements were primarily associated with material delivery (in particular infill material), and dredge-spoil disposal operations. Thus, the majority of vessel movements were directly related to waste and materials.

Although there was a predicted increase in vessel movements expected to occur during Phase 4, the rate at which vessels arrived within the PoCF's harbour limits on a daily basis did not increase dramatically. This is because material deliveries by vessel were programmed to match construction activities, with deliveries only being made for materials needed at that time.

Vessel movements were coordinated by PoCF, providing appropriate notification and communications to minimise collision risks. Furthermore, every vessel was required to adhere to relevant legislation including the International Regulations for Preventing Collisions at Sea (as amended) and the Port Authority's procedures for vessel management. As such, increased vessel movements during construction were judged not to have a significant interaction with other marine traffic.

Carrying out construction works from a vessel or from land into the sea does pose the risk that someone may fall into the water. Appropriate site health and safety precautions (i.e., production of construction Risk Assessment Method Statements (RAMS) aligning with the PMSC) were in place to mitigate against this. In addition, the Port and Royal Naval Lifeboat Institute (RNLI) have the ability to respond to such an event, and a safety boat was onsite throughout the works.

16.3.2 Operational

The Phase 4 Development once completed, fell under the Port of Cromarty Firth's operational management system, which took into account the increase in vessel numbers during cruise ship, renewables and oil and gas scenarios.

The new berths as part of Phase 4 are operated in line with existing PoCF procedures for vessel management utilised within the Firth and across the maritime sector to minimise collision risks, including the International Regulations for Preventing Collisions at Sea (as amended).

16.4 Potential Impacts from Phase 5

16.4.1 Construction

It is likely that there may be an increase in the number of material delivery vessels associated with the construction of Phase 5 when compared with Phase 4. This is attributed to the delivery of infill material for land reclamation, as the size of the laydown areas associated with Phase 5 are greater than those constructed during Phase 4 and therefore will require larger volumes of material. However, vessel movements will be phased with the construction programme, with just-in-time delivery of materials, and as such the rate at which vessels will arrive within the PoCF harbour limits on a daily basis shall not increase dramatically. Irrespective of this, all vessel movement will be coordinated by the PoCF, with appropriate notifications and communications to minimise collision risks and to ensure increased vessel movements do not have significant interactions with other vessels.

Each vessel will be required to adhere to relevant legislation including the International Regulations for Preventing Collisions at Sea (as amended) and the Port Authorities procedures for vessel management.

16.4.2 Operational

As with Phase 4, operational vessel movements will be managed in line with existing PoCF procedures for vessel management utilised within the Firth and across the maritime sector to minimise collision risks, including the International Regulations for Preventing Collisions at Sea and the PMSC.

In addition, there is the potential during operations for floating offshore wind turbine bases, or complete assembled units to be moved to and from the Phase 5 berth. The floating offshore wind structures are vessels which are manoeuvred by tugs, in a similar manner to oil and gas rigs. PoCF have a long history of managing this type of activity within harbour limits and hence are accustomed to minimising associated risks within their existing procedures.

16.5 Scoping Assessment

Construction and operational activities conducted during Phase 4 at the PoCF were deemed to have no significant impact on navigation with the appropriate implementation of mitigation measures. There have been no navigational incidents associated with the construction of the Phase 3 and 4 developments. The impacts associated with Phase 5 construction are indistinguishable from those already assessed for Phase 4. Equally, planned operations at Phase 5 do not give rise to any activity dissimilar to those already managed by PoCF. Hence, with appropriate mitigation measures employed, it is recommended that Navigation is **scoped out** of the EIA process for Phase 5.

16.6 Proposed Mitigation

The mitigation previously utilised for the Phase 4 development alongside the adoption of relevant guidance and policies will be sufficient to negate the impacts on navigation. These are detailed within the Initial Schedule of Mitigation in Section 25.

17 Traffic and Transport

This section considers the potential traffic and transport impacts associated with the proposed Phase 5 development. New information sources, plus information utilised as part of the Phase 4 EIA, has been used to inform the baseline in this scoping exercise on traffic and transport. Information from the Phase 3 EIA has not been used to inform the baseline as it is out of date; however, the experience from Phase 3 has been used to inform the potential impacts of Phase 5.

17.1 Policy Frameworks & Legislation

Relevant policy and guidance which should be taken into account for traffic and transport assessments include:

- Planning Advice Note (PAN) 75: Planning for Transport;
- Transport Assessment Guidance (Transport Scotland, 2012);
- HITRANS Regional Transport Strategy (Draft) (HITRANS, 2017); and
- NPF4 (Scottish Government, 2023).

Under the heading of Sustainable Transport, Policy 13 of NPF4 aims to '*encourage, promote and facilitate developments that prioritise walking, wheeling, cycling and public transport for everyday travel and reduce the need to travel unsustainably*', with policy outcomes including '*Developments are in locations which support sustainable travel*' (Scottish Government, 2023). Policy 13 (b) requires that transport requirements generated by a development proposal are considered in terms of sustainable travel.

17.2 Baseline

17.2.1 Road Safety

17.2.1.1 Traffic Collisions

As part of the Phase 4 EIA, road traffic collision data was obtained from The Highland Council for a five-year period between 29/09/2012 and 28/09/2017. This was obtained for the local highway network in the vicinity of the ISB. A review of the accident data highlighted that over this period there were a total of 0 fatal, 2 serious, 12 slight and 28 damage collisions across the entire area (Affric Limited, 2018). Only two of the collisions occurred on the B817 within the immediate vicinity of the ISB.

More recently, Crash Map data 2018 – 2021 highlights that in the vicinity of the B817 from Dalmore to Invergordon and from Kildary to Invergordon there has been a total of 0 fatal, 1 serious and 3 slight accidents (Crash Map, 2022). Although the number of road traffic collisions for 2018-2021 appear to be down from those for 2012 – 2017, it should be noted that the COVID-19 pandemic during much of 2020 and early 2021 may be a contributing factor to this, due to reduced numbers of vehicles on the roads.

17.2.2 Traffic

Traffic data was collected in the vicinity of ISB in 2016 as well as its access points onto the B817. The surveys undertaken consisted of Manual Classified Counts (MCCs), Automatic Traffic Counters (ATCs) and queue length surveys (where applicable). In addition, daily and monthly traffic flow information for 2016 from two permanent ATC counters along the A9 near the Alness and Tomich junctions were provided by Transport Scotland for Phase 4.

Traffic surveys for Phase 4 indicated that the ISB access onto the B817 and other junctions along the B817 in the vicinity of the site operate well within capacity, without notable queuing or congestion occurring. The B817 has a design capacity of 1800 vehicles per hour and the two-way link flows were:

- Weekday morning peak: 393 vehicles per hour; and
- Weekday afternoon peak: 493 vehicles per hour.

In addition, traffic volumes along the B817 in the vicinity of the ISB are representative of typical weekday traffic with a morning peak at 08:00h – 09:00h, a midday peak around 12:00h – 13:00h, and an afternoon peak around 16:00h – 17:00h (Affric Limited, 2018). Figure 17.1 provides an indication weekday hourly traffic volumes along the B817 in the vicinity of the ISB in January 2016.

An additional access to the ISB was added at the west end of the site prior to the construction of Phase 3. As such, traffic destined for the west end of the ISB joining the B817 at the Alness end no longer has to utilise the main ISB gate. This reduces the traffic passing the end of Invergordon High Street and hence minimising waiting and queuing at the junction between the west end of the High Street and the B817.

A digital speed sign has been installed on the B817 near the western access gate, to make drivers aware of their speed as they enter the village. In addition, a pedestrian crossing has been installed opposite the West Harbour in recent years to accommodate safe pedestrian access to and from the western access gate.

Along the A9 near Tomich, highest average daily traffic volumes were recorded August – September (Affric Limited, 2018). On the A9 near Alness, the highest average daily traffic volumes were recorded in August, with April, June, July and September traffic flow volumes being above average. Figure 17.2 shows the average daily traffic volumes per month along the A9 near the Tomich junction in 2016 and Figure 17.3 shows the average daily traffic volumes per month along the A9 near the Alness junction in 2016.

In conjunction with the Phase 3 development a new car park was constructed opposite the ISB main gate, on the north side of the B817. Coupled with the parking on the south side of the B817 at the main gate, harbour office and port office, there is more than enough parking for all ISB users.

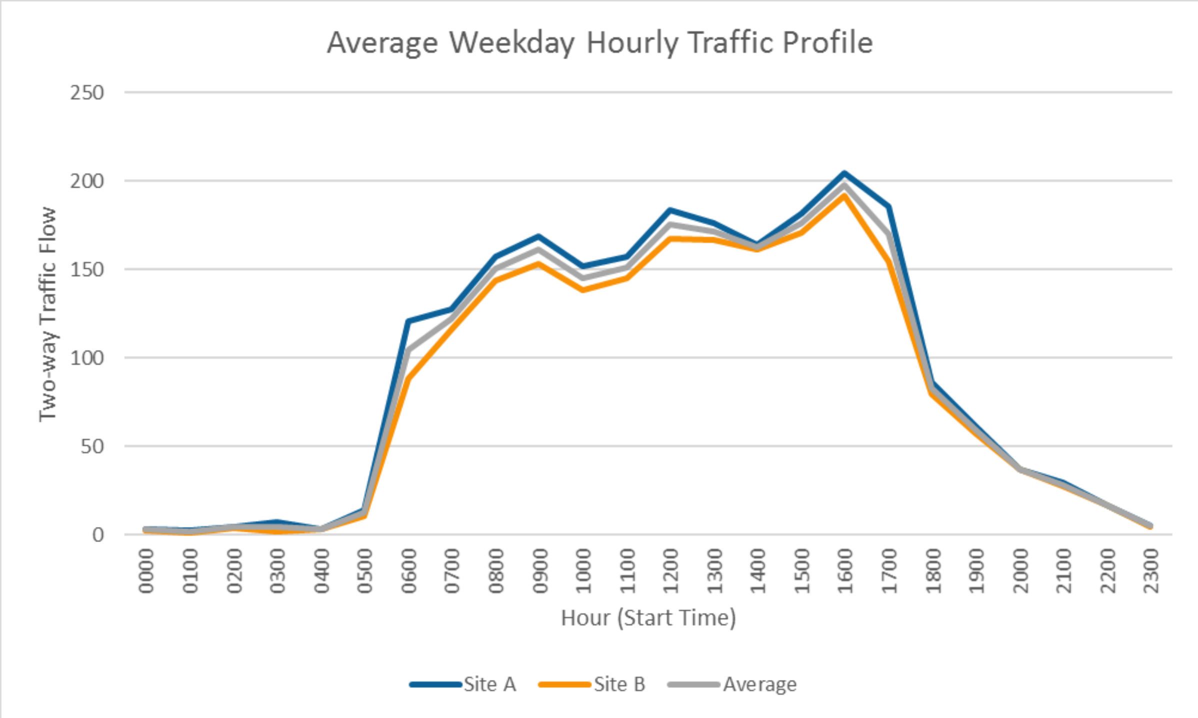

Figure 17.1: B817 ATC's – Average Weekday Hourly Traffic Profile

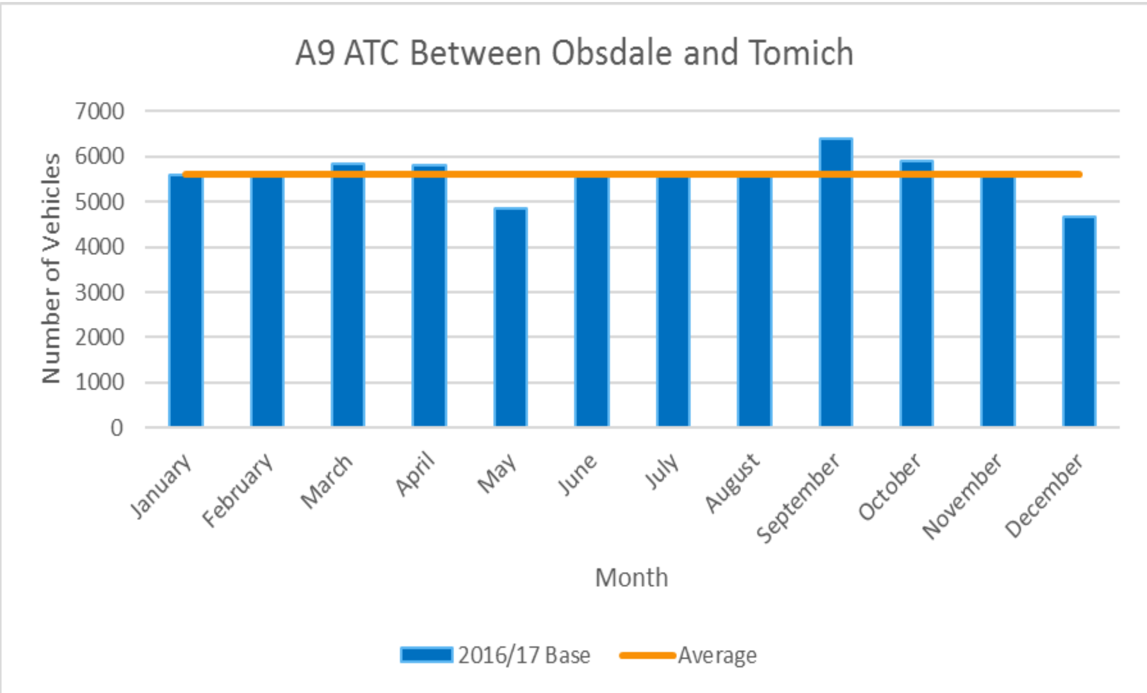

Figure 17.2: A9 ATC near Tomich Junction – Average Daily Traffic Volumes per Month

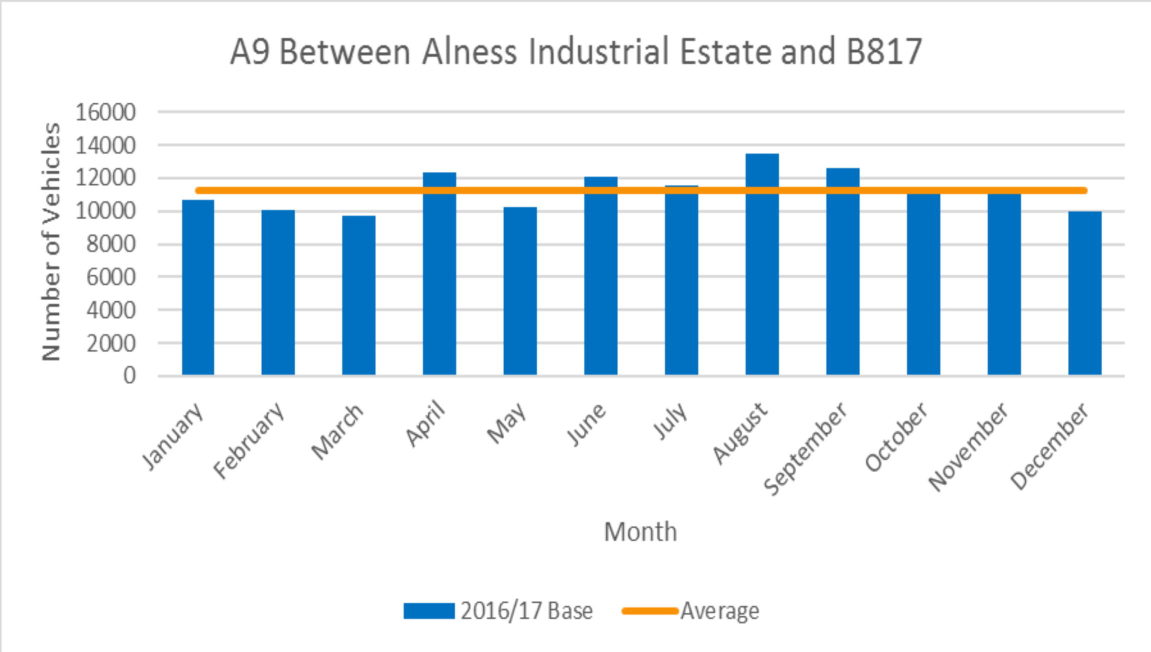

Figure 17.3: A9 ATC near Alness Junction – Average Daily Traffic Volumes per Month

17.2.3 Transport

Invergordon has a train station connecting the town to Thurso and Wick in the North and Inverness to the south, which in turn provides access to the rest of the UK's rail network and airports including Inverness, Aberdeen and Edinburgh.

There are regular buses running both north and south through Invergordon, providing additional public transport options for workers.

A cycle track connects Invergordon to Alness, which then links into National Cycle Network Route 1. PoCF provide both bicycle shelters and showers to facilitate active travel to work by PoCF and their tenants' workforces.

17.3 Previous EIA – Impacts and Mitigation

A summary of the construction and operational impacts identified and any specific mitigation from the Phase 3 & 4 EIAs are provided in this section. This section outlines the mitigation actions implemented.

17.3.1 Construction

For the construction of Phases 3 & 4 at the PoCF, potential impacts on Traffic and Transport and the associated mitigation were assessed and based on the maximum number of vehicle movements per day. The main traffic movements were associated with the delivery of rock armour from local quarries including Ardcronnie.

During Phase 3, a car windscreen was hit by a rock released from between the wheels of an HGV. Mitigation was subsequently included to ensure that site operatives were checking all wheels prior to HGV's leaving the construction site, or any other areas associated with the development (i.e., quarries providing materials). This measure was effectively implemented during the remainder of the Phase 3 construction campaign and for Phase 4, without incident recurrence.

Following the submission of the Phase 4 EIA and the marine construction licence application, a Construction Traffic Management Plan (CTMP) was requested by Marine Scotland. As such, a CTMP was developed and implemented throughout Phase 4.

A summary of the impacts and the mitigation proposed are outlined in Table 17.1 (Affric Limited, 2013; 2018).

Table 17.1: Traffic & Transport – Construction Impacts and Mitigation

<table>
<tr><th>Impact</th><th>Significance of Impact (Absence of Mitigation)</th><th>Mitigation</th><th>Significance of Residual Effect</th></tr>
<tr><td>Disruption to pedestrians and cyclists, as a result of an increase in HGV movements.</td><td>Minor, Adverse, Temporary, Non-significant</td><td rowspan="4">Traffic Management Plan

Avoidance of HGV movements during typical weekday peak hours.

Wheel inspections prior to leaving. HGV movements to occur outside of typical weekday peak hours and arrangements made with vendors for construction vehicles to travel to/ from site using agreed routes and access points.</td><td>Minor, Adverse, Temporary, Non-significant</td></tr>
<tr><td>Disruption to road and Public Transport users as a result of an increase in HGV movements.</td><td>Negligible, Adverse, Temporary, Non-significant</td><td>Negligible, Adverse, Temporary, Non-significant</td></tr>
<tr><td>Road safety compromised due to construction traffic travelling to/ from site along B817.</td><td>Moderate, Adverse, Temporary, Significant</td><td>Negligible, Adverse, Temporary, Non-significant</td></tr>
<tr><td>Local Amenities disrupted by HGV movements.</td><td>Minor, Adverse, Temporary, Non-significant</td><td>Minor, Adverse, Temporary, Non-significant</td></tr>
</table>

17.3.2 Operational

For operational activities anticipated to occur at Phases 3 and 4 at the PoCF, potential impacts on Traffic and Transport and the associated mitigation were assessed and based on the proposed, permanent design elements and anticipated activities. A summary of the impacts and the mitigation proposed are outlined in Table 17.2 (Affric Limited, 2013; 2018).

Table 17.2: Traffic & Transport – Operational Impacts and Mitigation

Impact	Significance of Impact (Absence of Mitigation)	Mitigation	Significance of Residual Effect
A 1% increase in daily traffic movements to and from the ISB.	Negligible, Non-significant	Development of an appropriate sustainable travel plan in line with local and national policy.	Negligible, Non-significant
Increased demand on the local transport infrastructure and capacity on the local highway, due to Offshore Renewables, Oil & Gas operations.	Minor, Adverse, Non-significant	Sustainable transport access to the ISB for typical daily operations will be promoted. Support current transport polices and government initiatives that promote and encourage walking, cycling; and public transport to include bus, taxis, and rail.	Negligible to Minor, Adverse, Permanent, Non-significant
Increase in car and sustainable travel (bus, walk, cycle) movements to the ISB resulting in a minor increase in road safety risk, due to Offshore Renewables, Oil & Gas operations.	Minor, Adverse, Non-significant		Minor, Adverse, Permanent, Non-significant
Additional trips on the local highway network, potential increase in local infrastructure use, due to Offshore Renewables, Oil & Gas operations.	Minor, Adverse, Permanent, Non-significant		Minor, Adverse, Permanent, Non-significant
Increase usage of footways, cycleway, crossing points along key desire lines. Increase in congestion over a short period of time in the morning with buses arriving at the port to take Cruise Ship patrons on excursions.	Minor, Adverse, Non-significant	Safe segregation of vehicles and non-motorised movements within the ISB will be in place. Existing Cruise Ship Traffic Management Plan included the Phase 4 operations and passengers will be encouraged to make use of port affiliated onshore excursions which pick-up/ drop-off within the designated area on the ISB.	Minor to Moderate, Adverse, Permanent, Non-significant
Public transport services will likely experience some increase in travel times, associated with Cruise Ship operations.	Minor, Adverse, Non-significant		Minor, Adverse, Permanent, Non-significant
Increase in car and sustainable travel mode (bus, walk, cycle) movements to the Service Base will result	Minor, Adverse, Non-significant		Minor, Adverse, Permanent, Non-significant

Impact	Significance of Impact (Absence of Mitigation)	Mitigation	Significance of Residual Effect
minor increase in road safety risk, associated with Cruise Ship operations.			
Cruise Ships could increase the possibility of privateer buses parking along the B817 which could restrict traffic movements along the B187 and local residents general experience when using local infrastructure such as footways and crossing points.	Minor, Adverse, Non-significant		Minor, Adverse, Permanent, Non-significant

17.4 Potential Impacts from Phase 5

As the construction of the Phase 5 development is proposed to support the growing offshore renewables industries already active at the PoCF, it is anticipated that the impacts associated with traffic and transport during the construction and operations of Phase 5 will be similar to those assessed as part of Phases 3 and 4. The potential impacts are largely associated with traffic flows (i.e., two-way), as opposed to total vehicle numbers.

17.4.1 Construction Impacts

Construction impacts associated with the proposed Phase 5 development could affect road safety, pedestrians, cyclists, cause driver delays and disrupt local amenities. These impacts may arise from:

- Construction personnel commuting to work;
- Material deliveries (aggregates, cement and components);
- Delivery and removal of heavy plant to carry out works; and
- Removal of waste from site (small volume anticipated).

Such impacts have already been assessed as part of the Phase 3 and 4 EIAs (see Tables 17.1 & 17.2) and it can be assumed that the impacts will be the same for Phase 5, particularly considering that where practicable, material deliveries will be brought by sea to decrease HGV movements.

The maximum rate of traffic flow is likely to be associated with the bulk delivery of materials to create any rock armouring. Rates of traffic flow are likely to be greater for stone to create rock armouring than any other material delivery, as much of this will require delivery by HGV directly from a quarry. For Phase 4 this was forecast to generate approximately 270 one-way or 540 two-way HGV movements per week over a 36-week period; typical two-way daily flows are estimated at 108 movements throughout the working week. This remained within the B817 design capacity.

Although Phase 5 is a larger development than Phase 4, it is envisaged that the two-way vehicles movements associated with material delivery will not be significantly greater than those outlined for Phase 4. This is because the maximum rate of traffic flow shall be constrained by the capacity to load/unload HGV's on-site, limiting the level of change to less than 10% increase. It is recognised that material deliveries may be required to take place over a longer period of time due to a greater amount of material needing to be used in the construction of the development, although this shall be reflected in a project specific CTMP.

As the potential impacts identified for Phase 5 were previously assessed as non-significant for Phases 3 and 4, following mitigation, it is justifiable to assume that should Phase 5 adopt the same approach to mitigation measures as Phases 3 and 4, the impacts will remain non-significant.

17.4.2 Operational Impacts

Increased capacity for offshore renewable and oil and gas decommissioning activities at Phase 5 are likely to provide an increase in direct and indirect job opportunities (see Section 18). As such, any operational traffic flows are likely to be associated with workforce attending site. It is however, envisaged that traffic flows associated with workforce movements shall not increase dramatically, as many of the direct and/or indirect job opportunities associated with the operations of Phase 5 shall be largely focussed on job retention, as personnel change industries and jobs from oils and gas IRM to offshore renewable production, assembly, marshalling etc.

Existing facilities to encourage the active travel and public transport links are available for the workforce, to minimise private car journeys.

Operational deliveries will be primarily by sea and hence no noticeable change to HGV movements is predicted for the operational phase.

17.5 Scoping Assessment

Construction and operational activities conducted during Phases 3 and 4 at the PoCF were deemed to have no significant impact on traffic and transport with the appropriate implementation of mitigation measures. As maximum rates of traffic flow are unlikely to increase for both the construction and operation of Phase 5, the impacts associated with the proposed development will be almost identical to those described for Phases 3 and 4. As such, it can be assumed that the significance of impacts is indistinguishable from those already assessed and therefore it is recommended that Traffic and Transport is **scoped out** of the EIA process for Phase 5.

17.6 Proposed Mitigation

Minimising material requirements through the design phase and by reusing materials where possible as discussed in Section 15.5 to minimise the number of road movements required, and maximising deliveries by sea, will reduce traffic and transport issues. The mitigation utilised for the previous phases, alongside the adoption of relevant guidance and policies will be sufficient to negate the impacts of Phase 5 on traffic and transport. These are detailed in the Initial Schedule of Mitigation in Section 25.

18 Socioeconomics

Only impacts assessed as part of the Phase 4 EIA has been used to inform this scoping exercise on socioeconomics, on the basis that this information is the most up-to-date and relevant to Phase 5.

18.1 Policy Frameworks & Legislation

Relevant policy and guidance which should be taken into account for socioeconomic assessments include:

- GEN 2: Economic benefits: Sustainable development and use which provides economic benefit to Scottish communities is encouraged when consistent with the objectives and policies of this Plan (Scottish Government, 2015);
- GEN 3: Social benefits: Sustainable development and use which provides social benefits is encouraged when consistent with the objectives and policies of this Plan (Scottish Government, 2015);
- Local (UK) Content Targets as set out in the Offshore Wind Sector Deal (see Section 4.2.2);
- Policy 77: Public Access (Highland Council, 2012);
- HM Treasury Green Book: Appraisal and Evaluation in Central Government (UK Government, 2013);
- Highland-wide Local Development Plan (HwLDP) (Highland Council, 2012); and
- Inner Moray Firth Local Development Plan (IMFLDP) (Highland Council, 2023).

18.2 Baseline

It is recognised that there have been significant changes to the socio-economic landscape since the previous EIA's were produced, due to the COVID 19 pandemic and changing global situations associated with Brexit and the invasion of Ukraine by Russia. Changes are ongoing; hence, it is deemed premature to present baseline data at this point. Current data will be utilised within the EIA (see Section 18.6).

18.3 Previous EIA – Impacts and Mitigation

An economic assessment conducted as part of the EIA for the proposed Phase 4 development at the PoCF revealed that there would be an overall positive benefit to the local community. Although all socioeconomic impacts associated with the construction of Phase 4 were assessed as positive, particularly with regard to local sourcing of materials, they were non-significant. Operational impacts, however, were assessed as positive and significant (Affric Limited, 2018).

As a result of the increased operations at the Phase 4 development, significant benefits to gross value added (GVA) associated with these onshore jobs was estimated, along with an increase in the number of full-time equivalent (FTE) jobs available (Affric Limited, 2018).

When considered in 2018 Phase 4's potential to support the offshore renewables industry, led to estimations that during the operational phase activities at the Phase 4 Development would create approximately 27.7 permanent FTE direct jobs locally. Those jobs had associated wages and salaries at that time of £11.36 million and GVA of £23.27 million. When taking into account indirect and induced impacts during the operational phase, activities at the Phase 4

Development could support approximately 42.2 FTE jobs locally with associated wages and salaries of £15.81 million and GVA of £34.60 million (Affric Limited, 2018).

In summary, once operational, Phase 4 had a positive significant impact on the economics of both the cruise ship and offshore renewables industries.

Consideration was also given to impacts on recreation and tourism during both construction and operational stages of the project. Adverse impacts were primarily on Linear Park users and the Invergordon Boat Club, taking account of the assessment undertaken for noise and LVIA it was concluded that effects would be adverse negligible non-significant.

18.4 Potential Impacts from Phase 5

As the construction of the proposed Phase 5 development is required to support the growing offshore renewables industries at the PoCF, it is anticipated that the impacts associated with socioeconomics during the construction of Phase 5, and once operational, will be similar to those assessed as part of Phase 4.

18.4.1 Construction

During construction, Phase 5 has the potential to have a positive impact by providing:

- Direct jobs associated with construction works;
- Local sourcing of materials; and
- Indirect jobs through the supply chain and service industry sectors.

In addition, there is a potential for social interactions with local residents and visitors to the area.

18.4.2 Operations

During operations, Phase 5 has the potential to have a positive impact by providing:

- Direct jobs and income associated with PoCF staff required to operate Phase 5;
- Direct jobs and income associated with the range of additional activity that can be accommodated/carried out at the service base;
- Indirect jobs and income through the supply chain.

The proposed Phase 5 development will be situated within the newly created Inverness and Cromarty Firth Green Freeport. The Green Freeport is a partnership of public and private sector organisations, including Highland Council, which aims to ensure the Cromarty Firth and wider region becomes a major global hub for green energy and decarbonisation whilst providing local benefits and investment including the provision of approximately 15,000 good-quality well-paid jobs over the next 10 years.

As discussed in Section 4.2.4 the Highland Council are updating their development plans. The Inner Moray Firth Delivery Programme was updated with 2023 information to support Inner Moray Firth Local Development Plan 2, currently being considered by Scottish Ministers, and it is anticipated that this will incorporate the Green Freeport. The development planning process will identify and facilitate required developments including those that relate human health aspects such as housing, education and transport at a regional level.

The Inverness and Cromarty Firth Green Freeport is expected to be operational by spring 2024. Once operational, it will attract jobs and investment. National insurance reliefs will be reinvested into training and some of the retained non-domestic rates generated will be reinvested locally into community infrastructure and services.

Phase 5, Invergordon, and the wider Cromarty Firth area are located within the Green Freeport, and as such will contribute to and benefit from the wider economic and social benefits, which will in turn benefit human health (see Section 22).

It is recognised that the development is on the edge of the village of Invergordon and hence could present social as well as economic issues, which also require consideration.

18.5 Scoping Assessment

It is anticipated that further positive, significant impacts will arise during the construction of Phase 5, and once Phase 5 is operational. In addition, there is the potential for social interactions with the local community which also need to be considered. As such, it is proposed that socioeconomics is **scoped-in** to the Phase 5 EIA.

18.6 Proposed Impact Assessment

A socio-economic impact assessment is proposed to address the following:

- Baseline to provide an understanding of:
  - The local economy, set in the context of Scotland as a whole;
  - Social aspects of the area such as recreational usages of open ground; and Facilities in the vicinity of the development.
- Consideration of construction impacts associated with:
  - Direct jobs associated with construction works;
  - Local sourcing of materials;
  - Indirect jobs through the supply chain and service industry sectors; and
  - Social interaction considerations.
- Operational impacts associated with:
  - Direct jobs and income associated with PoCF staff required to operate Phase 5;
  - Direct jobs and income associated with the offshore wind operational scenario;
  - Indirect jobs and income through the supply chain; and
  - Social interaction considerations.

The economic impacts will be measured in terms of:

- Employment;
- Income (earnings); and
- Gross Value Added (GVA).

19 Climate Change

Previous EIAs for developments at the PoCF have considered climate change impacts as part of other EIA Chapters. For example, GHG emission calculations for Phase 4 were included as part of the air quality topic, whilst flooding was considered as part of coastal processes.

For the purpose of the scoping exercise for Phase 5, GHG emissions only are considered within any prospective climate change EIA chapter. Impacts associated with flooding have been included as part of coastal processes (see Section 10).

19.1 Policy Frameworks & Legislation

Relevant policy and guidance which should be taken into account for Climate Change assessments include:

- GEN 5 Climate Change: Marine planners and decision makers must act in the way best calculated to mitigate, and adapt to, climate change (Scottish Government, 2015);
- GEN 14 Air quality: Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits (Scottish Government, 2015);
- The Fifth Carbon Budget: This report produced by the Committee on Climate Change (CCC) details carbon budgets within UK sectors, and identifies reductions that are required to meet the 100% reduction target by 2050 (Committee on Climate Change, 2015);
- Climate Change (Emissions Reduction Targets) (Scotland) Act 2019; and
- Institute of Environmental Management Assessment (IEMA) Guide: Assessing Greenhouse Gas Emissions and Evaluating their Significance 2nd Edition (IEMA, 2022a).

19.2 Baseline

Over the last few decades, Scotland's climate has warmed, rainfall patterns have become more variable, and sea levels have risen. This anthropogenically driven climate change is a result of GHG emission (Adaptation Scotland, 2021).

A measure of emissions or removals of GHGs in Scotland, including international aviation and shipping, estimated source emissions stood at 47.8 million tonnes of carbon dioxide equivalent in 2019; this equates to a fall of 43.8 percent between 1990 and 2019 and a fall of 2.3 percent between 2018 and 2019 (Scottish Government, 2021). Note 2019 data has been considered, as unprecedented conditions due to the Covid-19 global pandemic significantly affected emissions during the most recent reported period, 2020.

Rainfall in Scotland during the winter and autumn is predicted to increase due to climate change, while rainfall in the summer months will decrease (Adaptation Scotland, 2021). The East of Scotland tends to be drier than the West (Met Office, 2016), and drought events are predicted to increase over the next two decades. A handful of drought events are predicted for Invergordon and the surrounding areas between 2021 and 2040 (Kirkpatrick Barid *et al*, 2021).

19.3 Previous EIA – Impacts and Mitigation

19.3.1 Construction

As part of the Phase 4 EIA, sources of GHG associated with the construction works were described in terms of Carbon Dioxide Equivalents (CO_2e). To understand how CO_2e are used in assessments, there needs to be an understanding on global warming potential (GWP). GWP is the heat absorbed by any GHG in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide (CO_2). CO_2e is calculated from GWP. For any gas, CO_2e is the mass of CO_2 that would warm the earth as much as the mass of that gas. Thus, it provides a common scale for measuring the climate effects of different gases.

The amount of CO_2e was given in tonnes for each material used in the construction of Phase 4, and for the assumed transport distances of each material.

It was identified that approximately 15,760 tonnes of CO_2e would be emitted during the construction of Phase 4, which is equivalent to the annual carbon footprint of 2,584 people or 0.03% of the annual CO_2e for the whole of Scotland (for 2015, given the time of writing of the Phase 4 EIA). However, it was considered that as the development will last decades, the greenhouse gas cost should be spread over the development's operational lifespan, which is approximately 60 years. As such the development's GHG emissions were deemed to be non-significant. However, CO_2e emissions were still minimised wherever practicable.

19.3.2 Operations

As Phase 4 was developed to benefit the offshore renewables industry, as well as oil and gas IRM, it was considered that the operations of the port would contribute towards national and international targets relating to the reduction in GHG emissions.

Although it was not appropriate to claim credit for any carbon savings associated with offshore renewables in the Phase 4 EIA operational assessment, it was acknowledged that the contribution that Phase 4 may play in realising the potential of the offshore wind sector could have a beneficial effect.

19.4 Potential Impacts from Phase 5

19.4.1 Construction

To understand the impacts of the proposed Phase 5 development and its contribution to climate change, carbon calculations for construction are required. This will also allow all stakeholders to understand the full carbon lifecycle of the project when considering operational impacts of the development.

The main sources of GHG emissions over the project's lifecycle shall be associated with raw material extraction and manufacture of products required for construction, material transportation, plant movements and construction personnel commuting to and from the workplace.

19.4.2 Operations

During the operations of Phase 5, there shall be some carbon costs associated with the use of lighting, plant movements and personnel commuting to and from the workplace. However, GHG emissions associated with these aspects are not considered to be significant on a national level.

On the other hand, the benefits of offshore renewables with regard to their contribution to national and international targets, and to the reduction in GHG emissions, are well understood. As such, there are likely to be 'carbon savings' associated with the activities taking place at Phase 5, as the facilitation of offshore renewable infrastructure production and assembly will result in long-term carbon benefit once offshore windfarms are operational.

The specific carbon benefits of the renewables developments can't be attributed directly to this project, but it should be recognised that Phase 5 is vital to support the offshore wind sector, playing a significant part in the move towards net zero.

19.5 Scoping Assessment

It is recommended Climate Change is **scoped-in** to the EIA for Phase 5.

19.6 Proposed Impact Assessment

GHG emissions during the construction and/or operations of Phase 5 are not expected to be significant in national terms, especially when considering the operational lifetime of the facility. However, it is important to understand in the wider context of Phase 5's contribution to GHG emissions in combination with offshore wind. This shall allow the overall carbon costs and benefits of offshore wind to be understood.

Published CO_2e conversion factors will be utilised in conjunction with the raw material quantities and potential sources of GHGs to calculate the CO_2e associated with construction. Any assessment on anticipated GHG emissions during construction shall take into consideration the intrinsic carbon costs associated with the travel distances for material transportation (based on realistic assumptions of where materials may be sourced) and the amount of CO_2e contained within each material.

GHG emissions will not be calculated for operational scenarios as these are likely to be proportionate to the amount of work being carried out at any one time. As such, GHG emissions associated with operations are mainly under the control of PoCF and the stakeholders which utilise the ISB. However, they shall be discussed in qualitative terms to help describe the wider context of an operational Phase 5, in combination with offshore wind.

The assessment will be undertaken to ensure the development adheres to the relevant policy frameworks and legislation, and opportunities to minimise CO_2e are identified and maximised.

20 Archaeology & Cultural Heritage

Although archaeology and cultural heritage assets were scoped out of the Phase 4 EIA due to a lack of direct and indirect impacts, consideration was given to them in the Phase 3 EIA. Consideration to archaeology and cultural heritage assets within the Phase 3 EIA were with regards to impacts on asset setting as no known assets would be directly impacted.

This section explores the need to include the impacts on setting for assets previously assessed as part of the Phase 3 EIA and located close to the ISB.

20.1 Policy Frameworks & Legislation

Relevant policy and guidance include:

- GEN 6 Historic environment: Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance (Scottish Government, 2015);
- PAN 2/2011: Planning and Archaeology (Scottish Government, 2011b);
- Managing Change in the Historic Environment: Setting (Historic Scotland, 2016); and
- Protocol for Archaeological Discoveries for Offshore Renewables Projects (The Crown Estates, 2010).

20.2 Baseline

20.2.1 Assets Located within the Development

A review of PastMaps identified that there have been a number of shipwrecks recorded in the Cromarty Firth over the years, however the majority of these have been salvaged due to the value of the vessels and/or cargo, and to maintain safe navigation within the shipping channels. No records of residual wrecks were found in the proposed location of the development.

Although there are other items listed in the historic records with 500m of the development site, none are situated on the site itself.

20.2.2 Assets Located Close to the Development Setting

20.2.2.1 Thief's Stone

The Clach a'Mheirlich or the Thief's Stone is a Schedule Monument Index Number 1675; (Highland Council ID: MHG14745). It is a Class I seventh to ninth century symbol stone. The Thief's Stone is set on flat ground on the edge of an arable farmed field. The ground to the north of the stone slopes upwards to a rise before dipping. To the south of the stone is a footpath, the B817, the Invergordon Boating Club and the Cromarty Firth. The town of Invergordon and the ISB are located to the east and southeast of the Thief's Stone (Figure 20.1). A railway line runs east-west to the north of the stone.

20.2.2.2 Old Rosskeen Parish Church and Burial Ground

The Old Rosskeen Parish Church and Burial Ground are afforded listed building status (A), identification no. 15040, covered by Highland Council records MHG22559 (Mausoleum), MHG17561 (Church) and MH16255 (Graveyard). The church and burial ground are likely to date back to medieval times. The Old Rosskeen Parish Church and Burial Ground are on the north side of the railway line, approximately 1km to the northwest of the proposed development (see Figure 20.1). The graveyard slopes up hill to the north behind the church and mausoleum, as such the top of the graveyard has views over the railway embankment to the Cromarty Firth.

Figure 20.1: Location of the Thief's Stone (green circle) and the Rosskeen Parish Church and Burial Ground (red circle) Relative to the ISB (Grid 68, south of Cromlet)

20.2.2.3 Newhall Point Site of Chapel and Burial Ground

A site of a chapel and circular burial ground at Newhall Point, Balblair, is designated as a Scheduled Monument, Index Number 5950 (Highland Council ID:MHG8766). The chapel has never been located but is thought to be early medieval to medieval, potentially Pre-reformation. Although the chapel has never been found, worked stone utilised in neighbouring buildings may have been reused from the chapel. The circular burial ground has been subject to trial excavations and rescue excavations, the later required due to the construction of a new property. Carbon dating of skeletons showed them to be 10th-11th century. No articles were recovered from the east to west and north to south orientated remains (Highland Council 2013b). The site is to the south and west of houses in Newhall Point which prevent intervisibility with the service base, as such it will not be considered further.

20.3 Previous EIA – Impacts and Mitigation

20.3.1 Construction Impacts and Mitigation

As desk-based studies did not identify any archaeological or cultural heritage assets within the proposed development area, no direct impacts from construction were identified.

However, due to the potential for previously unidentified items to be found on the seabed it was previously proposed that a Protocol for Archaeological Discoveries aligning to the Crown Estates (2010) guidance: Protocol for Archaeological Discoveries for Offshore Renewables Projects was included within the Schedule for Mitigation for inclusion within the CEMD for the project.

20.3.2 Operational Impacts and Mitigation

The Phase 3 EIA identified operational impacts on the settings of the assets identified in Section 20.2: Baseline.

20.3.2.1 Thief's Stone

Within the Phase 3 EIA, the intervisibility between the Thief's Stone and the proposed development was identified as low, as it was screened by trees and the Invergordon Boat Club facility. A landscape and visual impact assessment and associated visualisation photomontages included this viewpoint and gave an indication of how little of the development will be seen from the stone. It was therefore assessed that the Thief's Stone would be subject to very low impact by the Phase 3 development and as such minor non-significant effect was predicted.

20.3.2.2 Old Rosskeen Parish Church and Burial Ground

Within the Phase 3 EIA, it was identified that the church and burial ground would be well-screened from the development by the railway line, bridges, embankment and trees, to the extent that it will not be possible to see the development from the asset. Impacts on the setting were deemed to be very low, short-term, and reversible therefore minor non-significant effects were concluded.

20.4 Potential Impacts from Phase 5

20.4.1 Construction

Desk studies and bathymetry studies of the area have not identified any items within the potential construction area. Hence no direct significant impacts on known assets are predicted. There remains a potential for unknown articles to be disturbed by the works.

20.4.2 Operations

As the proposed Phase 5 development is to be located further west than that of the Phase 3 development, and there is the potential for increased intervisibility especially if fully assembled floating wind turbines are located on the berth. This could give rise to impacts on the setting of historical assets.

20.5 Scoping Assessment

It is proposed that with mitigation construction impacts on Archaeology & Cultural Heritage are scoped out for construction.

As the Phase 5 development is proposed to be located further west than the Phase 3 development, operational impacts on the setting of the Thief's Stone and the Old Rosskeen Parish Church and Burial Ground assets need to be considered. As the effects are primarily associated with visual impacts, the two assets shall be specifically considered in the LVIA chapter. If ZTV studies demonstrate significant intervisibility between Phase 5 and the assets, then an assessment on setting will be completed. It is not proposed that a stand-alone Archaeology and Cultural Heritage chapter will be included in the EIAR, and hence the topic is **scoped out**.

20.6 Proposed Impact Assessment

To help understand the potential impacts of asset setting for the Thief's Stone and the Old Rosskeen Parish Church and Burial Ground, these assets will be included in the LVIA conducted for the proposed Phase 5 development as described in Section 14.6. If, there is notable visual impacts then an assessment on setting will be completed.

20.7 Mitigation

There is always a risk of identification of previously unidentified artifacts, as such an Archaeology Protocol aligning to the Crown Estates (2010) guidance: Protocol for Archaeological Discoveries for Offshore Renewables Projects will be in place for the construction works as identified in Section 25.

21 Major Accidents and Natural Disasters

Phase 3 & 4 EIAs did not contain specific information related to Major Accidents or Natural Disasters as they were completed under the previous EIA regulations. As such, this has been newly assessed for Phase 5.

Following Institute of Environmental Management Assessment (IEMA) guidelines, a major accident can be caused by both man-made and natural hazards, and may be defined as:

> 'A major accident is an event, such as a train derailment or major road traffic accident, which threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment, and requires the use of resources beyond those of the client or its appointed representatives (i.e., contractors) to manage.' (IEMA, 2022).

21.1 Policy Frameworks & Legislation

Relevant policy and guidance which should be considered for Major Accidents & Natural Disaster assessments include:

- Control of Major Accident Hazards (COMAH) Regulations; and
- Major Accidents and Disasters in EIA: A Primer - IEMA Guidelines (IEMA, 2020; 2022).

21.2 Baseline

Several existing potential sources of man-made and natural hazards that could contribute to major accidents have been identified. These are detailed in turn within the following sections.

21.2.1 Biological Hazards

With PoCF serving offshore industries and the cruise ship sector, relevant biological hazards primarily relate to communicable human diseases. The introduction of disease agents via movement of workers and leisure users associated with the port has the potential to result in outbreaks of illness in the local population and contribute to wider spread. Two specific examples, norovirus and SARS-CoV-2 (the causative agent of Covid-19) are discussed further below.

Within the last 10 years, there have been a handful of incidents involving cases of norovirus outbreaks associated with the cruise ship industry. Some of the cruise ship vessels which have experienced norovirus outbreaks over this time period have subsequently berthed at the ISB. As outbreaks were contained within the vessels themselves, they did not impact the local community. Gastrointestinal illnesses including noroviruses are associated with cruise ships and as health officials track illnesses on cruise ships, outbreaks are found and reported more quickly negating the requirement for further incident management.

While there are currently no Covid-19 management measures in force in the UK (UK Government, 2023), Covid-19 is an ongoing consideration. If an incident occurred aboard a vessel docking at the ISB, appropriate steps would be taken. For example, a crew of a Norwegian ship berthed at the ISB were instructed not to leave the vessel after a number of confirmed cases of Covid-19 on board in 2020. As such, there was no risk to the wider community and no requirement for further incident management.

21.2.2 Fires

No fires have occurred at ISB during the last five years. There are, however, flammable materials in the form of fuel oils stored on the ISB. These are appropriately managed in line with the Water Environment (Controlled Activities) (Scotland) Regulations 2011 as amended.

21.2.3 Malicious / Terror Attacks

Although the ISB is not considered to be at risk from terror attacks, Extinction Rebellion activists have previously blockaded the main entrance to the ISB. The blockade and subsequent protest were made in the run up to the Conference of the Parties 26 (COP26) climate summit in Glasgow in November 2021. Since then, no further incidents have occurred. The PoCF have appropriate security arrangements in place to minimise the chance of, and if need be, manage incidents if they occur.

21.2.4 Natural Disasters

There have been no recorded incidences of natural disasters occurring within the Cromarty Firth or surrounding areas.

21.2.4.1 Earthquakes

While earthquakes are occasionally recorded in Scotland, particularly around the Great Glen Faultline and Comrie in Perthshire (Musson, 2007), the most recent record of a significant earthquake (measuring 5.1 on the Richter Scale) within the vicinity of PoCF was in 1816 near Inverness (British Geological Survey, 2022).

21.2.4.2 Extreme Weather

Storm events bringing strong winds are a relatively regular occurrence for the Highland region. Over the last two years, there have been at least two Met Office recognised storm events bringing storm-force winds to the area, with 2022 storms seeing gusts of 70-80mph recorded widely across monitoring stations in Scotland (Met Office, 2023).

Periods of drought are also a known occurrence, as across much of the UK. SEPA monitoring and reporting through their Water Scarcity Report shows the nearest monitoring station, Newhall Bridge, to have experienced periods of low to very river flows in the last 180 days (SEPA, 2023). Periods of drought increase the risk of wildfires, and also flooding in the event of subsequent heavy rainfall.

Coastal flooding associated with weather events is also an identified risk. As detailed in Section 10.2.2 Flood Risk, the majority of the coastline around the proposed Phase 5 development is classified by SEPA as having a high likelihood of coastal flooding, defined as a 10% chance of flooding each year (SEPA 2022c).

21.2.5 Transport Incidents

Vehicles attending facilities at the ISB do so via the local road network, and vessels utilise established navigation routes according to the port's Marine Safety Management System (MSMS). Baseline information on shipping movements and traffic safety is provided in Section 16: Navigation and Section 17: Access, Traffic and Transport.

21.3 Potential Impacts from Phase 5

The IEMA guidance Major Accidents and Disasters in EIA: A Primer (IEMA, 2020) scoping decision process has been followed in considering the potential impacts of the proposed Phase 5 development. As detailed in Figure 21.1, the decision flowchart considers whether a development is itself a source of hazard, or equally whether it interacts with any external hazard sources, that could result in a major accident/disaster. Where a hazard source or interaction is identified, it is then considered whether the hazard is adequately controlled through the project design and legislative/standards requirements relating to the development or is assessed within another EIA topic. If so, the hazard can be scoped out of further consideration. If a hazard is not controlled or assessed elsewhere in the EIA, it requires inclusion as a Major Accidents and Disasters topic.

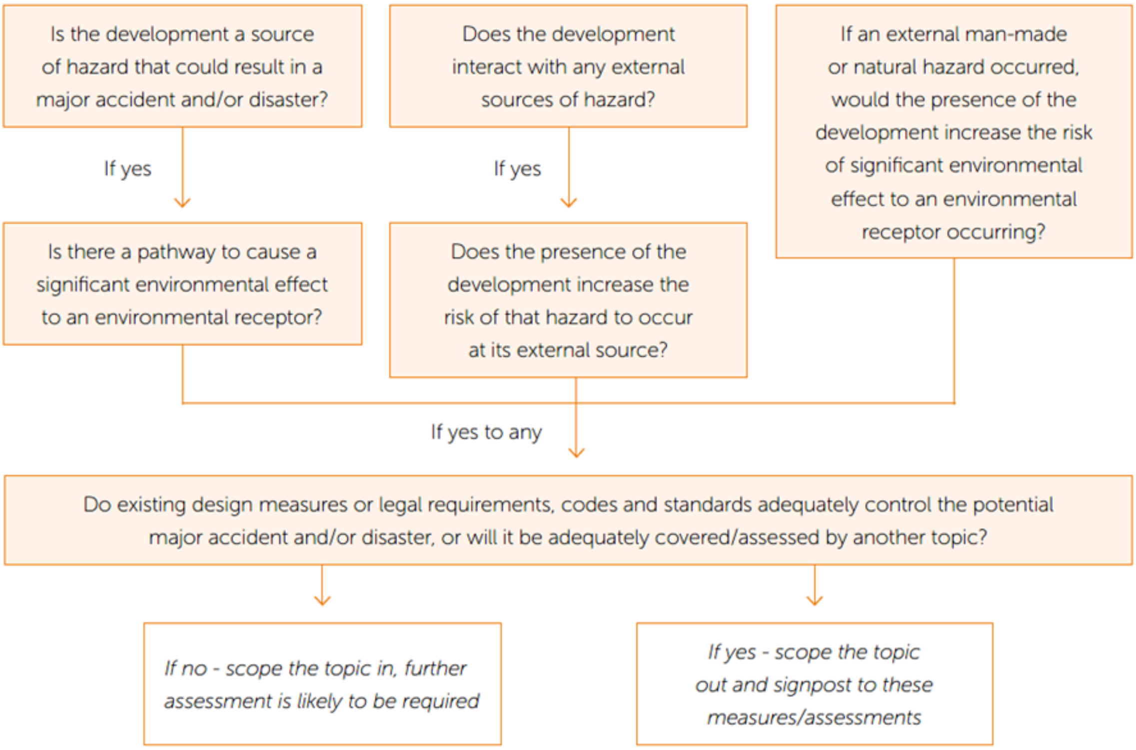

Figure 21.1: IEMA Scoping Decision Flowchart (IEMA, 2020)

A list of potential major accidents and disasters has been developed and considered in terms of how the location and proposed use may affect the risk of each scenario occurring. This is presented in Table 21.1. As per IEMA guidance (IEMA 2020), whether each accident or disaster scenario is controlled or assessed elsewhere within the EIA is considered. Where relevant, Table 21.1 signposts to design measures, legal requirements, codes and standards or other sections within this document.

Table 21.1. Major Accidents & Natural Disaster – Potential Impacts

Major Accidents and Disasters	Location Risk	Proposed Use Risk	Comments	Design Measures or Legal Requirements, Codes and Standards (if applicable)	Topic Section (if applicable)	Scope In / Out
Epidemic / Pandemic	Yes	No	The potential for the introduction of diseases such as norovirus are managed by Vessel Sanitation Programmes. As these are more closely related to the Cruise Ship industry, no new potential impacts are identified. In addition, the PoCF has management procedures in place to deal with disease outbreaks which could impacts human health.	The Public Health (Ships) (Scotland) Regulations 1971 (as amended).		Out
Biological Hazards: Animal / Insect Infestation	No	Yes	No major disaster sources identified. Risk of non-native invasive species introduction has been considered.		Section 13.2	Out
Fire	No	No	Development does not introduce new fire sources which are not already present on site. No new potential impacts identified.			Out
Displaced Population	No	No	There is no evidence to suggest that Phase 5 could contribute to displacement of populations surrounding the development.			Out
Terror / Malicious Attacks	No	No	The development is not considered to increase the risk of terror attacks.			Out
Earthquakes	No	No	Earthquakes are unlikely to occur at the scale in which significant impacts could occur. Therefore, no new potential impacts have been identified.			Out
Severe Storms	No	No	The ISB location provides a sheltered waters protecting it from the worst effects of severe storms.			Out
Coastal Flooding	Yes	No	No significant flood risk is identified due to the nature of the Phase 5 development.	Design of development to mitigate risk of coastal flooding.	Section 10	Out

Major Accidents and Disasters	Location Risk	Proposed Use Risk	Comments	Design Measures or Legal Requirements, Codes and Standards (if applicable)	Topic Section (if applicable)	Scope In / Out
Transport Incidents: Road Vehicles	No	No	No major incident sources identified. A project-specific Construction Traffic Management Plan will be developed for the construction phase.		Section 17	Out
Transport Incidents: Shipping	Yes	Yes	Vessels movements within PoCF, including operations associated with Phase 5 (e.g., tugs, floating wind turbines) could result in a shipping incident. However, vessel movements will be controlled under PoCF Marine Safety Management System.	Port Marine Safety Code; and International Regulations for Preventing Collisions at Sea 1972 (as amended).	Section 16	Out
Transport Incidents: Aviation	No	Yes	The largest wind turbines that could be berthed on Phase 5 could in theory cause issues for aviation.		Section 23	Out

21.4 Scoping Assessment

It is proposed that Major Accidents & Natural Disasters be **scoped out** of the Phase 5 EIA. This is on the basis that all locational or use risks identified are adequately addressed by existing legislation or other topics within this report, as detailed in Table 21.1.

22 Human Health

As defined in the World Health Organisation's (WHO) constitution, health is a state of complete physical, mental, and social wellbeing, not merely the absence of disease of infirmity (WHO, 1946). From an EIA perspective, public health is considered in terms of both potential positive and negative impacts on the health of the population. Health and safety for employees is covered under other regulatory frameworks and is not considered within an EIA.

The new IEMA Guide to Effective Scoping of Human Health in EIA (IEMA, 2022a) has provided the framework for this scoping assessment. No external stakeholder engagement has been carried out as input from the local council board has been deemed not appropriate at this stage due to the nature of the project and potential effects. The Scottish Public Health Observatory (ScotPHO) website has been utilised as a source of relevant information with regards to the health of the Scottish Public (ScotPHO, 2023).

22.1 Baseline

As discussed in Section 2.1, the project will be situated at the Invergordon Service Base (ISB), located on the coast of the town of Invergordon. Scoping will consider population health influencing factors such as behavioural, social, economic, and bio-physical factors for the site-specific workforce at ISB, the local population of the town of Invergordon and the wider regional population.

There are a range of clinical, behavioural and lifestyle risk factors which impact upon human health. A 2009 report from WHO identified five behaviours which contribute to approximately 90% of the total burden of disease in high income country populations. These are noted as tobacco use, alcohol consumption, poor diet, physical inactivity and, overweight and obesity, all of which have an impact on the health and wellbeing of people living in Scotland. For example, 63% of the adult population are categorised as "overweight including obesity" resulting in health care impacts with an estimated economic cost of £4.6 billion per year (ScotPHO, 2023).

The sum of these contributing factors results in Scotland having one of the lowest life expectancies in Western Europe with the life expectancy at birth for males being 76.6 years, on average and females being 80.8 years, on average. In the Highland National Health Service (NHS) area, life expectancy is slightly higher than the Scottish average at 77.6 years and 81.9 years for males and females respectively. In addition, deprivation also has an impact on health, wellbeing, and overall life expectancy and at present, almost one in five working age adults in Scotland live in poverty (ScotPHO 2023).

Those living in deprived areas are less likely to meet five-a-day recommendation for daily fruit and vegetable consumption and are less likely to be physically active, resulting in higher body mass index and a higher risk of obesity related illness. Neighbourhood satisfaction is also lower in urban and deprived places, and more disadvantaged groups are more likely to be impacted by aspects of the physical environment (such as climate change and traffic congestion) (ScotPHO, 2023).

The Scottish Index of Multiple Deprivation (2020) identifies places in Scotland where people are experiencing disadvantage across different aspects of their lives. Areas defined as deprived relate to people having a low income and/or an area with fewer resources and opportunities. Invergordon is shown on this index as having an area within the town with most deprivation.

22.2 Potential Impacts

The IEMA Guide to Effective Scoping of Human Health in EIA proposes a list of determinants of health to be considered in scoping and a number of steps to be undertaken to identify whether any of the determinant factors should be scoped into the EIA. In the first instance there needs to be a source – pathway – receptor linkage to make an impact likely. Where determinant factor is likely to occur, then the scale of the change be it positive or negative needs to identify if it could be significant. In the event that a negative effect could be significant, then committed mitigation can be taken into account to identify if it can be scoped out. In the event of a potentially positive effect, consideration is given to whether committed enhancements are sufficient to maximise the benefits, if they are the topic can be scoped out (IEMA, 2022a). Table 22.1 provides a list of determinants, identifies if there is a likelihood of an effect, considers significance and present the committed mitigations / enhancements to inform the scoping in or out of each determinant.

Table 22.1: Consideration of Potential Human Health Effects

Categories	Wider Determinants of Health	Likelihood (Source, Pathway, receptor)	Comments	Significance (Positive or Negative)	Committed Mitigation/ Enhancements	Scoped In/ Out
Health Related Behaviours	Physical Activity	None	The development does not have any elements which would give rise to any direct change in health-related behaviours of the population.			Out
	Risk Taking Behaviour	None				Out
	Diet and Nutrition	None				Out
Social Environment	Housing	Potential during construction.	Increased demand for housing due to an influx of workers. This could put pressure on housing availability but could also increase the status of housing stock due to increased demand.	Positive and negative – non-significant.	The development is in the Green Freeport area and will benefit from the wider planning to manage the associated housing requirement that the additional jobs may bring (see Section 18.3.2).	Out
	Relocation	Potential during construction.	Temporary relocation during construction. Influx of new people into a community can cause concerns and conflict.	Negative – non-significant.	The development area is in the Green Freeport and will benefit from the wider planning to manage the issues associated with relocation the jobs may bring (see Section 18.3.2).	Out
	Open space, leisure, and play	None	The development is not located in an area where it will impact upon availability of open space, leisure or play.			Out
	Transport modes, access, and connections	None	The development is situated on the edge of the town and no connectivity expected.			Out
	Community safety	None	No linkages from the project to these determinants have been identified.			Out

Categories	Wider Determinants of Health	Likelihood (Source, Pathway, receptor)	Comments	Significance (Positive or Negative)	Committed Mitigation/ Enhancements	Scoped In/ Out
	Community identity, culture, resilience, and influence	Potential as part of the wider Green Freeport project.	Feeling of pride belonging to a town involved in the promotion of green energy and decarbonisation.	Positive	See Section 18.3.2.	Out
	Social participation, interaction, and support	None	No linkages from the project to these determinants have been identified.			Out
Economic Environment	Education and training	Potential during construction	Potential for apprenticeships and further training during construction.	Positive	Further opportunity with the Green Freeport development (see Section 18.3.2).	Out
	Employment and income	Potential during construction	Employment opportunities during construction and operations and opportunities within the supply chain.	Positive	Further opportunity with the Green Freeport development (see Section 18.3.2).	Out
Bio-physical Environment	Climate change mitigation and adaptation	Potential operational	Climate change taken account of within design see Sections 10 and 19, to prevent issues such as flooding.	Non-significant		Out
	Air quality	None	Air quality is considered in Section 8 with no significant effects identified and therefore no knock-on health implications.			Out
	Water quality or availability	None	Water quality is considered in Section 9 with no significant effects identified and therefore no knock-on health implications.			Out
	Land quality	None	Ground conditions is considered in Section 11 with no significant effects			Out

Categories	Wider Determinants of Health	Likelihood (Source, Pathway, receptor)	Comments	Significance (Positive or Negative)	Committed Mitigation/ Enhancements	Scoped In/ Out
			identified and therefore no knock-on health implications.			
	Noise and vibration		In-air acoustics is considered in Section 6 with no significant effects identified and therefore no knock-on health implications.			Out
	Radiation	None	The development does not give rise to any radiation.			Out
Institutional and Built Environment	Health and social care services	Potential during construction.	Potential increase in demand during construction and operations due to additional jobs.	Negative – non-significant.	The development is in the Green Freeport area and will benefit from the wider planning to manage the issues associated with increased demand that the jobs may bring (see Section 18.3.2).	Out
	Built environment	None	No linkages from the project to these determinants have been identified.			Out
	Wider societal infrastructure and resources	Potential during operation	As part of the wider Green Freeport development, Phase 5 will form part of the hub for producing green energy.			Out

22.3 Scoping Assessment

It is proposed that human health is **scoped out** of the Phase 5 EIA the basis that the potentially significant effects are positive and are being considered as part of the wider Green Freeport development.

22.4 Mitigation

Mitigation and enhancements identified through the assessment of socio-economic effects will help to minimise negative and maximise positive health effects associated with the project.

23 Aviation Consideration

Impacts on aviation have not previously been considered as part of the Phase 3 or 4 EIAs, as there were no identified interactions. The potential for the commissioning of offshore wind turbines alongside Phase 5, due to their height does require consideration in terms of interaction with radar systems and physical interactions with aircraft.

23.1 Policy Frameworks & Legislation

The Civil Aviation Authority (CAA) regulates aviation in the UK, they produce Civil Aviation Publications (CAP), which provide policy and guidance. CAA Policy and Guidelines on Wind Turbines (CAP 764) includes a recognition of the need to co-exist, while ensuring that safety is not compromised (CAA, 2016). CAP 738 Safeguarding of Aerodromes is also relevant to the project (CAA, 2020).

UK Air Regulations are underpinned by Acceptable Means of Compliance (AMC), Guidance Material (GM) and, where appropriate, Certification Specifications (CS) these provide the framework for minimising risks.

23.2 Baseline

Highlands and Islands Airports Limited (HIAL) operated Inverness airport is located at Dalcross around 11.5 miles south of the ISB. In addition to accommodating commercial and private flights at Dalcross, both air ambulance and coastguard helicopter services are based there. The helicopter regularly lands at Raigmore Hospital and other landing sites around the Highlands.

Highland Council operate the Dornoch Airfield located approximately 14 miles northeast of ISB. The grass landing strip is used by private light aircraft and model aircraft enthusiasts. The Ministry of Defence has bases on the Moray coastline. Military operations are known to be undertaken over the Cromarty Firth and the surrounding area.

The topography of the local area ranges from sea level to 1046m (3,432ft) at the top of Ben Wyvis as can be seen in Figure 23.1. The average elevation on the Black Isle; which is the area of land between Inverness airport and PoCF, is 200m (Topographic Map, 2023).

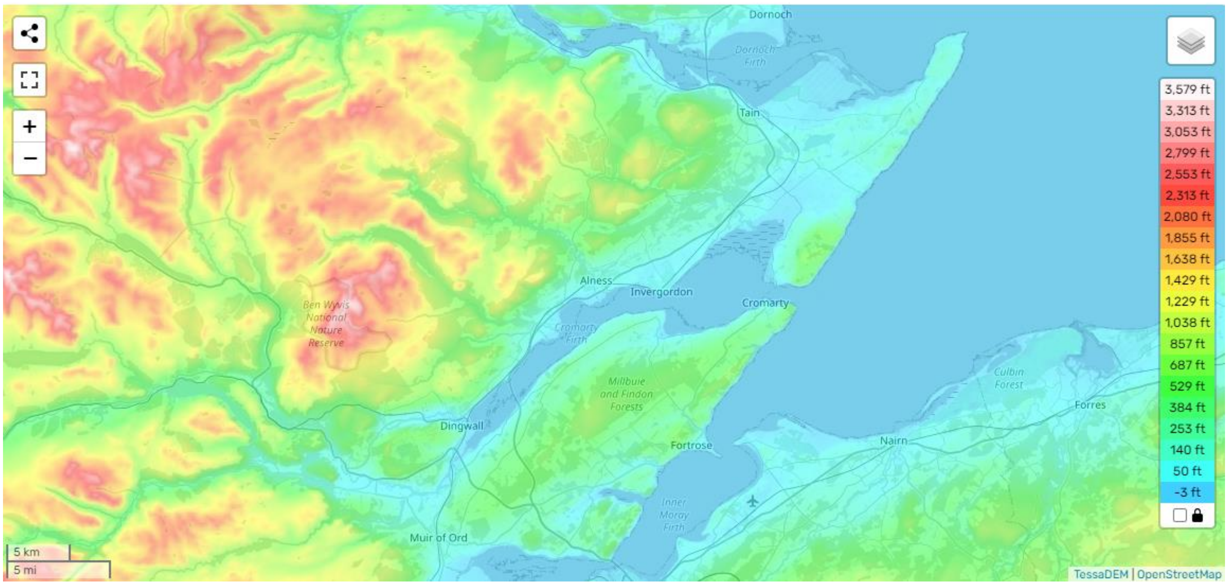

Figure 23.1 Black Isle Topographic Map (Topographic Map, 2023).

23.3 Potential Impacts from Phase 5

23.3.1 Construction

No impacts on aviation are predicted during the construction of Phase 5.

23.3.2 Operations

The Phase 5 elements subject to EIA will not pose any risk to aviation due to their low-lying nature. However, if it is to be utilised to assemble offshore wind turbines, then they components being erected are very tall and could interact with aviation.

There is potential for up to 4 full height floating wind turbines located on berths at any one time. These wind turbines could have tip heights of 330m (1082ft), they will not be fully operational. However, during pre-commissioning activities, there will be controlled movement of blades for one turbine at a time for short periods. Thus, impacts that may occur as a result are as follows:

- Physical presence giving rise to a collision risk;
- Unwanted radar returns; and
- Unwanted communication, navigation, and surveillance (CNS) returns.

As shown in Figure 23.1, the hills to the north and west of the port are over 330m high, however the land to the south and east is lower, hence it is physically possible for aircraft to be flying at heights which could give rise to a collision risk if appropriate mitigation isn't in place. Full data on local civilian and military radar systems has not as yet been collated to provide an understanding of possible unwanted radar and communication returns.

23.4 Scoping Assessment

it is recognised that the structures associated with the Phase 5 development do not pose a risk to aviation, rather the potential use to assemble wind turbines may.

The CAA recommend pre-planning consultation is carried out with both civilian and military aviation stakeholders. PoCF propose to undertake consultation to discuss potential operational scenarios to understand the extent of any aviation issues and how they can be overcome. Once Phase 5 is constructed and a developer has firm plans for the use of the facility, specific discussions will be required with the relevant stakeholders to allow specific arrangements to be made. As such it is proposed that Aviation is **scoped out** of the EIA on the basis that the issue will be addressed in parallel with the appropriate stakeholders.

23.5 Mitigation

A programme of consultation to be carried out with relevant aviation stakeholders including:

- Highland and Islands Airports Ltd;
- Maritime and Coastguard Agency;
- Bristow's (operator of helicopters for MCA);
- Scottish Ambulance Service;
- Highland Council;
- Ministry of Defence; and
- Civil Aviation Authority.

A route map to be utilised by offshore windfarm developers planning on utilising the port will be developed to facilitate compliance with the appropriate legislation, guidance and requirements to ensure stakeholder acceptability and if necessary, agreement for specific planned activities.

24 Cumulative Impacts

To be able to consider the proposed Phase 5 development in a meaningful way, the effects need to be considered in parallel with other proposed developments that are planned or committed within the local or regional area. This needs to be within a realistic geographical range in terms of the type of impact and foreseeable in terms of delivery, i.e., will have planning consent or marine licensing.

As the number and nature of cumulative impacts may change between the submission of this scoping report and the submission of the EIA, this section outlines only how potential cumulative impacts associated with the proposed Phase 5 development will be assessed as part of the EIA.

24.1 Offshore Developments

The main project types that are anticipated to be considered include the following:

- Ports and harbour developments within the Moray Firth area;
- Offshore renewable energy developments in the North Sea primarily, this may include projects in the ScotWind and INTOG leasing rounds;
- Offshore energy related projects including for example the development of wet storage of turbine substructures; and

- Subsea pipelines and cables in the Cromarty Firth.

At this point it is thought unlikely that there will be any oil and gas, carbon capture, aquaculture or aggregate extraction (excluding dredging) projects that are likely to give rise to cumulative effects with Phase 5, if any are identified they will be considered.

24.2 Onshore Developments

Onshore developments which could rise to cumulative impacts with the Phase 5 development are anticipated to include:

- Onshore wind developments within 50km, due to the potential landscape and visual impacts;
- Other major developments close enough to have impacts on the same receptors (fauna or human);
- Onshore port related developments within the Moray Firth; and
- Potentially non-major developments in the immediate vicinity of Phase 5, which could impact upon the same receptors, note this is unlikely to include residential alterations or developments of less than 5 houses.

24.3 Proposed Environmental Impact Assessment

IEMA suggest that a useful ground rule is that the environmental effects of any development that is already built and operational is effectively included within the environmental baseline that is being assessed in the EIA, so are excluded from the cumulative impact assessment, otherwise there would be double counting. The projects that are either in the planning process (including Marine Licencing) or consented but not yet developed need to be considered. Any projects that are earlier in the development process (i.e., prior to consent submission) can be discounted as that developer will be responsible for taking the effects of this project into consideration in their own EIA, and there is unlikely to be sufficient information to make a meaningful assessment.

In order to identify those projects which should be included in terms of cumulative assessment, a review of the Highland Council ePlanning web portal and Marine Directorate's register of current projects will be undertaken.

Once relevant projects have been identified, a review of their potential effects will be completed to understand whether they could be impacting upon the same receptors as the Phase 5 development. The findings of which will be recorded within the EIAR. Cumulative assessment will be considered for the relative topic areas utilising the information publicly available of the relevant projects. Where required mitigation measures will be outlined under each of the topics assessed within the EIA for Phase 5.

25 Initial Schedule of Mitigation

A summary of the proposed mitigation measures for the Phase 5 development is provided in Tables 25.1 & 25.2 for construction and operations respectively.

Table 25.1: Proposed Construction Mitigation Measures

Topic	Mitigation Measures	Reference
Air Quality	Dust Management Plan to be developed and implemented, including appropriate measures such as: • Vehicles entering and leaving the site will be covered to prevent escape of materials during transport. • Delivery vehicles will follow designated routes over made surfaces, as far as practicable. • Road sweepers will be employed as required to minimise the spread of material through the ISB, and if need be, onto the public road. • Appropriate planning to minimise the number of times material is moved and the time material is stored. • Materials stored on site will be minimised where practicable by utilising a just in time delivery system. • Revetment materials will be supplied as fines free as practicable and placed promptly. • Infill materials will be kept moist to avoid dust arisings until they have been covered by geotextiles or surfacing; this is likely to require the use of mobile water bowsers or water jets in dry weather conditions to damp down infill material.	Section 8
Water Quality	An Environmental Clerk of Works (ECoW) will observe the start of each activity that could give rise to increased sediment in the water column to ensure that any plumes arising are localised and disperse quickly. If increases in sediments are not as predicted, the construction technique will be reviewed to identify areas for improvement to prevent reoccurrence.	Section 9
	Appropriate isolation will be ensured prior to commencement of infilling. Arrangements will be reviewed as infilling works progress, to ensure sufficient residence time is maintained to allow materials to drop out.	
	All works will be carried out in accordance with the Code of Practice on Non-Native Species, adopting a precautionary approach to minimise the risk of releasing non-native species. Risk assessments relevant to planned activities will be completed and advice sought on best practice as necessary. Presence of non-native species will be reported.	
	All vessels visiting Phase 5 during construction are expected to be compliant with the relevant requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 and where appropriate follow Guidelines for the Control and Management of Ships Biofouling to Minimize the Transfer of Invasive Aquatic Species (Marine Environment Protection Committee, 2011).	
Terrestrial Ecology – Otter	Otter Species Protection Plan to be put in place detailing measures to prevent entrapment, injury and disturbance of otter.	Section 12.3
	Prior to construction works commencing a pre-construction otter survey will be carried out to understand current activity levels in the area and potential for holts and layups within 200m of the construction site.	
	Immediately prior to rock armour being removed it will be visually inspected to ensure that otters are not present. Rock armour will only be removed on the agreement of the ECoW.	

Topic	Mitigation Measures	Reference
	If a resting place is found during the survey or visual inspection, works will be delayed until an appropriate way forward has been agreed with NatureScot and an EPS License obtained if necessary.	
Marine Ecology – Fish Ecology	No dredging and dredged spoil deposit operations will take place during the month of May.	Section 13.3
Marine Ecology – Marine Mammals	Dredge Disposal Marine Mammal Protocol will be agreed through the Cetacean EPS licencing process to be implemented for all marine mammals.	Section 13.4
	Piling Marine Mammal Protocol will be agreed through the Cetacean EPS licencing process to be implemented for all marine mammals.	
	All vessels will follow guidance set out in NatureScot's 'Scottish Marine Wildlife Watching Code' (2017).	
Materials & Waste	Where practicable a high recycled content will be sought, this is applicable primarily to steel material, noting that the appropriate engineering standards will also need to be met.	Section 15
	Reuse of rock armour removed from existing phases during construction.	
	Rock, stone and infill material will be delivered on a 'just in time' basis as far as practicable. If rock or stone needs to be stored it will be on an appropriate area, such that surface water arising will not flow directly to the sea.	
	Potential utilisation of fencing to prevent use of stored materials by ground nesting birds or otters.	
	Fuel storage will be under strict management controls to prevent pollution incidents, maintain security and to comply with the requirements of CAR (GBRs 26 and 28). Fuel bowsers will be double skinned and stored in appropriate areas away from watercourses and drains and avoiding collision risk. Storage will be locked when not in use.	
	Refuelling will be carried out in designated areas, by trained operatives following site refuelling procedures. The refuelling procedure will take into account requirements under CAR and best practice laid out in GPP2 and PPG6.	
	Where practicable, bio-degradable hydraulic fluids will be utilised in machinery during construction. All oils and chemicals will be subject to Control of Substances Hazardous to Health (COSHH) assessments under the COSHH Regulations 2002. All COSHH assessments will include a section on the environment to highlight any precaution or mitigation requirements.	
	Appropriately bunded oil and chemical storage cabinets will be provided on site. These will be kept locked, with the key under management control to ensure appropriate use and accountability. Spill kits and procedures will be in place.	

Topic	Mitigation Measures	Reference
	An appropriate Site Waste Management System (SWMS) will be put in place by the construction contractor. It will ensure that appropriate records are kept for all waste arisings including volumes, categories and waste carriers used, and that waste transfer notes will be retained.	
	The SWMS will be based around the waste hierarchy and, as such, every effort will be made to minimise waste arisings, and to reuse materials on site. Where this is not practicable, the next step down the waste hierarchy is recycling. Recycling will be facilitated by the segregation of wastes. Clearly marked and labelled waste receptacles will be provided in designated areas. Waste receptacles (bins and skips) will incorporate lids or covers to protect against vermin gaining access and wind blowing wastes out of skips. Wastes suitable for recycling are likely to include wood, metals, paper, plastics and oils.	
	A suitable licensed waste contractor will be employed to collect wastes for recycling and disposal.	
	Cement washings will be carried out in a dedicated area >10m from the nearest watercourse or drain. Washing arisings will be collected for onsite treatment. This will include settlement and, if required, pH correction. The liquids will be reused on site as grey water if suitable, or disposed of via a consented discharge onsite route, if available. Alternatively, they will be taken off site for disposal. The solids will be disposed of as solid waste.	
	Appropriate shuttering and edge protection will be in place to contain concrete pours.	
	The ECoW and/or site supervisor will inspect all shuttering to be used during 'over-water' pours of concrete such as the cope beam, to ensure it is adequately sealed prior to the pour commencing.	
	Prior to works commencing a litter sweep will be carried out on rock armour to be removed from the revetments of Phase 3 & 4 Combined West Quay to ensure that any litter present does not escape to the marine environment during construction works.	
	All personnel working on the project will need to undertake site induction; this will include a section on waste management and the use of the waste receptacles provided. It will be made clear that littering will not be tolerated. The use of single use plastics will be discouraged, reusable water bottles supplied to all personnel and reusable crockery and cutlery will be provided in the welfare facilities. ECoW walk rounds will identify if littering is becoming an issue on the construction site or vessels, allowing corrective action to be taken.	
Navigation	Construction vessel traffic will abide by the following provisions, which unless otherwise stated apply only to vessels exceeding 10m in length: • Upon entering PoCF's Port Limits, vessels will transit to the Phase 5 Development using the main navigational channel, unless otherwise required for reasons of safe navigation. • Vessels will maintain constant speed and direction when transiting between the Phase 5 Development and the spoil disposal ground, unless otherwise required for reasons of safe navigation.	Section 16

Topic	Mitigation Measures	Reference
	• Vessels will adhere to set routes (in accordance with the general requirements of PoCF) between the Phase 5 Development and the spoil disposal ground.	
	Prior to any construction works commencing there will be a meeting between the construction contractors and the Port Manager or designate to discuss the project and associated construction navigational issues. The Port Manager or designate will review Risk Assessed Method Statements (RAMS) where navigation is a factor prior to works being undertaken.	
	During construction there will be meetings at appropriate intervals between the construction team and the Port Manager or designate to ensure that the construction activities planned for the coming period and planned Port activities are fully understood and any potential clashes resolved.	
	Marine safety information, including local Notices to Mariners and radio navigation warnings will be issued as deemed appropriate during the marine works.	
	Information will be provided to the UK Hydrographic Office to allow them to update nautical charts and associated publications.	
	All vessels will comply with the International Regulations for Preventing Collisions at Sea 1972 (as amended).	
	PoCF will liaise with the Northern Lighthouse Board to agree the navigational lighting requirements of the new development.	
	Dredging will be completed as per the Phase 5 development design to ensure that vessels can berth safely without running aground.	
	All vessels will operate according to PoCF procedures, compliant with the PMSC. Including the compulsory pilotage of vessels over 60m within the Cromarty Firth.	
Traffic and Transport	HGV's wheels will be checked prior to leaving any construction areas.	Section 17
	A project specific CTMP will be produced, including mitigation such as: • HGV movements to occur outside of typical weekday peak hours; • HGV to use agreed routes; • No convoying of vehicles; • Appropriate communication routes; and • Voluntary speed limits for HGV's passing schools.	
Archaeology & Cultural Heritage	Archaeology Protocol aligning to the Crown Estates (2010) guidance: Protocol for Archaeological Discoveries for Offshore Renewables Projects is included within the Schedule for Mitigation for inclusion within the CEMD for the project.	Section 20

Table 25.2: Proposed Operational Mitigation Measures

Topic	Mitigation Measures	Reference
Air Quality	Any cement plant will be subject to appropriate permitted under PPC regulations. Operation of cement plants will be undertaken in accordance with the BAT, in alignment with Part B PPC permit requirements.	Section 8
Water Quality	Dredge disposal license will be in place for future maintenance dredge requirements.	Section 9
	Appropriate spill prevention and response procedures to be in place.	
	All vessels visiting Phase 5 are expected to be compliant with the relevant requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 and where appropriate follow Guidelines for the Control and Management of Ships Biofouling to Minimize the Transfer of Invasive Aquatic Species (Marine Environment Protection Committee, 2011).	
Marine Ecology – Fish Ecology	No maintenance dredge or dredge disposal activities will be carried out during the month of May.	Section 13.3
Navigation	All vessels will comply with the International Regulations for Preventing Collisions at Sea 1972 (as amended).	Section 13.4 Section16
	All vessels will operate according to PoCF procedures and instructions, compliant with the PMSC.	
	The dredged berth pocket will be surveyed regularly and dredged as required to maintain safe operational draft depths.	
Traffic and Transport	Review and if required update the PoCF’s existing sustainable travel plan to ensure it adequately considered Phase 5 operations.	Section 17
Aviation Considerations	Production of a route map for offshore wind farm developers utilising the port to be put in place with input from the relevant stakeholders, to ensure all relevant legislation and guidance is followed to minimise risks and impacts.	Section 23

26 Conclusions

The PoCF, are planning their fifth phase of development of the ISB. A scoping opinion is sought under Part 4, Paragraph 14: 'Request for scoping opinions' of the EIA regulations for Phase 5. The production of this scoping report has drawn upon experience gained during the consenting and construction of previous phases at the ISB, which utilised similar construction techniques. By incorporating tried and tested mitigation and enhancement measures the scoping report demonstrates that potential significant adverse effects in EIA terms are limited. It is proposed that EIA efforts are focused on areas where there are potential significant effects that need to be understood to allow appropriate mitigation or enhancement to be identified, to maximise the benefits of the project while minimising any adverse effects.

Topics proposed to be scoped out of detail consideration within the EIAR are done so on the basis that the mitigation and enhancements identified in the Initial Schedule of Mitigation provided in Section 25 are implemented. Table 26.1 summaries the proposed scope of the EIA and the topics to be included within any EIAR, for the proposed Phase 5 development.

Table 26.1: Summary of Topics Scoped In, or Scoped Out

Topic	Construction	Operations
In-Air Acoustics		
Underwater Noise		
Air Quality (Dust Only)		
Water Quality		
Coastal Processes and Flooding		
Ground Conditions		
Biodiversity Terrestrial - Ornithology		
Biodiversity Terrestrial - Otter		
Biodiversity Marine- Benthic Ecology		
Biodiversity Marine - Fish Ecology		
Biodiversity Marine - Marine Mammals		
Landscape and Visual		
Materials and Waste		
Navigation		
Traffic and Transport		
Socioeconomics		
Climate Change (GHG emissions only)		Discussed in qualitative terms only
Archaeology and Cultural Heritage		For impacts on setting only – shall be included within an LVIA
Major Accidents and Natural Disasters		
Human Health		
Aviation Considerations		

Key

Scoped Out – No significant effect predicted taking account of mitigation.	
Scoped In – Potential for significant effects, further assessment required.	

The need to provide sufficient information to support Appropriate Assessment under the Habitats Regulations is understood and will be provided within an HRA Report.

The Phase 5 development located within one of only two Green Freeports is required to provide appropriate facilities to maximise the local content in developing Scotland's offshore floating wind sector. As such it plays a vital role in the move towards net zero.

PoCF are committed to ensuring the design of Phase 5 minimises environmental effects of constructing and operating the development, and where this is not practicable appropriate mitigation will be implemented to minimise effects.

A scoping opinion is sought from Marine Scotland to allow the project to progress the EIA in support of the Phase 5 development. Furthermore, an opinion on which Natura 2000 sites should be taken forward for Appropriate Assessment, is also requested to allow appropriate information to be submitted in support of the planning application.

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Glossary

Acronym	Definition
µPa	Micro-pascal
AA	Appropriate Assessment
AGLV	Area of Great Landscape Value
AOD	Above Ordinance Datum
AQMA	Air Quality Management Areas
ATCs	Automatic Traffic Counters
BAT	Best Available Technique
BAP	Biodiversity Action Plan
BPEO	Best Practicable Environmental Options
BS	British Standard
CAR	The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)
CCP	Climate Change Plan
CCS	Carbon Capture and Storage
CCU	Carbon Capture and Utilisation
CD	Chart Datum
CEMD	Construction Environmental Management Document
CEMP	Construction Environmental Management Plan
CES	Crown Estate Scotland
CFPA	Cromarty Firth Port Authority
CIEEM	Chartered institute of Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CNS	Communication, navigation and surveillance
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalents
COMAH	Control of Major Accident Hazards
COP26	Conference of the Parties 26
COPA	Control of Pollution Act
COSHH	Control of Substances Hazardous to Health
CTMP	Construction Traffic Management Plan
dB	decibels
dBA	Decibels A-weighted
EcIA	Ecological Impact Assessment
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPS	European Protected Species
FLOW	Floating Offshore Wind
FOW CoE	The Floating Offshore Wind Centre of Excellence
FTE	Full-time Equivalent
GEN	General Planning Principles
GES	Good Environmental Status Descriptors
GHG	Greenhouse Gas
GI	Ground Investigations
GPP	Guidance for Pollution Prevention
GVA	Gross Value added
GWP	Global Warming Potential
Ha	Hectares

Acronym	Definition
HF	High Frequency
HGV	Heavy Goods Vehicle
HRA	Habitat Regulations Appraisal
HSPP	Habitat and Species Protection Plan
HwLDP	Highland wide Local Development Plan
IAQM	Institute of Air Quality Management
IEMA	Institute of Environmental Management Assessment
IMFLDP	Inner Moray Firth Local Development Plan
IMO	International Maritime Organization
INTOG	Innovation and Targeted Oil & Gas
IRM	Inspection, Repair & Maintenance
ISB	Invergordon Service Base
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
kJ	kilojoules
km	kilometres
km^2	Kilometres-squared
$L_{Aeq(t)}$	Average weighted total sound energy over time
LCT	Landscape Character Types
LDP	Local Development Plans
LF	Low Frequency
LSEs	Likely Significant Effects
LVIA	Landscape and Visual Assessment
m	metres
m^2	Metres-squared
m^3	Metres-cubed
MCCs	Manual Classified Counts
MD-LOT	Marine Directorate Licensing Operations Team
MF	Mid-Frequency
MHWS	Mean High-Water Springs
MNNS	Marine Non-Native Species
MPS	Marine Policy Statement
MW	Mega Watt
NAL	Noise Assessment Location
NATS	National Air Traffic Services
NBN	National Biodiversity Network
NM	Nautical Mile
NMFS	National Marine Fisheries Service (United States)
NML	Noise Monitoring Location
NMP	Scottish National Marine Plan
NMPi	National Marine Plan Interactive
NNR	National Nature Reserve
No.	Number
NPF	National Planning Framework
NSA	National Scenic Areas
NSR	Noise Sensitive Receptors
OS	Ordnance Survey
OSPAR	The Convention for Protection of the Marine Environment of the North-East Atlantic
PAC	Pre-Application Consultation

Acronym	Definition
PAM	Passive Acoustic Monitoring
PAN	Planning Advice Notes
PMF	Priority Marine Feature
PMSC	Port Marine Safety Code
PoCF	Port of Cromarty Firth
pp	Peak Pressure
PPC	Pollution Prevention and Control
PPG	Pollution Prevention Guideline
PTS	Permanent Threshold Shifts
re	Reference
PW	Phocid Pinnipeds (underwater)
RMS	Root-Mean Squared
Ro/Ro	Roll-on Roll-off
RPM	Rotations Per Minute
s	seconds
SAC	Special Area of Conservation
SCOS	Special Committee on Seals
ScotPHO	Scottish Public Health Observatory
SDP	Strategic Development Plans
SEL	Sound Exposure Level
SEPA	Scottish Environment Protection Agency
SLA	Special Landscape Areas
SME	Small-Medium Enterprise
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SP=EED	Successful Planning = Effective Engagement and Delivery
SPL_{peak}	Peak Sound Pressure level
SSSI	Site of Special Scientific Interest
TTS	Temporary Threshold Shifts
UNCLOS	UN Convention on the Law of the Sea
VHF	Very High Frequency
VPs	Viewpoints
WFD	Water Framework Directive
WHO	World Health Organisation
WLA	Wild Land Areas
ZTV	Zone of Theoretical Visibility

Appendix 1 - Pre-Screening Habitats Regulations Appraisal

Port of Cromarty Firth Phase 5

Habitat Regulations Appraisal Screening Supporting Document

Report Number: 71_REP_14_2

Date: 15/11/2023

Document Control

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Contents

1 Introduction

The Port of Cromarty Firth (PoCF) are planning to further extend the Invergordon Service Base (ISB). This will be their fifth phase of development therefore the project is known as Phase 5. The ISB is situated immediately adjacent to a European Protected Site (Cromarty Firth Special Protection Area (SPA)). Furthermore, several SPAs and Special Areas of Conservation (SAC) are situated within the wider locality of the site. In addition, if dredge associated with the construction of the Phase 5 development, is not suitable for reuse it is assumed it will be sentenced to the Sutors Dredge Disposal Site (CR019), immediately adjacent to the Moray Firth SAC. As such, a Habitats Regulations Appraisal (HRA) will be required to facilitate consenting. This HRA Screening Supporting Document provides the information required for the competent authority (Marine Directorate) to identify which sites will require Appropriate Assessment (AA).

As the ISB is situated immediately adjacent to the Cromarty Firth SPA. Winter bird surveys and breeding bird surveys have been undertaken over several years (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos Consulting (Atmos) 2022; and Atmos, 2023). Winter bird surveys were completed in 2015/16, 2017/18, 2020/21 and 2022/23 (see Table A1.1). Breeding bird surveys for common eider, common tern and arctic tern were undertaken in 2016 and 2017 (Swann & Brockway, 2016; and Swann & Brockway, 2017. Whilst a breeding bird surveys for all bird species was undertaken in 2022 and 2023 (Atmos 2022; and Atmos, 2023).

1.1 Legislative Basis

The legislative context behind the need for a HRA is based on Article 6(3) of the Habitats Directive (92/43/EEC) and Article 4(4) of the Birds Directive (2009/147/EC) and is implemented in Scotland through The Conservation (Natural Habitats, &c Regulations 1994 (as amended) (hereafter referred to as the 'Habitats Regulations').

In Scotland, the Scottish Planning Policy document ensures that RAMSAR sites are linked to European Protected Sites (i.e. SPA's and SAC's), and therefore, protected under the same legislation. Subsequently RAMSAR sites are included within the HRA via the associated European Protected Site and do not need to be considered separately as part of this HRA Screening Supporting Document.

If a likely significant effect (LSE) is predicted to any Qualifying Features of any European Protected Site at the first stage of the HRA, then an AA must then be carried out. The AA must demonstrate that the proposal will not adversely affect the integrity of the site (NatureScot, 2021b).

It is the responsibility of the competent authority to carry out the AA based on robust, scientific information provided by the project developer about the proposed project. It is not the role of the developer to make an assessment on whether the proposal will have an adverse effect on any associated European Protected Sites. To this end information sufficient to allow an AA to be carried out will be submitted with the Marine Licence applications.

1.2 Terminology

The terminology employed as part of the HRA process relates to LSEs. It is important when reading the HRA Screening Supporting Document, to be aware that the term 'significant/significance' has a different meaning to that within Environmental Impact Assessments (EIA). The 'significant/significance' terminology used as part of the ecological impact assessments in EIA refers to significance based on a systematic assessment matrix. In this HRA Screening Supporting Document, the use of the word 'significant' relates to the potential for ecological connectivity.

A precautionary approach was undertaken during the assessment for LSEs, and when determining whether a project, or an activity associated with the project, may have an effect, or the possibility of having an effect, on a European Protected Site (NatureScot, 2021c). A project component is said to have an LSE on a designated site if there is ecological connectivity with the site's qualifying interests and there is the potential for the conservation objectives of the designated site to be undermined. Where an LSE "*cannot be excluded, on the basis of objective information*" (European Court of Justice C-127/02, 2004) an AA is required. The conservation objectives of the site provide the framework for considering the potential for LSEs.

1.3 Objectives

The objectives of this HRA Screening Supporting Document are to summarise:

- Outline the details of the Phase 5 development (including construction and operations activities);
- Consider whether any of the qualifying features of any European Protected Sites have ecological connectivity to the Phase 5 development site;
- Consider whether there is the potential for LSE to any of the qualifying features with probable ecological connectivity to the Phase 5 development site, with consideration of the sites conservation interests; and
- Outline which qualifying features may require to be scoped in for AA.

2 Proposed Activity

2.1 Location

The Phase 5 development is proposed at the ISB on the northern shore of the Cromarty Firth, it will be located within the redline boundary as shown in Drawing 1024-PH5-032. It should be noted, however, that the actual footprint (construction and dredge) is likely to be smaller than that shown. The larger envelope footprint at this stage is to provide flexibility when moving through the design stages to turn the conceptual designs into a scheme design, and then eventually a detailed design. It is assumed that if dredge needs to be disposed of then it will be disposed of to the Sutors Dredge Disposal Site (CR019), immediately adjacent to the Moray Firth.

2.2 Design Elements

The conceptual envelope of the Phase 5 development looks to provide further expansion of the ISB and will expand upon the already developed Phases 3 and 4. Objectives of the expansion include:

- Providing additional berthing;
- Provision of an area of the quay which could be used by a Roll-on Roll-off (Ro/Ro) vessel;
- Providing additional laydown space;
- A deepwater berth;
- Heavy lift capacity;
- Increased connectivity between previous phases of development whilst maintaining suitable berthing areas to support the multiple users;
- Provision of appropriate services (lighting, water, drainage and power); and
- Provision of elements to support Offshore Wind activities.

It is important to note however, that the proposed Phase 5 development is at the conceptual design stage and as such, the details of the project in the following sections are not fully developed. In addition, not all elements may be required. However, at this stage the intent is to keep the envelope sufficiently broad.

The actual design of Phase 5 will be influenced by the following factors:

- The findings of sediment modelling;
- Landscape and visual considerations;
- Ecological studies;
- Findings of any Ground Investigation works;
- Input from stakeholders including:
    - Current and potential clients;
    - Local residents;
    - The Highland Council; and
    - Other interested parties.

2.3 Likely Construction Techniques

Construction techniques utilised for each of the conceptual design elements for Phase 5 are likely to be similar to those undertaken during Phases 3 and 4. For example, to infill the Queen's Dock and to reclaim land north of Phases 3 and 4, or to the west of Phase 4, a barrier is likely to be created through the formation of an initial bund then placement of the rock revetment and the piled quay walls. The bund will be infilled prior to the materials being compacted to obtain the appropriate height and structural performance of the development. It is hoped that the majority of the material for this construction activity shall be delivered by sea or be sourced through the re-use of dredge spoil material. To understand if dredge material can be re-used, sediment sampling has been undertaken and a Best Practicable Environmental Options (BPEO) Report will be produced.

The construction techniques that have been considered throughout this report, are as follows:

- Vibro and Impact Piling;
- Land Reclamation activities, namely Infilling and Rock Dumping;

- Dredging; and
- Dredge Spoil Disposal.

It is noted that the installation of various services will also be required, however this is a relatively minor construction task and from experience is unlikely to give rise to any significant environmental effects.

2.4 Operational Scenarios

The Phase 5 development will provide further support to the renewable energy sector, enabling a range of activities. An operational scenario has therefore, been developed for the purpose of understanding what needs to be considered within the Phase 5 EIA, this will also be utilised for the HRA. Although actual operations may vary from the scenario described, they are considered to be applicable to the range of offshore wind projects which the Phase 5 development will be able to support, this is assumed to be the worst-case scenario.

Based on a number of operational scenarios, it has been assumed that the maximum operating envelope would be associated with concrete floating offshore wind substructure production, the maximum operating envelope includes the following main activities:

- The delivery of cement dry product and aggregate by sea, for onsite storage and concrete batching.
- The production of the concrete floating substructures.
- Storage of floating bases at quayside.
- The delivery by sea of the main wind turbine components for onsite assembly and the delivery by road of other minor equipment and tools.
- Installation of the turbine components (tower, nacelle, blades) onto the concrete floating bases, utilising cranes located on the quay side or alternatively on a jack-up installation vessel.
- Wind turbine pre-commissioning and initial testing activities carried out at the quay side to ensure that they can safely and effectively operate.

The number of fully assembled floating turbine structures that can be accommodated at the ISB, is limited by the rotor diameter and need to provide sufficient space to ensure blades do not collide. Utilising the Queens Dock, Quay West 1 and 2, and Phase 5 berths a maximum of three floating turbines could be accommodated.

During the project wind farm operations phase, the port may be used for major component replacement or other maintenance activity. However, this scenario is well within the envelope of the fabrication and assembly hence, not considered as a separate operational scenario.

Maintenance dredge activities may also be required during the operational stage of Phase 5’s lifecycle.

3 Designated Sites

The designated sites and their qualifying interests relevant to the Phase 5 development are shown in Table 3.1. The sites, or species within the sites, are scoped in or out depending on whether there is potential ecological connectivity to the proposed activity. A reduced list of designated sites and features is then taken forward for further assessment. Explanations for why certain sites or qualifying features are excluded is laid out in Section 3.1.

Distances provided within Table 3.1 have been measured in a straight line from the nearest point of the designated site to the Phase 5 development site. It is noted however, that for marine species, it is more appropriate to considered the distance around the coastline. Thus, determining the distance in which it would take to travel through the marine environment. These distances are included within the sections below, as appropriate.

Table 3.1: Designated Sites Relevant to the Site of the Phase 5 Development

Designated Site	Distance (approximate) and Direction	Qualifying Feature(s)	Included in Further Assessment?
Cromarty Firth SPA	<100 metres (m) north	**Breeding:** Osprey (*Pandion haliaetus*); and Common tern (*Sterna hirundo*); and **Non-breeding:** Whooper swan (*Cygnus cygnus*); Bar-tailed godwit (*Limosa lapponica*); Greylag goose (*Anser answer*); Redshank (*Tringa tetanus*); Curlew (*Numenius arquata*); Knot (*Calidris canutus*); Red-breasted merganser (*Mergus serrator*); Scaup (*Aythya marila*); Pintail (*Anas acuta*); Wigeon (*Anas Penelope*); Dunlin (*Calidris alpina*); and Oystercatcher (*Haematopus ostralegus*).	IN (see section 3.2.1)
Moray Firth SAC	6 kilometres (km) east	Bottlenose dolphin (*Tursiops truncatus*).	IN (see section 3.2.2)
		Subtidal sandbanks.	OUT (see section 3.1.1)

Designated Site	Distance (approximate) and Direction	Qualifying Feature(s)	Included in Further Assessment?
Moray Firth SPA	11km east	**Breeding:** European shag (*Phalacrocorax aristotelis*); and **Non-breeding:** Great northern diver (*Gavia immer*); Red-throated diver (*Gavia stellata*); Slavonian grebe (*Podiceps auratus*); Scaup Common eider (*Somateria mollissima*); Long-tailed duck (*Clangula hyemalis*); Common scoter (*Melanitta nigra*); Velvet scoter (*Melanitta fusca*); Common goldeneye (*Bucephala clangula*); and Red-breasted merganser.	IN (see section 3.2.3)
Inner Moray Firth SPA	15km south south-west	**Breeding:** Common tern; and **Non-breeding:** Bar-tailed godwit; Greylag goose; Red-breasted merganser; Redshank; Curlew; Goosander (*Mergus merganser*); Common goldeneye; Wigeon; Cormorant (*Phalacrocorax carbo*); and Oystercatcher.	IN (see section 3.2.4)
		Breeding: Osprey; and **Non-breeding:** Scaup; and Teal (*Anas crecca*).	OUT (see section 3.1.2)
Loch Eye SPA	16km northeast	**Non-breeding:** Greylag goose.	IN (see section 3.2.5)
		Non-breeding: Whooper swan.	OUT (see section 3.1.3)

Designated Site	Distance (approximate) and Direction	Qualifying Feature(s)	Included in Further Assessment?
Dornoch Firth and Loch Fleet SPA	16km northeast	**Non-breeding:** Bar-tailed godwit; Greylag goose; Wigeon; Curlew; Redshank; Dunlin; and Oystercatcher.	IN (see section 3.2.6)
		Breeding: Osprey; and **Non-breeding:** Teal; and Scaup.	OUT (see section 3.1.4)
Dornoch Firth and Morrich More SAC	16km northeast	Common seal (*Phoca vitulina*).	IN (see section 3.2.7)
		Coastal dune heathland; Atlantic salt meadows; Dunes with juniper thickets; Lime-deficient dune heathland with crowberry; Shifting dunes; Estuaries; Dune grassland; Humid dune slacks; Otter (*Lutra lutra*); Intertidal mudflats and sandflats; Reefs; Glasswort and other annuals colonising mud and sand; Subtidal sandbanks; and Shifting dunes with marram.	OUT (see section 3.1.5)
River Oykel SAC	25km northwest	Freshwater pearl mussel (*Margaritifera margaritifera*); and Atlantic salmon (*Salmo salar*).	OUT (see section 3.1.6)

Designated Site	Distance (approximate) and Direction	Qualifying Feature(s)	Included in Further Assessment?
River Spey SAC	48km southeast	Otter; Freshwater pearl mussel; Sea lamprey (*Petromyzon marinus*); and Atlantic salmon.	OUT (see section 3.1.7)
River Moriston SAC	58km southwest	Freshwater pearl mussel; and Atlantic salmon.	OUT (see section 3.1.8)
Berriedale and Langwell Waters SAC	65km northeast	Atlantic salmon.	OUT (see section 3.1.9)
Firth of Tay and Eden Estuary SAC	153km southeast	Estuaries; Intertidal mudflats and sandflats; Common seal; and Subtidal sandbanks.	OUT (see section 3.1.10)
Farey and Holm of Farey SAC	186km northeast	Grey seal (*Halichoerus grypus*).	OUT (see section 3.1.11)

* NatureScot, 2018a; JNCC, 2023e; NatureScot, 2020a; NatureScot, 2018c; NatureScot, 2018d; NatureScot, 2018b; JNCC, 2023b; JNCC, 2023g; JNCC, 2023h; JNCC, 2023f; JNCC, 2023a; JNCC, 2023d; and JNCC, 2023c.

3.1 Reasons for Designated Sites or Qualifying Features Exclusions

3.1.1 Moray Firth SAC

3.1.1.1 Habitats

The Moray Firth SAC supports an Annex I habitat, subtidal sandbanks (i.e., sandbanks which are slightly covered by sea water all the time) (Joint Nature Conservation Committee (JNCC), 2023e).

The dredge disposal site (the Sutors) is situated within the Moray Firth SAC. However, dredge disposal associated with the Phase 5 development is not anticipated to impact upon subtidal sandbanks associated with the SAC. Sedimentation associated with dredge disposal will be localised, with sediments dropping out of the water column in a matter of minutes. The closest sandbanks to the dredge disposal site are situated approximately 2.7km away (within the marine environment), within Cromarty Bay (NatureScot, 2021a), protected from the Sutors by the land mass at Cromarty, and hence sediments are highly unlikely to reach the designated feature.

General construction activity associated with the Phase 5 development is not anticipated to impact upon subtidal sandbanks associated with the Moray Firth SAC, as the works will not encroach upon associated habitats. Thus, there is considered to be no ecological connectivity, and the qualifying feature (subtidal sandbanks), is excluded from further assessment.

3.1.2 Inner Moray Firth SPA

3.1.2.1 Ornithology

The Inner Moray Firth SPA qualifies under Article 4.1 by regularly supporting populations of European importance of the Annex 1 species, osprey which forage throughout the SPA (2008 to 2012, up to 25 territories within feeding range (12.5 % of the GB population), with 4 pairs breeding within the site, (4% of the GB population)) (NatureScot, 2018c).

The Inner Moray Firth SPA also qualifies under Article 4.2 by regularly supporting in excess of 20,00 individual waterfowl and including nationally important populations of scaup (118 individuals (1% of the GB population)) and teal (2,066 individuals (1% of the GB population)) (NatureScot, 2018c).

Osprey generally forage up to 10km of the nest (Hardey, *et al.*, 2013). The Inner Moray Firth SPA is situated approximately 13km southeast and 15km south of the Phase 5 development site and ISB. Therefore, it would be considered justifiable to assume that osprey breeding within the SPA do not utilise habitats within close proximity to the Phase 5 development site and the ISB to forage. Furthermore, there are no know records of osprey within 10km of the Phase 5 development site and ISB (National Biodiversity Network (NBN), 2023). Therefore, there is considered to be no ecological connectivity, and the qualifying feature (osprey) is excluded from further assessment.

Winter bird surveys of the shoreline adjacent to the Phase 5 development site and ISB were undertaken in 2015/16, 2017/18, 2020/21 and 2022/23. No records of scaup or teal were recorded during any of the winter bird surveys (see Table A1.1). In addition, none of these species were recorded during the breeding bird surveys, undertaken in 2016, 2017, 2022 and 2023 (Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos 2023). Therefore, it would be considered justifiable to assume that scaup and teal from the Inner Moray Firth SPA do not utilise habitats within close proximity to the Phase 5 development site or ISB. Thus, temporary disturbance due to general construction activity and long-term disturbance due to operations are not anticipated to cause any LSE to either species.

Scaup and teal are diving birds, and therefore, the potential for impacts to occur due to underwater noise associated with piling works during construction has been considered. Piling works will be required during the construction phase, which will result in underwater noise. The importance of in-air hearing for aquatic bird species is well documented. However, underwater hearing of bird species remains relatively unknown. There is research to suggest that underwater noise can result in behavioural changes of diving birds (Hansen, *et al.*, 2020; and Patterson, 2023). In particular, lesser scaup (*Aythya affinis*) have been found to be sensitive to under-water noise (Hansen, *et al.*, 2020), with thresholds not substantially different from that of odontocetes and pinnipeds at low frequencies (Crowell, *et al.*, 2016; Hansen, *et al.*, 2017; and Therrien, 2014). Noise dissipation for piling activities were modelled for the Phase 4 development, peak noise levels were predicted to drop below levels that could cause hearing damage to marine mammals within 55m and are modelled to be below 165dB (levels which could impact upon low frequency marine mammals) within 1km. As neither scaup or teal were identified within close proximity to the ISB or Phase 5 development site (Appendix 1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023), it would be considered justifiable to assume that the noise levels anticipated as a result of piling will not result in any LSE for either species.

The dredge disposal site (the Sutors) is situated approximately 9km from the Inner Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, temporary disturbance due to dredge disposal associated within the Phase 5 development is not anticipated to result in any significant effects to scaup or teal. Thus, there is considered to be no ecological connectivity. The ornithological qualifying features (scaup and teal) are excluded from further assessment.

3.1.3 Loch Eye SPA

3.1.3.1 Ornithology

Loch Eye SPA qualifies under Article 4.1 by regularly supporting a population of European importance of the Annex 1 species, whooper swan (140 individuals, over 1% of the population) (NatureScot, 2018d).

Winter bird surveys of the shoreline adjacent to the Phase 5 development site and ISB were undertaken in 2015/16, 2017/18, 2020/21 and 2022/23. No records of whooper swan were recorded during any of the winter bird surveys (see Table A1.1). In addition, no whooper swan were recorded during the breeding bird surveys, undertaken in 2016, 2017, 2022 and 2023 (Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023).

Therefore, it would be considered justifiable to assume that whooper swan from the Loch Eye SPA do not utilise habitats within close proximity to the Phase 5 development site or ISB. Thus, there is considered to be no ecological connectivity, and this ornithological qualifying feature (whooper swan) is excluded from further assessment.

3.1.4 Dornoch Firth and Loch Fleet SPA

3.1.4.1 Ornithology

The Dornoch Firth and Loch Fleet SPA qualifies under Article 4.1 by regularly supporting populations of European importance of the Annex 1 species, osprey (up to 6 territories within feeding range (6% of the GB population), with 1 pair breeding within the site (1% of the GB population)) (NatureScot, 2018b).

The Dornoch Firth and Loch Fleet SPA also qualifies under Article 4.2 by regularly supporting in excess of 20,000 individual waterfowl including teal (1,592 individuals (1% of the GB population)) and scaup (123 individuals (1% of the GB population) (NatureScot, 2018b).

Osprey generally forage up to 10km of the nest (Hardey, *et al*., 2013). The Dornoch Firth and Loch Fleet SPA is situated approximately 16km northeast of the Phase 5 development site and ISB. Therefore, it would be considered justifiable to assume that osprey breeding within the SPA do not utilise habitats within close proximity to the Phase 5 development site and ISB to forage. Furthermore, there are no know records of osprey within 10km of the Phase 5 development site and ISB (NBN, 2023). Therefore, there is considered to be no ecological connectivity, and the qualifying feature (osprey) is excluded from further assessment.

Winter bird surveys of the shoreline adjacent to the Phase 5 development site and ISB were undertaken in 2015/16, 2017/18, 2020/21 and 2022/23. No records of teal or scaup were recorded during any of the winter bird surveys (see Table A1.1). In addition, none of these species were recorded during the breeding bird surveys, undertaken in 2016, 2017, 2022 and 2023 (Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos 2023). Therefore, it would be considered justifiable to assume that teal and scaup from the Dornoch Firth and Loch Fleet SPA do not utilise habitats within close proximity to the Phase 5 development site or ISB. Thus, temporary disturbance due to general construction activity and long-term disturbance due to operations are not anticipated to cause any LSE to either species.

Teal and scaup are diving birds, and therefore, the potential for impacts to occur due to underwater noise associated with piling works during construction has been considered. Piling works will be required during the construction phase, which will result in underwater noise. The importance of in-air hearing for aquatic bird species is well documented. However, underwater hearing of bird species remains relatively unknown. There is research to suggest that underwater noise can result in behavioural changes of diving birds (Hansen, *et al.*, 2020; and Patterson, 2023). In particular, lesser scaup (*Aythya affinis*) have been found to be sensitive to under-water noise (Hansen, *et al.*, 2020), with thresholds not substantially different from that of odontocetes and pinnipeds at low frequencies (Crowell, *et al.*, 2016; Hansen, *et al.*, 2017; and Therrien, 2014). Noise dissipation for piling activities were modelled for the Phase 4 development, peak noise levels were predicted to drop below levels that could cause hearing damage to marine mammals within 55m and are modelled to be below 165dB within 1km. As neither teal nor scaup have been identified within close proximity to the ISB or Phase 5 development site (Appendix 1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos 2023), it would be considered justifiable to assume that the noise levels anticipated as a result of piling will not result in any LSE for either species.

The dredge disposal site (the Sutors) is situated approximately 40km from the Dornoch Firth and Loch Fleet SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, temporary disturbance due to dredge disposal associated within the Phase 5 development is not anticipated to result in any significant effects to teal or scaup.

Thus, there is considered to be no ecological connectivity. The ornithological qualifying features (teal and scaup) are excluded from further assessment.

3.1.5 Dornoch Firth and Morrich More SAC

3.1.5.1 Habitats

The Dornoch Firth and Morrich More SAC supports, several Annex I habitats. Including, 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 and shifting dunes with marram (JNCC, 2023b).

The Dornoch Firth is the most northerly large estuary in the UK. The estuary is fed by the Kyle of Sutherland and largely unaffected by industrial development. Within the estuary, there is a complete transition from riverine habitats to full marine conditions and associated ecosystems (Joint Nature Conservation Committee (JNCC, 2023b).

The estuary contains extensive areas of mudflats and sandflats. The flats extend along the northern and southern shores and are characteristic of a range of environmental conditions. There is a continuous gradient in the physical structure of the flats, from medium-sand beaches on the open coast to stable, fine-sediment mudflats and muddy sands further inland. Resulting in a high species diversity (JNCC, 2023b).

The sheltered bays provide a habitat for communities of algae, eelgrass (*Zostera* spp.) and the pioneer saltmarsh plant glasswort (*Salicornia* spp.). Areas of the site have been designated for the presence of glasswort and other annuals that colonise in mud and sand. Furthermore, the site has been selected for Atlantic salt meadows. The site is the most northly site selected for these habitat types, representing both habitats in the northern part of their range in the UK (JNCC, 2023b).

In addition, the Dornoch Firth and Morrich More SAC supports a large dune system, which is physically diverse, supporting several dune structures. Including, embryonic shifting dunes, shifting dunes along the shoreline with *Annophila arenaria* (white dunes), fixed coastal dunes with herbaceous vegetation (grey dunes), decalcified fixed dunes with *Empetrum nigrum*, Atlantic decalcified fixed dunes (*Calluno-ulicetea*), humid dune slacks and coastal dunes with *Juniperus* species (JNCC, 2023b).

Each of the qualifying features listed above are immobile features associated with habitats. When considering the distance within the marine environment, there is approximately 43km around the coastline between The Dornoch Firth and Morrich More SAC and the Phase 5 development site and ISB and no ecological connectivity between habitats associated with the SAC and the Phase 5 development site has been identified. Therefore, it is considered unlikely that the Phase 5 development would impact upon habitats associated with qualifying features of the Dornoch Firth and Morrich More SAC. Thus, these qualifying features (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 and shifting dunes with marram) are excluded from further assessment.

3.1.5.2 Otter

The Dornoch Firth and Morrich More SAC qualifies by supporting an Annex II species, otter.

The Dornoch Firth and Morrich More consists of an estuarine system with extensive areas of bordering natural habitat including sand dune, woodland and small lochans. The River Evelix and the River Oykel, which both feed into the site, provide further otter habitat. The area supports a good population of otters in what is the only east coast estuarine site selected for the species in Scotland (JNCC, 2023b).

Otter are a mobile species with extensive home ranges. In a coastal environment, otter generally range between 2-10km (Chanin, 2013). However, in order to reach the Phase 5 development site and ISB from the Dornoch Firth and Morrich More SAC, otter would need to travel approximately 43km around the coast. Thus, is it considered to be unlikely that otter from the SAC would range within the Phase 5 development site. Consequently, there is considered to be no ecological connectivity, and the qualifying feature (otter) is not being taken forward for further assessment.

3.1.6 River Oykel SAC

3.1.6.1 Freshwater pearl mussel

The River Oykel SAC qualifies by supporting an Annex II species, freshwater pearl mussel.

The River Oykel supports a population of freshwater pearl mussel, with high densities recorded at some locations along the river (including a population of several thousand individuals). Surveys of the river have recorded high percentages of juveniles within the population, which indicates that there has been recent successful recruitment. In addition, there is evidence of pearl mussel populations in deep water (JNCC, 2023g).

In the marine environment (i.e. directing around areas of land mass), there is approximately 74km between the River Oykel SAC and the ISB and Phase 5 development site. Therefore, there is not direct connectivity between water courses associated with the SAC and the area of Phase 5 development site. In addition, it is acknowledged that the larval phase of freshwater pearl mussels is reliant on the integrity of the salmon population (Taeubert & Geist, 2017). Thus, impacts on this phase of the pearl mussel life cycle are directly correlated to impacts on Atlantic salmon and there is no need to consider this aspect separately (see section 3.1.6.2).

3.1.6.2 Atlantic salmon

The River Oykel SAC also supports another Annex II species, Atlantic salmon (JNCC, 2023g).

The River Oykel flows into the Kyle of Sutherland, which meets the Dornoch Firth in Bonar Bridge, approximately 74km (through the marine environment) from the Phase 5 development site and ISB. Salmon are habitual, returning to the same river each year (Mills, 1985). Thus, it is considered unlikely that Atlantic salmon from the River Oykel SAC would migrate through the Cromarty Firth. Therefore, there is considered to be no ecological connectivity, and the qualifying features (Atlantic salmon and freshwater pearl mussel) are excluded from further assessment.

3.1.7 River Spey SAC

3.1.7.1 Otter

The River Spey SAC qualifies by supporting an Annex II species, otter (JNCC, 2023h).

The River Spey is an important site for otter due to the good quality freshwater habitat. Surveys have identified high levels of otter presence throughout the River Spey catchment area. Riverine habitat features known to be important to otters are present. Including reedbeds, islands and healthy populations of important prey species. The persistence of a strong population of otter on this river indicates that habitat conditions are particularly favourable for the species (JNCC, 2023h).

Otter are a mobile species with extensive home ranges. In a coastal environment, otter generally range between 2-10km (Chanin, 2013). However, in order to reach the Phase 5 development site and ISB from the River Spey SAC, otter would need to travel approximately 66km around the coast. Thus, is it considered to be unlikely that otter from the SAC would range within the Phase 5 development site. Consequently, there is considered to be no ecological connectivity, and the qualifying feature (otter) is not being taken forward for further assessment.

3.1.7.2 Freshwater pearl mussel

The River Spey SAC also qualifies by supporting freshwater pear mussel (another Annex II species) (JNCC, 2023h).

The River Spey is a large river situated on the east coast of Scotland. The river drains an extensive upland catchment and supports an outstanding population of freshwater pearl. Extremely dense mussel colonies have been recorded in parts of the River Spey and the total population is estimated at several million. The population also shows recent recruitment and a high proportion of juveniles. Thus, the River Spey is considered to support a pearl mussel population of great international significance (JNCC, 2023h).

In the marine environment (i.e. directing around areas of landmass), there is approximately 65km between the River Spey SAC ISB and Phase 5 development site. Therefore, there is considered to be no direct connectivity with watercourses associated with the SAC and the Phase 5 development site. In addition, it is acknowledged that the larval phase of freshwater pearl mussels is reliant on the integrity of the salmon population (Taeubert & Geist, 2017). Thus, impacts on this phase of the pearl mussel life cycle are directly correlated to impacts on Atlantic salmon and there is no need to consider this aspect separately (see section 3.1.7.4).

3.1.7.3 Sea lamprey

The River Spey supports sea lamprey (an Annex II species) in the northern part of their range in the UK. Surveys show that sea lamprey larvae are widely distributed throughout the middle and lower reaches of the river, where the fast-flowing waters of the River Spey provide ideal spawning conditions for the species. In addition, the river is unpolluted with minimal modifications. Thus, the river matches key habitat requirements of the sea lamprey in terms of good water quality, clean gravels and marginal silts and unobstructed migration route to the sea (JNCC, 2023h).

Sea lamprey do not always return to their spawning ground, and instead, utilise sensory organs to identify suitable spawning habitat. Suitable freshwater and intertidal habitats for sea lamprey have been identified within the Cromarty Firth, where there are several records of sea lamprey (NBN, 2023). However, in order for sea lamprey to travel from the mouth of the River Spey to reach the Phase 5 development site and ISB, they would need to travel approximately 66km. Furthermore, there is no evidence to suggest that there is considered to be ecological connectivity for populations of sea lamprey from the River Spey to utilise habitats within the Cromarty Firth interchangeably. Therefore, the qualifying feature (sea lamprey) is not being taken forward for further assessment.

3.1.7.4 Atlantic salmon

The River Spey SAC also qualifies by supporting a third Annex II species, Atlantic salmon (JNCC, 2023h).

The River Spey supports one of the largest populations of Atlantic salmon in Scotland, with little evidence of modification caused by non-native stocks. Adults spawn throughout virtually the entire length of the river, and there is an abundance of high-quality nursery habitat in the main river and numerous tributaries. There are minimal constraints to migration and the river is oligotrophic throughout the entirety of is length. For a water system of its size, the River Spey is also relatively free from flow modifications such as abstractions, diversions and impoundments. The salmon population includes fish of all ages, including migrating smolts and returning adults (JNCC, 2023h).

The mouth of the River Spey is situated in Spey Bay, approximately 65km (within the marine environment) from the Phase 5 development site. Here the river connects to the North Sea, providing a suitable migratory route for Atlantic salmon. Salmon are habitual, returning to the same river each year (Mills, 1985). Thus, it is considered unlikely that Atlantic salmon from the River Spey would bypass the mouth of the river and travel within the Cromarty Firth. Therefore, there is considered to be no ecological connectivity, and the qualifying features (Atlantic salmon and freshwater pearl mussel) are excluded from further assessment.

3.1.8 River Moriston SAC

3.1.8.1 Freshwater pearl mussel

The River Moriston SAC qualifies by supporting an Annex II species, freshwater pearl mussel (JNCC, 2023f).

The River Moriston flows into the northern side of Loch Ness and supports a population of freshwater pearl mussel. Freshwater pearl mussels are present from downstream of a hydro-electric dam to the convergence with Loch Ness. Due to illegal pearl-fishing, the population is not abundant. However, survey results show that 40% of the population is composed of juveniles. This is the highest percentage recorded in any Scottish pearl mussel population and indicates that recent successful recruitment has taken place (JNCC, 2023f).

In the marine environment (i.e. directing around areas of landmass), there is approximately 80km between the River Moriston SAC and the ISB and Phase 5 development site. Therefore, there is considered to be no direct connectivity between watercourses associated with the SAC and the Phase 5 development site. In addition, it is acknowledged that the larval phase of freshwater pearl mussels is reliant on the integrity of the salmon population (Taeubert & Geist, 2017). Thus, impacts on this phase of the pearl mussel life cycle are directly correlated to impacts on Atlantic salmon and there is no need to consider this aspect separately (see section 3.1.8.2).

3.1.8.2 Atlantic salmon

The River Moriston SAC also qualifies by supporting Atlantic salmon (another Annex II species) (JNCC, 2023f).

The River Moriston flows into Loch Ness, which then flows into Loch Dochfour and the River Ness, before reaching the Beauly Firth in Inverness, approximately 80km (within the marine environment) from the Phase 5 development site and ISB. Salmon are habitual, returning to the same river each year (Mills, 1985). Thus, it is considered highly unlikely that Atlantic salmon from the River Moriston would enter the Cromarty Firth to spawn in a different river. Therefore, there is considered to be no ecological connectivity, and the qualifying features (Atlantic salmon and freshwater pearl mussel) are excluded from further assessment.

3.1.9 Berriedale and Langwell Waters SAC

3.1.9.1 Atlantic salmon

The Berriedale and Langwell Waters SAC qualifies by supporting an Annex II species, Atlantic salmon (JNCC, 2023a).

The Berriedale and Langwell Waters on the north-east coast of Scotland support small, but high-quality population of Atlantic salmon. The rivers have two separate catchments, although share a short length of river just before they meet the sea. Both rivers are oligotrophic and drain from the southern edge of the Caithness and Sutherland peatlands. Records indicate that the full range of Atlantic salmon life-history types return to the river (JNCC, 2023a).

The mouth of Berriedale and Langwell Waters is situated within Berriedale, approximately 75km (within the marine environment) from the Phase 5 development site and ISB, where the waters flow into the North Sea. Salmon are habitual, returning to the same river each year (Mills, 1985). Thus, it is considered unlikely that Atlantic salmon from the Berriedale or Langwell Waters would bypass the mouth of the waters and travel a greater distance to enter the Cromarty Firth to spawn on one of the rivers which flow into the Cromarty Firth. Hence there is considered to be no ecological connectivity, and the qualifying feature (Atlantic salmon) is excluded from further assessment.

3.1.10 Firth of Tay and Eden Estuary SAC

3.1.10.1 Habitats

The Firth of Tay and Eden Estuary SAC supports three Annex I habitats. Including, estuaries, intertidal mudflats and sandflats and subtidal sandbanks (JNCC, 2023d).

The Firth of Tay and the Eden Estuary are two high-quality estuarine areas. The two estuaries are included within a single SAC because they are integral components of a large, geomorphologically complex area that incorporates a mosaic of estuarine and coastal habitats. The Firth of Tay is the least-modified of the large east coast estuaries in Scotland. The Eden estuary represents a smaller 'pocket' estuary. The inner parts of the estuaries sheltered from waves, while outer areas, particularly of the Firth of Tay, are exposed to strong tidal streams. This has resulted in a complex pattern of erosion and deposition of the sandbank feature at the firths' mouth. The sediments within the SAC support biotopes, reflective of the gradients of exposure and salinity. The abundance, distribution and composition of the associated fauna and flora are ecologically representative of northern North Sea estuaries (JNCC, 2023d).

In addition, the Firth of Tay and Eden Estuary SAC supports sandbanks which are 'slightly covered by sea water all the time' and 'mudflats and sandflats that are not covered by seawater at low tide' (JNCC, 2023d).

Estuaries, intertidal mudflats and sandflats and subtidal sandbanks are immobile features associated with habitats. The Firth of Tay and Eden Estuary SAC is situated approximately 153km southeast of the Phase 5 development site and ISB and no ecological connectivity between habitats associated with the SAC and the Phase 5 development site has been identified. Therefore, it is considered unlikely that the Phase 5 development would impact upon the Estuaries, intertidal mudflats and sandflats or subtidal sandbanks associated with qualifying features of the Firth of Tay and Eden Estuary SAC. Thus, these qualifying features (estuaries, intertidal mudflats and sandflats and subtidal sandbanks) are excluded from further assessment.

3.1.10.2 Common Seal

The Firth of Tay and Eden Estuary supports a nationally important breeding colony of common seal (an Annex II species). Around 600 adults haul-out at the site to rest, pup and moult, representing around 2% of the UK population of the species (JNCC, 2023d).

While common seal are a mobile feature, the relatively short distances of common seal foraging trips (typically 50km) (Lyons, 2004), means that it is considered unlikely that common seals would travel from the Firth of Tay and Eden Estuary SAC to the Phase 5 development site and ISB (approximately 286km around the coast). Hence there is considered to be no ecological connectivity, and the qualifying feature (common seal) is excluded from further assessment.

3.1.11 Faray and Holm of Faray SAC

3.1.11.1 Grey Seal

The Faray and Holm of Faray SAC qualifies by supporting an Annex II species, grey seal (JNCC, 2023c).

Faray and Holm of Faray are two uninhabited islands in the northern part of Orkney, which support a well-established grey seal breeding colony. The seals tend to be found in areas where there is easy access from the shore. Freshwater pools on the islands appear to be particularly important. The islands support the second-largest breeding colony in the UK, contributing around 9% of annual UK pup production (JNCC, 2023c).

Faray and Holm of Farey SAC is situated approximately 205km away from the ISB and Phase 5 development site (within a marine environment). Grey seal are a highly mobile feature, which undertake both short-distance and long-distance travel.

A study tracking grey seal identified that individuals return to the same haul out site during 88% of trips. Travelling mean return distance was recorded as 39.8km (McConnell, et al., 2001). Long-distance travel by grey seal has been recorded up to 2,100km. However, long-distance trips are generally undertaken to known haul out sites (McConnell, et al., 2001). There is a designated haul-out site for common seals within the Cromarty Firth, approximately 8.5km from the ISB and Phase 5 development site (MarineScotland, 2023). However, there are no known records of grey seal at this haul out site (NBN, 2023). Thus, it would be considered reasonable to assume that grey seal from the Faray and Holm of Faray SAC are not making long-distance trips to within close proximity to the Phase 5 development site. Therefore, there is considered to be no ecological connectivity, and the qualifying feature (grey seal) is excluded from further assessment.

3.2 Designated Site Information – For Assessment

The Conservation Objectives of each of the designated sites taken forward for further assessment is provided under each designated site section.

As aforementioned, the data collected during winter and breeding bird surveys has been used to understand the potential for ecological connectivity between the Phase 5 development site and designated sites with ornithological qualifying features, and whether they required further assessment (Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos 2023). Where a site designated for ornithological features has been included in this section, the same data has been used to identify the potential for LSE.

3.2.1 Cromarty Firth SPA

The Cromarty Firth SPA is a large, narrow-mouthed estuary which supports the largest intertidal flats in the Moray Basin. The boundaries of the SPA mostly follow those of the Cromarty Firth Site of Special Scientific Interest (SSSI) and the estuarine section of Lower River Conon SSSI (NatureScot, 2018a).

The Cromarty Firth SPA qualifies under Article 4.1 by regularly supporting populations of European importance of Annex 1 species. Including, osprey, common tern, whooper swan and bar-tailed godwit (NatureScot, 2018a).

The Cromarty Firth SPA further qualifies under Article 4.2 by regular supporting a population of European importance of the migratory species, greylag goose (NatureScot, 2018a).

The Cromarty Firth also qualifies under Article 4.2 by regularly supporting in excess of 20,000 waterfowl. Including nationally important populations of redshank, curlew, knot, red-breasted merganser, scaup, pintail, wigeon, greylag goose, bar-tailed godwit, whooper swan, dunlin and oystercatcher (NatureScot, 2018a).

The ISB and Phase 5 development site is situated <100m from the Cromarty Firth SPA. Therefore, winter bird surveys and breeding bird surveys have been undertaken for several years. Bar-tailed godwit, greylag goose, redshank, curlew, red-breasted merganser, wigeon, dunlin and oystercatcher were previously recorded on the shore adjacent to the ISB during winter bird surveys, undertaken in 2015/16, 2017/18, 2020/21 and 2022/23 (see Table A1.1). In addition, common tern were recorded nesting within the ISB and adjacent habitats during the breeding bird surveys in 2016, 2017, 2022 and 2023 (Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos 2023). Whilst curlew and oystercatcher have been recorded nesting within the ISB and adjacent habitats during a breeding bird surveys in 2022 and 2023 (Atmos, 2022; and Atmos 2023). Thus, nine of the ornithological qualifying features of the Cromarty Firth SPA are known to be present within close proximity to the Phase 5 development site. Bird species that have not previously been identified during the winter or breeding bird surveys are still being assessed due to the proximity between the SPA and the Phase 5 development site (<100m).

The conservation objectives for the Cromarty Firth SPA are shown in Table 3.2. A summary of the LSE considerations given to the qualifying features are shown in Table 3.3.

Table 3.2: Conservation Objectives of the Cromarty Firth SPA

Conservation objectives of the designated site
Overarching Conservation Objective: 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.
Further Conservation Objectives: 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; and • No significant disturbance of the species.

A degree of connectivity has been identified between the Cromarty Firth SPA and the Phase 5 development site due to the proximity of the proposed built footprint to the SPA (<100m) and the known presence of nine of qualify features of the SPA within the ISB and adjacent habitats (see Table A1.1; Swann & Brockway, 2016; Swann and Brockway, 2017; Atmos, 2022; and Atmos, 2023). Potential direct impacts associated with the Phase 5 development are connected to temporary disturbance during the construction phase, long-term disturbance during operation (see Table 3.3). **Thus, there is anticipated to be potential for LSE for eight of the ornithological qualifying features of the SPA and an AA is likely to be required.**

Table 3.3: Qualifying Features of the Cromarty Firth SPA

Qualifying feature	Summary of assessment
Osprey	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, is within suitable feeding range of 25 osprey territories. Providing suitable foraging habitat for 12.5% of the GB population of osprey (2008 to 2012, five-year mean). Furthermore, 1 breeding pair has been identified within the SPA (1% of the GB population) (NatureScot, 2018). Osprey generally forage up to 10km of the nest (Hardey, *et al.*, 2013). However, there are no known records of osprey within 10km of the Phase 5 development site (NBN, 2023). Furthermore, osprey are unlikely to utilise habitats within and around the Phase 5 development site to forage. Foraging dependencies of coastal populations of osprey have been found to correlate with the sea surface temperature (SST), which is known to have an impact upon the availability of surface-dwelling fish (Crawshaw & O'Connor 1997). Marquiss, Robinson and Tidal, 2007 identified that osprey were primarily freshwater foragers where the SST of the adjacent coastline was 11°C in June. As the average SST of the Cromarty Firth in June is 11.1°C (SeaTemperature, 2022), it would be considered justifiable to assume that local populations of osprey forage predominantly on freshwater fish. Therefore, disturbance and changes to the marine habitats adjacent to the ISB associated with the Phase 5 development is not expected to cause any detriment to the population of the species as a viable component of the site, effect the distribution of the species within the site, or cause significant disturbance of the species as a whole. Osprey are not anticipated to forage within the area of the dredge disposal site (the Sutors), as the habitats are considered to be suboptimal for fish species associated with their diet (Marquiss, Robinson and Tindal, 2007).
Common tern	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 2% of the GB population of common tern (1989 to 1993 mean of 294 pairs) (NatureScot, 2018a). Common tern are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Thus, dredge disposal is not expected to impact upon the species. Breeding common tern were recorded on the rock armour of berth 4 within the ISB in 2016, 2017 and 2023 (Swann & Brockway, 2016; Swann & Brockway, 2017; and Atmos, 2023). In addition, breeding common tern were recorded on a purpose-built tern nesting raft, situated approximately 1500m east-north-east of the ISB in 2022 and 2023 (Atmos, 2022; and Atmos, 2023). As the tern raft is situated outwith the known disturbance distance of breeding common tern (200-400m; NatureScot, 2022), an increase of disturbance levels due to construction activity and operations associated with the Phase 5 development, are not anticipated to degrade breeding suitability of the purpose-built raft. However, there is considered to be potential for adverse impacts to common tern breeding within the ISB. Thus, there is potential for LSE to common tern.

Qualifying feature	Summary of assessment
Whooper swan	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 1% of the GB population of whooper swan (1992/93 to 1996/97 winter peak mean of 64 individuals) (NatureScot, 2018a). However, whooper have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that whooper swan from the Cromarty Firth SPA are not utilising habitats immediately adjacent to the ISB or Phase 5 development site. Thus, temporary disturbance due to construction activity and long-term disturbance due to operations are not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Construction works and operations including the use of heavy plant will be carried out within and adjacent to the intertidal/marine environment. There is a risk of accidental loss of containment into the water of pollutants such as chemical, hydraulic fluids and fuel oils from construction and operation works. The release of pollutants into the marine environment could have negative, direct or indirect, implications on marine habitats. It should, however, be recognised that the Phase 5 development will need to comply with the CAR and instruction detailed within the GPP5 (NRW, NIEA & SEPA, 2017) and the PoCF Guides and Permits for the control of hazardous activities, such as bunkering (PoCF, 2023). The volumes associated with an accidental release of contaminant during construction or operation works are limited. Hence, in the unlikely event that an accidental release of contaminants does occur, the impacts are not anticipated to be of a scale that will affect large areas of the designated site and indeed its qualifying features. Furthermore, the ports spill response procedures would be enacted, which would limit the spread and recover immiscible pollutants from the water. Thus, no loss or degradation of habitats is anticipated as a result of construction activity and operations associated with the Phase 5 development. The extent of habitats supporting the species and the structure, function and supporting processes of habitats supporting the species shall be maintained. Furthermore, whooper swan are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable habitat. As such, no LSE to whooper swan is anticipated.

Qualifying feature	Summary of assessment
Bar-tailed godwit	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 3% of the GB population of bar-tailed godwit (1992/93 to 1996/97 winter mean peak of 1,355 individuals) (NatureScot, 2018a). Bar-tailed godwit are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable habitat. Wintering bar-tailed godwit were recorded on the shoreline adjacent to the ISB during the 2016/17 winter bird surveys (see Table A1.1). Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which could, in turn, affect the distribution of the species within the site. Therefore, there is potential for LSE to bar-tailed godwit.

Qualifying feature	Summary of assessment
Greylag goose	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 2% of the GB population of greylag goose (1992/93 to 1996/97 winter mean peak of 1,782 individuals) (NatureScot, 2018a). An individual greylag goose was recorded on one occasion during the 2022/23 winter bird survey (see Table A1.1). This is the first time that the species has been recorded during the winter bird surveys. The goose landed within the water close to shore during the survey and rested for two/three minutes before flying away. No behaviour was observed other than resting (Affric, 2023). Therefore, the observation is not considered to be confirmation that the species utilise the site on a regular basis. Therefore, it would be considered justifiable to assume that greylag goose from the Cromarty Firth SPA do not generally use habitats immediately adjacent to the ISB or Phase 5 development site. Thus, temporary disturbance due to construction activity and long-term disturbance due to operations are not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Construction works and operations including the use of heavy plant will be carried out within and adjacent to the intertidal/marine environment. There is a risk of accidental loss of containment into the water of pollutants such as chemical, hydraulic fluids and fuel oils from construction and operation works. The release of pollutants into the marine environment could have negative, direct or indirect, implications on marine habitats. It should, however, be recognised that the Phase 5 development will need to comply with the CAR and instruction detailed within the GPP5 (NRW, NIEA & SEPA, 2017) and the PoCF Guides and Permits for the control of hazardous activities, such as bunkering (PoCF, 2023). The volumes associated with an accidental release of contaminant during construction or operation works are limited. Hence, in the unlikely event that an accidental release of contaminants does occur, the impacts are not anticipated to be of a scale that will affect large areas of the designated site and indeed its qualifying features. Furthermore, the ports spill response procedures would be enacted, which would limit the spread and recover immiscible pollutants from the water. Thus, no loss or degradation of habitats is anticipated as a result of construction activity and operations associated with the Phase 5 development. The extent of habitats supporting the species and the structure, function and supporting processes of habitats supporting the species shall be maintained. Furthermore, greylag goose are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable habitat. As such, no LSE to greylag goose is anticipated.

Qualifying feature	Summary of assessment
Redshank	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 1% of the GB population of redshank (1992/93 to 1996/97 winter mean peak of 1,149 individuals) (NatureScot, 2018a). Redshank are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable habitat. Wintering redshank were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which could, in turn, affect the distribution of the species within the site. Therefore, there is potential for a LSE to redshank.
Curlew	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 1% of the GB population of curlew (1992/93 to 1996/97 winter mean peak of 1,313 individuals) (NatureScot, 2018a). Curlew are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable habitat. Wintering curlew were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). Furthermore, breeding curlew were recording on the shoreline adjacent to the ISB during the 2022 and 2023 breeding bird surveys (Atmos, 2022; and Atmos, 2023). Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to curlew.

Qualifying feature	Summary of assessment
Knot	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 1% of the GB population of knot (1992/93 to 1996/97 winter mean peak of 4,312 individuals) (NatureScot, 2018a). However, knot have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that knot from the Cromarty Firth SPA are not utilising habitats immediately adjacent to the ISB or Phase 5 development site. Thus, temporary disturbance due to construction activity and long-term disturbance due to operations are not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Construction works and operations including the use of heavy plant will be carried out within and adjacent to the intertidal/marine environment. There is a risk of accidental loss of containment into the water of pollutants such as chemical, hydraulic fluids and fuel oils from construction and operation works. The release of pollutants into the marine environment could have negative, direct or indirect, implications on marine habitats. It should, however, be recognised that the Phase 5 development will need to comply with the CAR and instruction detailed within the GPP5 (NRW, NIEA & SEPA, 2017) and the PoCF Guides and Permits for the control of hazardous activities, such as bunkering (PoCF, 2023). The volumes associated with an accidental release of contaminant during construction or operation works are limited. Hence, in the unlikely event that an accidental release of contaminants does occur, the impacts are not anticipated to be of a scale that will affect large areas of the designated site and indeed its qualifying features. Furthermore, the ports spill response procedures would be enacted, which would limit the spread and recover immiscible pollutants from the water. Thus, no loss or degradation of habitats is anticipated as a result of construction activity and operations associated with the Phase 5 development. The extent of habitats supporting the species and the structure, function and supporting processes of habitats supporting the species shall be maintained. Furthermore, knot are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable habitat. As such, no LSE to knot is anticipated.

Qualifying feature	Summary of assessment
Red-breasted merganser	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 2% of the GB population of red-breasted merganser (1992/93 to 1996/97 winter mean peak of 204 individuals) (NatureScot, 2018a). The dredge disposal site (the Sutors) is situated approximately 2.6km from the Cromarty Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering red-breasted merganser were recorded on the shoreline adjacent to the ISB during the 2015/16 and 2020/21 winter bird surveys (see Table A1.1). Construction activity associated with the Phase 5 development could cause temporary disturbance. Thus, further consideration will be required. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to red-breasted merganser.

Qualifying feature	Summary of assessment
Scaup	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 3% of the GB population of scaup (1992/93 to 1996/97 winter mean peak of 295 individuals) (NatureScot, 2018a). The dredge disposal site (the Sutors) is situated approximately 2.6km from the Cromarty Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Scaup have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that scaup from the Cromarty Firth SPA are not utilising habitats immediately adjacent to the ISB or Phase 5 development site. Thus, temporary disturbance due to general construction activity and long-term disturbance due to operations are not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Piling works will be required during the construction phase, which will result in underwater noise. The importance of in-air hearing for aquatic bird species is well documented. However, underwater hearing of bird species remains relatively unknown. Nonetheless, lesser scaup (*Aythya affinis*) have been found to be sensitive to under-water noise (Hansen, *et al.*, 2020), with thresholds not substantially different from that of odontocetes and pinnipeds at low frequencies (Crowell, *et al.*, 2016; Hansen, *et al.*, 2017; and Therrien, 2014). In addition, there is research to suggest that underwater noise can result in behavioural changes of diving birds (Hansen, *et al.*, 2020; and Patterson, 2023). Behavioural changes may result in adverse impacts. Noise dissipation for piling activities were modelled for the Phase 4 development, peak noise levels were predicted to drop below levels that could cause hearing damage to marine mammals within 55m and are modelled to be below 165dB within 1km. As scaup have not been recorded within close proximity to the ISB and Phase 5 development site, it is likely that the habitats are suboptimal for the species. Noise will disperse to lower levels within 1km. Thus, no significant effects are expected to scaup utilising optimal habitats within the wider locality. As such, no LSE to scaup is anticipated.

Qualifying feature	Summary of assessment
Pintail	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 1% of the GB population of pintail (1992/93 to 1996/97 winter mean peak of 319 individuals) (NatureScot, 2018a). However, pintail have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that pintail from the Cromarty Firth SPA are not utilising habitats immediately adjacent to the ISB or Phase 5 development site. Thus, temporary disturbance due to construction activity and long-term disturbance due to operations are not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Construction works and operations including the use of heavy plant will be carried out within and adjacent to the intertidal/marine environment. There is a risk of accidental loss of containment into the water of pollutants such as chemical, hydraulic fluids and fuel oils from construction and operation works. The release of pollutants into the marine environment could have negative, direct or indirect, implications on marine habitats. It should, however, be recognised that the Phase 5 development will need to comply with the CAR and instruction detailed within the GPP5 (NRW, NIEA & SEPA, 2017) and the PoCF Guides and Permits for the control of hazardous activities, such as bunkering (PoCF, 2023). The volumes associated with an accidental release of contaminant during construction or operation works are limited. Hence, in the unlikely event that an accidental release of contaminants does occur, the impacts are not anticipated to be of a scale that will affect large areas of the designated site and indeed its qualifying features. Furthermore, the ports spill response procedures would be enacted, which would limit the spread and recover immiscible pollutants from the water. Thus, no loss or degradation of habitats is anticipated as a result of construction activity and operations associated with the Phase 5 development. The extent of habitats supporting the species and the structure, function and supporting processes of habitats supporting the species shall be maintained. Pintail are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable habitat. As such, no LSE to pintail is anticipated.

Qualifying feature	Summary of assessment
Wigeon	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 3% of the GB population of wigeon (1992/93 to 1996/97 winter mean peak of 9,204 individuals) (NatureScot, 2018a). The dredge disposal site (the Sutors) is situated approximately 2.6km from the Cromarty Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly foraging within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering wigeon were recorded on the shoreline adjacent to the ISB during the 2020/21 and 2022/23 winter bird surveys (see Table A1.1). Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to wigeon.
Dunlin	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 0.6% of the GB population of dunlin (1991/92 to 1995/96 winter mean peak of 3,384 individuals) (NatureScot, 2018a). Dunlin are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable habitat. Wintering dunlin were recorded on the shoreline adjacent to the ISB during the 2017/18 and 2022/23 winter bird surveys (see Table A1.1). Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to dunlin.

Qualifying feature	Summary of assessment
Oystercatcher	The Cromarty Firth SPA, situated <100m from the Phase 5 development site, supports 0.8% of the GB population of oystercatcher (2004/05 to 2009/10 winter peak mean of 2,702 individuals) (NatureScot, 2018a). Oystercatcher are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable habitat. Wintering oystercatcher were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). Furthermore, breeding oystercatcher were recording on the shoreline adjacent to the ISB during the breeding bird survey in 2022 and within the ISB and adjacent habitats during the breeding bird survey in 2023 (Atmos, 2022; and Atmos, 2023). Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to oystercatcher.

3.2.2 Moray Firth SAC

The Moray Firth SAC in north-east Scotland supports the only known resident population of bottlenose dolphin in the North Sea. The population is estimated to be around 130 individuals (Wilson, *et al.*, 1999). Bottlenose dolphins are present all year round, and, while they range widely in the Moray Firth, they appear to favour particular areas (JNCC, 2023e).

The conservation objectives for the Moray Firth SAC are shown in Table 3.4. A summary of the LSE considerations given to the qualifying features are shown in Table 3.5.

Table 3.4: Moray Firth SAC Conservation Objectives

Conservation objectives of the designated site
Overarching Conservation Objective: To ensure that the qualifying features of Moray Firth SAC are in favourable condition and make an appropriate contribution to achieving Favourable Conservation Status.
Further Conservation Objective (bottlenose dolphin only): To ensure that the integrity of Moray Firth SAC is maintained or restored in the context of environmental changes by ensuring that: • The population of bottlenose dolphin is a viable component of the site; • The distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance; and • The supporting habitats and processes relevant to bottlenose dolphin and the availability of prey for bottlenose dolphin are maintained.

A degree of connectivity has been identified between the Moray Firth SAC and the Phase 5 development due to mobile nature of bottlenose dolphins and known records of the species within the Cromarty Firth (NBN, 2023). Potential direct impacts to bottlenose dolphin associated with the Phase 5 development are connected with temporary disturbance during the construction phase, due to underwater noise associated with piling works (see Table 3.5). **Thus, there is anticipated to be potential for a LSE for the qualifying feature of the SAC and an AA is likely to be required.**

Table 3.5: Qualifying Features of the Moray Firth SAC

Qualifying feature	Summary of assessment
Bottlenose dolphin	The Moray Firth SAC is situated 6km from the Phase 5 development site. Bottlenose dolphin have been recorded ranging between 12-105km in an estuarine environment (Balmer, *et al.*, 2014; and Nekolny, 2017). Furthermore, there are records of bottlenose dolphin within the Cromarty Firth (NBN, 2023). Therefore, there is considered to be potential for ecological connectivity for bottlenose dolphin utilising the Moray Firth SAC to range within habitats in close proximity to the Phase 5 development site. The piling works required as part of the construction of the Phase 5 development will generate underwater noise. Thus, there is considered to be potential for bottlenose to be temporarily disturbed during construction works due to the underwater noise associated with piling, and thus, potential for a LSE to the species.

3.2.3 Moray Firth SPA

The Moray Firth SPA is a funnel-shaped body of sea situated on the north-east mainland coast of Scotland. Much of the Moray Firth is comprised of shallow water (<20m), over a sandy substrate. With the exception of a 50m deep channel running east-west through muddy substrate. Tidal flows are relatively weak with a maximum tidal range of 3m, as the Moray Firth is relatively sheltered. The Moray Firth is an important spawning ground and nursery area for a number of fish species, which together with abundant bivalve molluscs, are important prey species for seabirds (NatureScot, 2020a).

The Moray Firth SPA qualifies under Article 4.2 by regularly supporting populations of European importance of migratory species. Including common eider, common goldeneye, red-breasted merganser and European shag (NatureScot, 2020a).

Winter bird surveys and breeding bird surveys of the habitats adjacent to the Phase 5 development site and ISB have been undertaken for several years. European shag, common eider, common goldeneye and red-breasted merganser were previously recorded on the shore adjacent to the ISB during winter bird surveys, undertaken in 2015/16, 2017/18, 2020/21 and 2022/23 (see Table A1.1). In addition, common eider have been recorded nesting within the ISB and adjacent habitats during a breeding bird surveys in 2016, 2017, 2022 and 2023 (Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos 2023). Thus, four of the species listed as qualifying features of the Moray Firth SPA are known to be present within close proximity to the Phase 5 development site.

The conservation objectives for the Moray Firth SPA are shown in Table 3.6. A summary of the LSE considerations given to the qualifying features are shown in Table 3.7.

Table 3.6: Conservation Objectives of the Moray Firth SPA

Conservation objectives of the designated site
Overarching Conservation Objective: 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.
Further Conservation Objectives: 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 and maintain the habitats and food resources of the qualifying features in favourable condition.

A degree of connectivity has been identified between the Moray Firth SPA and the Phase 5 development. Furthermore, four of the ornithological species associated with qualifying features of the SPA are known to be present within the ISB and adjacent habitats (see Table A1.1; Swann & Brockway, 2016; Swann and Brockway, 2017; Atmos, 2022; and Atmos 2023). Potential direct impacts associated with the Phase 5 development are connected to temporary disturbance during the construction phase, long-term disturbance during operation and changes to the marine habitats adjacent to the ISB (see Table 3.7). **Thus, there is anticipated to be potential for a LSE for four of the ornithological qualifying features of the SPA and an AA is likely to be required.**

Table 3.7: Qualifying Features of the Moray Firth SPA

Qualifying feature	Summary of assessment
Great northern diver	The Moray Firth SPA supports 5.8% of the GB population of great northern diver (2001/02 to 2006/07 mean peak annual non-breeding population of 144 individuals) (NatureScot, 2020a). However, great northern diver have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that great northern diver associated with the Moray Firth SPA do not utilise habitats immediately adjacent to the ISB or Phase 5 development site. The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Therefore, no LSE to great northern diver is anticipated.
Red-throated diver	The Moray Firth SPA supports 1.9% of the GB population of re-throated diver (2001/02 to 2006/07 mean peak annual non-breeding population of 324 individuals) (NatureScot, 2020a). However, red-throated diver have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that red-throated diver associated with the Moray Firth SPA do not utilise habitats immediately adjacent to the ISB or Phase 5 development site. The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Therefore, no LSE to red-throated diver is anticipated.

Qualifying feature	Summary of assessment
Slavonian grebe	The Moray Firth SPA supports 3.9% of the GB population of Slavonian grebe (2001/02 to 2005/06 mean peak annual non-breeding population of 43 individuals) (NatureScot, 2020a). However, Slavonian grebe have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that Slavonian grebe associated with the Moray Firth SPA do not utilise habitats immediately adjacent to the ISB or Phase 5 development site. The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Therefore, no LSE to Slavonian grebe is anticipated.

Qualifying feature	Summary of assessment
Scaup	The Moray Firth SPA supports 17.9% of the GB population of scaup (2001/02 to 2005/06 mean peak annual non-breeding population of 930 individuals) (NatureScot, 2020a). The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. Nonetheless, it has been determined that scaup are unlikely to forage within the area of the Sutors or habitats within the species known maximum disturbance distance (450m; NatureScot, 2020b). A study was undertaken to observe scaup foraging behaviours. During which, it was determined that the greatest known depth that scaup were recorded feeding on the seabed for invertebrates was 23 feet (approximately 7.01m). However, it was identified that most foraging dives were undertaken in <5 feet of water (approximately 1.5m) (Cronan, 1957). The water depth within the Sutors is recorded at 50-51m (Navionics, 2023). Water depth within 450m, of the dredge disposal site generally ranges from 10-45m, with a small area towards the southeast having a water depth 5-10m (Navionics, 2023). Furthermore, the area of the Sutors has high marine traffic and is therefore heavily disturbed. Thus, the water within 450m of the Sutors is considered to be suboptimal foraging habitat for the species. As there is ample optimal foraging habitat within the wider context of the site (it would be considered justifiable to assume that scaup are unlikely to forage within the dredge disposal area or within distances that may result in disturbance (i.e. 450m). Dredge disposal will result in some temporary increase in solids in the water column. However, due to the minimal time that sedimentation is expected (i.e. less than 15 minutes) for each disposal, it is not anticipated to result in any loss or degradation of suitable habitats for scaup. Thus, temporary disturbance at the Sutors due to dredge disposal associated with the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Scaup have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that scaup from the Moray Firth SPA are not utilising habitats immediately adjacent to the ISB or Phase 5 development site. Thus, temporary disturbance due to general construction activity and long-term disturbance due to operations are not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Piling works will be required during the construction phase, which will result in underwater noise. The importance of in-air hearing for aquatic bird species is well documented. However, underwater hearing of bird species remains relatively unknown. Nonetheless, lesser scaup (*Aythya affinis*) have been found to be sensitive to under-water noise (Hansen, *et al.*, 2020), with thresholds not substantially different from that of odontocetes and pinnipeds at low frequencies (Crowell, *et al.*, 2016; Hansen, *et al.*, 2017; and Therrien, 2014). In addition, there is research to suggest that underwater noise can result in

Qualifying feature	Summary of assessment
Scaup	behavioural changes of diving birds (Hansen, *et al.*, 2020; and Patterson, 2023). Behavioural changes may result in adverse impacts. Noise dissipation for piling activities were modelled for the Phase 4 development, peak noise levels were predicted to drop below levels that could cause hearing damage to marine mammals within 55m and are modelled to be below 165dB within 1km. As scaup have not been recorded within close proximity to the ISB and Phase 5 development site, it is likely that the habitats are suboptimal for the species. Noise will disperse to lower levels within 1km. Thus, no significant effects are expected to scaup utilising optimal habitats within the wider locality. As such, no LSE to scaup is anticipated.
Common eider	The Moray Firth SPA supports 2.9% of the GB population of common eider (2001/02 to 2006/07 mean peak annual non-breeding population of 1,733 individuals) (NatureScot, 2020a). The dredge disposal site (the Sutors) is situated <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering common eider were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). Breeding common eider were recorded on the rock armour of the ISB in 2016, 2017, 2022 and 2023 (Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos 2023) and on the shoreline adjacent to the ISB in 2022 and 2023 (Atmos, 2022; and Atmos, 2023). There is considered to be ecological connectivity between the Phase 5 development site and the Moray Firth SPA. Thus, it would be considered justifiable to assume that common eider from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to common eider.

Qualifying feature	Summary of assessment
Long-tailed duck	The Moray Firth SPA supports 45.5% of the GB population of long-tailed duck (2001/02 to 2005/06 mean peak annual non-breeding population of 5,001 individuals) (NatureScot, 2020a). However, long-tailed duck have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that long-tailed duck associated with the Moray Firth SPA do not utilise habitats immediately adjacent to the ISB or Phase 5 development site. The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Therefore, no LSE to long-tailed duck is anticipated.
Common scoter	The Moray Firth SPA supports 5.5% of the GB population of common scoter (2001/02 to 2005/06 mean peak annual non-breeding population of 5,479 individuals) (NatureScot, 2020a). However, common scoter have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that common scoter associated with the Moray Firth SPA do not utilise habitats immediately adjacent to the ISB or Phase 5 development site. The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Therefore, no LSE to common scoter is anticipated.

Qualifying feature	Summary of assessment
Velvet scoter	The Moray Firth SPA supports 59.5% of the GB population of velvet scoter (2001/02 to 2005/06 mean peak annual non-breeding population of 1,488 individuals) (NatureScot, 2020a). However, velvet scoter have not been recorded during any of the winter bird surveys or breeding bird surveys (see Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023). Therefore, it would be considered justifiable to assume that velvet scoter associated with the Moray Firth SPA do not utilising habitats immediately adjacent to the ISB or Phase 5 development site. The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Therefore, no LSE to velvet scoter is anticipated.

Qualifying feature	Summary of assessment
Common goldeneye	The Moray Firth SPA supports 4.5% of the GB population of common goldeneye (2001/02 to 2005/06 mean peak annual non-breeding population of 907 individuals) (NatureScot, 2020a). The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering common goldeneye were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Moray Firth SPA. Thus, it would be considered justifiable to assume that common goldeneye from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to common goldeneye.

Qualifying feature	Summary of assessment
Red-breasted merganser	The Moray Firth SPA supports 1.8% of the GB population of red-breasted merganser (2001/02 to 2005/06 mean peak annual non-breeding population of 151 individuals) (NatureScot, 2020a). The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering red-breasted merganser were recorded on the shoreline adjacent to the ISB during the 2015/16 and 2020/21 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Moray Firth SPA. Thus, it would be considered justifiable to assume that red-breasted merganser from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Thus, further consideration will be required. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to red-breasted merganser.

Qualifying feature	Summary of assessment
European shag	The Moray Firth SPA supports 5.9% of the GB population (3.2% of the biogeographic population) of European shag during the non-breeding season (a mean peak annual non-breeding population of 6,462 individuals) and 10.2% of the GB population (2.7% of the biogeographic population) of European shag during the breeding season (a mean peak annual breeding population of 5,494 individuals) (NatureScot, 2020a). The dredge disposal site (the Sutors) is situated approximately <500m from the Moray Firth SPA. The Sutors dredging site has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering European shag were recorded on the shoreline adjacent to the ISB during the 2015/16 and 2022/23 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Moray Firth SPA. Thus, it would be considered justifiable to assume that European shag from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to European shag.

3.2.4 Inner Moray Firth SPA

The Inner Moray Firth SPA comprises of the Beauly Firth and Inverness Firth, which together form the eastern-most estuarine component of the Moray Basin ecosystem. The SPA contains extensive intertidal flats, saltmarsh and sand dunes. The boundary of the SPA follows those of the Beauly Firth SSSI, Longman and Castle Stuart Bays SSSI, Whiteness Head SSSI and most of Munlochy Bay SSSI (NatureScot, 2018c).

The Inner Moray Firth SPA qualifies under Article 4.1 by regularly supporting populations of European importance of the Annex 1 species, common tern and bar-tailed godwit (NatureScot, 2018c).

The Inner Moray Firth SPA also qualifies under Article 4.2 by regularly supporting in excess of 20,000 individual waterfowl. Including nationally importance populations of curlew, goosander, common goldeneye, wigeon, cormorant, redshank, red-breasted merganser, greylag goose, bar-tailed godwit and oystercatcher (NatureScot, 2018c).

Winter bird surveys and breeding bird surveys of the habitats adjacent to the Phase 5 development site and ISB have been undertaken for several years. Bar-tailed godwit, greylag goose, red-breasted merganser, redshank, curlew, goosander, common goldeneye, wigeon, cormorant and oystercatcher were previously recorded on the shore adjacent to the ISB during winter bird surveys, undertaken in 2015/16, 2017/18, 202/21 and 2022/23 (see Table A1.1). In addition, common tern, were recorded nesting within the ISB and adjacent habitats during the breeding bird surveys in 2016, 2017, 2022 and 2023 (Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos 2023). Whilst curlew and oystercatcher have been recorded nesting within the ISB and adjacent habitats during a breeding bird surveys in 2022 and 2023 (Atmos, 2022; and Atmos, 2023). Thus, eleven of the ornithological species listed as qualifying features of the Inner Moray Firth SPA are known to be present within close proximity to the Phase 5 development site.

The conservation objectives for the Inner Moray Firth SPA are shown in Table 3.8. A summary of the LSE considerations given to the qualifying features are shown in Table 3.9.

Table 3.8: Conservation Objectives of the Inner Moray Firth SPA

Conservation objectives of the designated site
Overarching Conservation Objective: 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.
Further Conservation Objectives: 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; and • No significant disturbance of the species.

A degree of connectivity has been identified between the Inner Moray Firth SPA and the Phase 5 development. Furthermore, eleven of the ornithological species associated with qualifying features of the SPA are known to be present within the ISB and adjacent habitats (see Table A1.1; Swann & Brockway, 2016; Swann and Brockway, 2017; Atmos, 2022; and Atmos, 2023). Potential direct impacts associated with the Phase 5 development are connected to temporary disturbance during the construction phase, long-term disturbance during operation and changes to the marine habitats adjacent to the ISB (see Table 3.9). **Thus, there is anticipated to be potential for a LSE for ten of the ornithological qualifying features of the SPA and an AA is likely to be required.**

Table 3.9: Qualifying Features of the Inner Moray Firth SPA.

Qualifying feature	Summary of assessment
Common tern	The Inner Moray Firth SPA supports 2% of the GB population of common tern (310 pairs) (NatureScot, 2018c). Common tern are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Thus, dredge disposal is not expected to impact upon the species. Breeding common tern were recorded on the rock armour of berth 4 within the ISB in 2016, 2017 and 2023 (Swann & Brockway, 2016; Swann & Brockway, 2017; and Atmos, 2023). In addition, breeding common tern were recorded on a purpose-built tern nesting raft, situated approximately 1500m east-north-east of the ISB in 2022 and 2023 (Atmos, 2022; and Atmos, 2023). As the tern raft is situated outwith the known disturbance distance of breeding common tern (200-400m; NatureScot, 2022), an increase of disturbance levels due to construction activity and operations associated with the Phase 5 development, are not anticipated to degrade breeding suitability of the purpose-built raft. However, there is considered to be potential for adverse impacts to common tern breeding within the ISB. Thus, there is potential for LSE to common tern.
Bar-tailed godwit	The Inner Moray Firth SPA supports 2% of the GB population of bar-tailed godwit (1992/93 to 1996/97 winter peak mean of 1,090 individuals). (NatureScot, 2018c). Bar-tailed godwit are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Wintering bar-tailed godwit were recorded on the shoreline adjacent to the ISB during the 2017/18 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Inner Moray Firth SPA. Thus, it would be considered justifiable to assume that bar-tailed godwit from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to bar-tailed godwit.

Qualifying feature	Summary of assessment
Greylag goose	The Inner Moray Firth supports 3% of the GB population (3% of the Iceland/UK/Ireland biogeographic population) of greylag goose (1992/93 to 1996/97 winter mean peak of 2,651 individuals) (NatureScot, 2018c). An individual greylag goose was recorded on one occasion during the 2022/23 winter bird survey (see Table A1.1). This is the first time that the species has been recorded during the winter bird surveys. The goose landed within the water close to shore during the survey and rested for two/three minutes before flying away. No behaviour was observed other than resting (Affric, 2023). Therefore, the observation is not considered to be confirmation that the species utilise the site on a regular basis. Therefore, it would be considered justifiable to assume that greylag goose from the Inner Moray Firth SPA do not generally use habitats immediately adjacent to the ISB or Phase 5 development site. Thus, temporary disturbance due to construction activity and long-term disturbance due to operations are not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Construction works and operations including the use of heavy plant will be carried out within and adjacent to the intertidal/marine environment. There is a risk of accidental loss of containment into the water of pollutants such as chemical, hydraulic fluids and fuel oils from construction and operation works. The release of pollutants into the marine environment could have negative, direct or indirect, implications on marine habitats. It should, however, be recognised that the Phase 5 development will need to comply with the CAR and instruction detailed within the GPP5 (NRW, NIEA & SEPA, 2017) and the PoCF Guides and Permits for the control of hazardous activities, such as bunkering (PoCF, 2023). The volumes associated with an accidental release of contaminant during construction or operation works are limited. Hence, in the unlikely event that an accidental release of contaminants does occur, the impacts are not anticipated to be of a scale that will affect large areas of the designated site and indeed its qualifying features. Furthermore, the ports spill response procedures would be enacted, which would limit the spread and recover immiscible pollutants from the water. Thus, no loss or degradation of habitats is anticipated as a result of construction activity and operations associated with the Phase 5 development. The extent of habitats supporting the species and the structure, function and supporting processes of habitats supporting the species shall be maintained. Furthermore, greylag goose are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. As such, no LSE to greylag goose is anticipated.

Qualifying feature	Summary of assessment
Red-breasted merganser	The Inner Moray Firth SPA supports 12% of the GB population (1% of the NW and central Europe biogeographic population) of red-breasted merganser (1992/93 to 1996/97 winter mean peak of 1,184 individuals) (NatureScot, 2018c). The dredge disposal site (the Sutors) has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering red-breasted merganser were recorded on the shoreline adjacent to the ISB during the 2015/16 and 2020/21 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Inner Moray Firth SPA. Thus, it would be considered justifiable to assume that red-breasted merganser from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Thus, further consideration will be required. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to red-breasted merganser.
Redshank	The Inner Moray Firth SPA supports 1% of the GB population (1% of the Eastern Atlantic biogeographic population) of redshank (1992/93 to 1996/97 winter mean peak of 1,621 individuals) (NatureScot, 2018c). Redshank are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Wintering redshank were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Inner Moray Firth SPA. Thus, it would be considered justifiable to assume that redshank from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance could be anticipated once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to redshank.

Qualifying feature	Summary of assessment
Curlew	The Inner Moray Firth SPA supports 1% of the GB population of curlew (1992/93 to 1996/97 winter mean peak of 1,262 individuals) (NatureScot, 2018c). Curlew are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Wintering curlew were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). Furthermore, breeding curlew were recording on the shoreline adjacent to the ISB during the 2022 and 2023 breeding bird survey (Atmos, 2022; and Atmos, 2023). There is considered to be ecological connectivity between the Phase 5 development site and the Inner Moray Firth SPA. Thus, it would be considered justifiable to assume that curlew from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to curlew.
Goosander	The Inner Moray Firth SPA supports 4% of the GB population of goosander (1992/93 to 19696/97 winter peak mean of 325 individuals) (NatureScot, 2018c). The dredge disposal site (the Sutors) has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering goosander were recorded on the shoreline adjacent to the ISB during the 2020/21 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Inner Moray Firth SPA. Thus, it would be considered justifiable to assume that goosander from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance could be anticipated once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to goosander.

Qualifying feature	Summary of assessment
Common goldeneye	The Inner Moray Firth SPA supports 1% of the GB population of common goldeneye (1992/92 to 1996/97 winter peak mean of 218 individuals) (NatureScot, 2018c). The dredge disposal site (the Sutors) has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering common goldeneye were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Inner Moray Firth SPA. Thus, it would be considered justifiable to assume that common goldeneye from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to common goldeneye.

Qualifying feature	Summary of assessment
Wigeon	The Inner Moray Firth SPA supports 3% of the GB population of wigeon (1992/93 to 1996/97 winter mean peak of 7,310 individuals) (NatureScot, 2018c). The dredge disposal site (the Sutors) has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly foraging within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering wigeon were recorded on the shoreline adjacent to the ISB during the 2020/21 and 2022/23 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Inner Moray Firth SPA. Thus, it would be considered justifiable to assume that wigeon from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to wigeon.

Qualifying feature	Summary of assessment
Cormorant	The Inner Moray Firth SPA supports 3% of the GB population of cormorant (1992/93 to 1996/97 winter peak mean of 409 individuals) (NatureScot, 2018c). The dredge disposal site (the Sutors) has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly foraging within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering cormorant were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Inner Moray Firth SPA. Thus, it would be considered justifiable to assume that cormorant from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to cormorant.
Oystercatcher	The Inner Moray Firth SPA supports 0.9% of the GB population (1991/92 to 1995/96 winter mean peak of 3,063 individuals) (NatureScot, 2018c). Oystercatcher are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Wintering oystercatcher were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). Furthermore, breeding oystercatcher were recording on the ISB and adjacent shoreline in 2022 and 2023 (Atmos, 2022; and Atmos, 2023). There is considered to be ecological connectivity between the Phase 5 development site and the Inner Moray Firth SPA. Thus, it would be considered justifiable to assume that oystercatcher from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to oystercatcher.

3.2.5 Loch Eye SPA

Loch Eye SPA is a shallow, eutrophic loch situated between the Cromarty and Dornoch Firths, around 4km east of Tain. Only a small number of eutrophic lochs are located within the Scottish Highlands. The loch supports an abundance of hydrophytes (which cover >90% of the sub-merged sediments). The boundaries of the Loch Eye SPA are the same as the Loch Eye SSSI (NatureScot, 2018d).

The Loch Eye SOA qualifies under Article 4.2 by regularly supporting populations of European importance of the migratory species, greylag goose (NatureScot, 2018d).

Winter bird surveys and breeding bird surveys of the habitats adjacent to the Phase 5 development site and ISB have been undertaken for several years. Greylag goose were previously recorded during a winter bird survey undertaken in 2022/23 (see Table A1.1). Thus, one of the ornithological species listed as qualifying features of the Loch Eye SPA has been recorded within close proximity to the Phase 5 development site.

The conservation objectives for the Loch Eye SPA are shown in Table 3.10. A summary of LSE considerations associated with the qualifying features are shown in Table 3.11.

Table 3.10: Conservation Objectives of the Dornoch Firth and Loch Fleet SPA

Conservation objectives of the designated site
Overarching Conservation Objective: 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.
Further Conservation Objectives: 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 habitats supporting the species; and • No significant disturbance of the species.

A degree of connectivity has been identified between the Loch Eye SPA and the Phase 5 development. Furthermore, one of the ornithological species associated with qualifying features of the SPA are known to be present within the ISB and adjacent habitats (see Table A1.1). Potential direct impacts associated with the Phase 5 development are connected to temporary disturbance during the construction phase, long-term disturbance during operation and changes to the marine habitats adjacent to the ISB (see Table 3.11). **However, as evidence from the winter bird surveys suggests that greylag goose do not regularly make use of habitats within close proximity to the Phase 5 development site, no LSE is anticipated.**

Table 3.11: Qualifying Features of the Loch Eye SPA

Qualifying feature	Summary of assessment
Greylag goose	The Loch Eye SPA supports 11% of the Iceland/UK/Ireland biogeographic population) of greylag goose (11,200 individuals) (NatureScot, 2018d). An individual greylag goose was recorded on one occasion during the 2022/23 winter bird survey (see Table A1.1). This is the first time that the species has been recorded during the winter bird surveys. The goose landed within the water close to shore during the survey and rested for two/three minutes before flying away. No behaviour was observed other than resting (Affric, 2023). Therefore, the observation is not considered to be confirmation that the species utilise the site on a regular basis. Therefore, it would be considered justifiable to assume that greylag goose from the Loch Eye SPA do not generally use habitats immediately adjacent to the ISB or Phase 5 development site. Thus, temporary disturbance due to construction activity and long-term disturbance due to operations are not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Construction works and operations including the use of heavy plant will be carried out within and adjacent to the intertidal/marine environment. There is a risk of accidental loss of containment into the water of pollutants such as chemical, hydraulic fluids and fuel oils from construction and operation works. The release of pollutants into the marine environment could have negative, direct or indirect, implications on marine habitats. It should, however, be recognised that the Phase 5 development will need to comply with the CAR and instruction detailed within the GPP5 (NRW, NIEA & SEPA, 2017) and the PoCF Guides and Permits for the control of hazardous activities, such as bunkering (PoCF, 2023). The volumes associated with an accidental release of contaminant during construction or operation works are limited. Hence, in the unlikely event that an accidental release of contaminants does occur, the impacts are not anticipated to be of a scale that will affect large areas of the designated site and indeed its qualifying features. Furthermore, the ports spill response procedures would be enacted, which would limit the spread and recover immiscible pollutants from the water. Thus, no loss or degradation of habitats is anticipated as a result of construction activity and operations associated with the Phase 5 development. The extent of habitats supporting the species and the structure, function and supporting processes of habitats supporting the species shall be maintained. Furthermore, greylag goose are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. As such, no LSE to greylag goose is anticipated.

3.2.6 Dornoch Firth and Loch Fleet SPA

Dornoch Firth and Loch Fleet SPA is a large area covering the two northernmost estuaries in the Moray Basin ecosystem. The Dornoch Firth is relatively unaffected by industrial development and supports large areas of intertidal flats, heath and sand dunes, saltmarsh and a stretch of rocky shore. Loch Fleet is a narrow-mouthed estuary containing extensive sandflats which are bordered by dunes, pinewood and alderwood. The dune systems of international importance for their flora and geomorphology. The boundaries of the SPA follow those of Dornoch Firth SSSI, Morrich More SSSI, Tarbat Ness SSSI, Loch Fleet SSSI and Mound Alderwoods SSSI except for the exclusion of a thin corridor of land on Morrich More SSSI (NatureScot, 2018b).

The Dornoch Firth and Loch Fleet SPA qualify under Article 4.1 by regularly supporting a population of European importance of the Annex 1 species, bar-tailed godwit (NatureScot, 2018b).

The Dornoch Firth further qualifies under Article 4.2 by regularly supporting populations of European importance of the migratory species, greylag goose and wigeon (NatureScot, 2018b).

The Dornoch Firth and Loch Fleet SPA also qualifies under Article 4.2 by regularly supporting in excess of 20,000 individual waterfowl. Including nationally important populations of curlew, redshank, wigeon, greylag goose, bar-tailed godwit, dunlin and oystercatcher (NatureScot, 2018b).

Winter bird surveys and breeding bird surveys of the habitats adjacent to the Phase 5 development site and ISB have been undertaken for several years. Bar-tailed godwit, greylag goose, wigeon, curlew, redshank, dunlin and oystercatcher were previously recorded on the shore adjacent to the ISB during winter bird surveys, undertaken in 2015/16, 2017/18, 202/21 and 2022/23 (see Table A1.1). In addition, curlew and oystercatcher have been recorded nesting within the ISB and adjacent habitats during a breeding bird survey in 2022 (Atmos, 2022). Thus, seven of the ornithological species listed as qualifying features of the Dornoch Firth and Loch Fleet SPA are known to be present within close proximity to the Phase 5 development site.

The conservation objectives for the Dornoch Firth and Loch Fleet SPA are shown in Table 3.12. A summary of LSE considerations associated with the qualifying features are shown in Table 3.13.

Table 3.12: Conservation Objectives of the Dornoch Firth and Loch Fleet SPA

Conservation objectives of the designated site
Overarching Conservation Objective: 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
Further Conservation Objectives: 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 habitats supporting the species; and • No significant disturbance of the species.

A degree of connectivity has been identified between the Dornoch Firth and Loch Fleet SPA and the Phase 5 development. Furthermore, seven of the ornithological species associated with qualifying features of the SPA are known to be present within the ISB and adjacent habitats (see Table A1.1; Swann & Brockway, 2016; Swann and Brockway, 2017; and Atmos, 2022). Potential direct impacts associated with the Phase 5 development are connected to temporary disturbance during the construction phase, long-term disturbance during operation and changes to the marine habitats adjacent to the ISB (see Table 3.13). **Thus, there is anticipated to be potential for a LSE for six of the ornithological qualifying features of the SPA and an AA is likely to be required.**

Table 3.13: Qualifying Features of the Dornoch Firth and Loch Fleet SPA

Qualifying feature	Summary of assessment
Bar-tailed godwit	The Dornoch Firth and Loch Fleet SPA supports 2% of the GB population (1989/90 to 1993/94 winter mean peak of 1,184 individuals) (NatureScot, 2018b). Bar-tailed godwit are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Wintering bar-tailed godwit were recorded on the shoreline adjacent to the ISB during the 2016/17 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Dornoch Firth and Loch Fleet SPA. Thus, it would be considered justifiable to assume that bar-tailed godwit from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to bar-tailed godwit.

Qualifying feature	Summary of assessment
Greylag goose	The Dornoch Firth and Loch Fleet SPA supports 1% of the GB population (1% of the Icelandic/UK/Ireland biogeographic population) of greylag goose (NatureScot, 2018b). An individual greylag goose was recorded on one occasion during the 2022/23 winter bird survey (see Table A1.1). This is the first time that the species has been recorded during the winter bird surveys. The goose landed within the water close to shore during the survey and rested for two/three minutes before flying away. No behaviour was observed other than resting (Affric, 2023). Therefore, the observation is not considered to be confirmation that the species utilise the site on a regular basis. Therefore, it would be considered justifiable to assume that greylag goose from the Dornoch Firth and Loch Fleet SPA do not generally use habitats immediately adjacent to the ISB or Phase 5 development site. Thus, temporary disturbance due to construction activity and long-term disturbance due to operations are not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Construction works and operations including the use of heavy plant will be carried out within and adjacent to the intertidal/marine environment. There is a risk of accidental loss of containment into the water of pollutants such as chemical, hydraulic fluids and fuel oils from construction and operation works. The release of pollutants into the marine environment could have negative, direct or indirect, implications on marine habitats. It should, however, be recognised that the Phase 5 development will need to comply with the CAR and instruction detailed within the GPP5 (NRW, NIEA & SEPA, 2017) and the PoCF Guides and Permits for the control of hazardous activities, such as bunkering (PoCF, 2023). The volumes associated with an accidental release of contaminant during construction or operation works are limited. Hence, in the unlikely event that an accidental release of contaminants does occur, the impacts are not anticipated to be of a scale that will affect large areas of the designated site and indeed its qualifying features. Furthermore, the ports spill response procedures would be enacted, which would limit the spread and recover immiscible pollutants from the water. Thus, no loss or degradation of habitats is anticipated as a result of construction activity and operations associated with the Phase 5 development. The extent of habitats supporting the species and the structure, function and supporting processes of habitats supporting the species shall be maintained. Furthermore, greylag goose are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. As such, no LSE to greylag goose is anticipated.

Qualifying feature	Summary of assessment
Wigeon	The Dornoch Firth and Loch Fleet supports 5% of the GB population (2% of the W Siberia/NW and NE Europe biogeographic population) of wigeon (NatureScot, 2018b). The dredge disposal site (the Sutors) has an approximate water depth of 51m (Navionics, 2023). Furthermore, the site has a fast water flow, caused by the tide running between two headlands (North Sutor and South Sutor). These factors suggest that the site would be sub-optimal for diving birds, as substantial energy exertion would be required to forage. As there is ample optimal habitat within the locality, this energy expenditure is considered to be unnecessary, and it is likely that diving birds will make use of more preferable habitats (Heath and Gilchrist, 2010). Therefore, it would be justifiable to assume that diving birds do not regularly forage within the area of the Sutors or surrounding waters. As such, dredge disposal associated within the Phase 5 development is not anticipated to cause any detriment to the population of the species as a viable component of the SPA, effect the distribution of the species within the SPA, or cause significant disturbance of the species as a whole. Wintering wigeon were recorded on the shoreline adjacent to the ISB during the 2020/21 and 2022/23 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Dornoch Firth and Loch Fleet SPA. Thus, it would be considered justifiable to assume that wigeon from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to wigeon.
Curlew	The Dornoch Firth and Loch Fleet SPA supports 1% of the GB population of curlew (1989/90 to 1993/94 winter peak mean of 1,397 individuals) (NatureScot, 2018b). Curlew are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Wintering curlew were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). Furthermore, breeding curlew were recording on the shoreline adjacent to the ISB during the 2022 and 2023 breeding bird survey (Atmos, 2022; and Atmos, 2023). There is considered to be ecological connectivity between the Phase 5 development site and the Dornoch Firth and Loch Fleet SPA. Thus, it would be considered justifiable to assume that curlew from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to curlew.

Qualifying feature	Summary of assessment
Redshank	The Dornoch Firth and Loch Fleet SPA supports 1% of the GB population (1989/90 to 1993/94 winter peak mean of 1,272 individuals) (NatureScot, 2018b). Redshank are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Wintering redshank were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Dornoch Firth and Loch Fleet SPA. Thus, it would be considered justifiable to assume that redshank from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance could be anticipated once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to redshank.
Dunlin	The Dornoch Firth and Loch Fleet SPA supports 1% of the GB population of dunlin (2005/06 to 2009/10 winter peak mean of 4,088 individuals) (NatureScot, 2018b). Dunlin are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Wintering dunlin were recorded on the shoreline adjacent to the ISB during the 2017/18 and 2022/23 winter bird surveys (see Table A1.1). There is considered to be ecological connectivity between the Phase 5 development site and the Dornoch Firth and Loch Fleet SPA. Thus, it would be considered justifiable to assume that dunlin from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to dunlin.

Qualifying feature	Summary of assessment
Oystercatcher	The Dornoch Firth and Loch Fleet SPA supports 0.8% of the GB population (2004/05 to 2009/10 winter peak mean of a minimum of 2,459 individuals) (NatureScot, 2018b). Oystercatcher are not anticipated to forage within the area of the dredge disposal site (the Sutors) due to the lack of suitable foraging habitat. Wintering oystercatcher were recorded on the shoreline adjacent to the ISB during the 2015/16, 2017/18, 2020/21 and 2022/23 winter bird surveys (see Table A1.1). Furthermore, breeding oystercatcher were recording on the ISB and adjacent shoreline in 2022 and 2023 (Atmos, 2022; and Atmos2023). There is considered to be ecological connectivity between the Phase 5 development site and the Dornoch Firth and Loch Fleet SPA. Thus, it would be considered justifiable to assume that oystercatcher from the SPA may travel to habitats within close proximity to the Phase 5 development site. Construction activity associated with the Phase 5 development could cause temporary disturbance. Furthermore, a long-term increase in disturbance is possible once the site is operational, which in turn, could affect the distribution of the species within the site. Therefore, there is potential for a LSE to oystercatcher.

3.2.7 Dornoch Firth and Morrich More SAC

The Dornoch Firth is the most northerly large estuary in Britain and supports a significant proportion of the Inner Moray Firth population of the common seal. The seals, which utilise sand-bars and shores at the mouth of the estuary as haul-out and breeding sites, are the most northerly population to utilise sandbanks. Their numbers represent almost 2% of the UK population of the species (JNCC, 2023b).

The conservation objectives for the Dornoch Firth and Morrich More SAC are shown in Table 3.14. A summary of LSE considerations associated with the qualifying features are shown in Table 3.15.

Table 3.14: Conservation objectives of the Dornoch Firth and Morrich More SAC

Conservation objectives of the designated site
Overarching Conservation Objective: 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 the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features.
Further Conservation Objectives: 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 habitats supporting the species; and • No significant disturbance of the species.

A degree of connectivity has been identified between the Dornoch Firth and Morrich More SAC and the Phase 5 development due to mobile nature of common seal and known records of the species within the Cromarty Firth (NBN, 2023). Potential direct impacts to common seal associated with the Phase 5 development are connected with temporary disturbance during the construction phase, due to underwater noise associated with piling works (see Table 3.15). **Thus, there is anticipated to be potential for a LSE to common seal and an AA will is likely to be required.**

Table 3.15: Qualifying features of the Dornoch Firth and Morrich More SAC

Qualifying feature	Summary of assessment
Common seal	Common seal are a mobile feature, and typically travel distances of 50km to forage. In order for common seal from the Dornoch Firth and Morrich More SAC to reach the Phase 5 development site and ISB, individuals would only need to travel approximately 43km around the coast. Thus, due to the distances between the SAC and the Phase 5 development site, and the fact that there are known records of common seal within the Cromarty Firth (NBN, 2023), there is considered to be potential for ecological connectivity. The piling works required as part of the construction of the Phase 5 development will generate underwater noise. Thus, there is considered to be potential for common seal to be temporarily disturbed during construction works due to the underwater noise associated with piling, and thus, a potential a LSE to the species.

4 Conclusion

The Phase 5 development is proposed to expand the existing ISB. Thus, a review of European Protected Sites has been completed to identify those that the Phase 5 development could have LSE on. Qualifying features associated with designated sites with suitable connectivity to the proposed Phase 5 development site have been considered.

Data from winter bird surveys and breeding bird surveys undertaken within the ISB and along the coastline adjacent to the Phase 5 development site has been used to determine the presence of ornithological features (Table A1.1; Swann & Brockway, 2016; Swann & Brockway, 2017; Atmos, 2022; and Atmos, 2023).

Potential LSE have been identified for several ornithological features associated with the Cromarty Firth SPA, Moray Firth SPA, Inner Moray Firth SPA and the Dornoch Firth and Loch Fleet SPA. In addition, there is considered to be potential LSE to bottlenose dolphin associated with the Moray Firth SAC and common seal associated with the Dornoch Firth and Morrich More SAC. LSE are associated with potential for temporary disturbance during the construction phase (including underwater noise), potential for long-term disturbance during operations and changes to the marine habitats adjacent to the ISB due to the new built footprint.

It is therefore suggested that AA maybe required for the features of the sites summarised in Table 4.1.

Table 4.1: Qualifying Features to be Taken Forward for an AA

Designated Site	Qualifying Features
Cromarty Firth SPA	**Breeding:** Common tern (*Sterna hirundo*); and **Non-breeding:** Bar-tailed godwit (*Limosa lapponica*); Redshank (*Tringa tetanus*); Curlew (*Numenius arquata*); Red-breasted merganser (*Mergus serrator*); Wigeon (*Anas Penelope*); Dunlin (*Calidris alpina*); and Oystercatcher (*Haematopus ostralegus*).
Moray Firth SAC	Bottlenose dolphin (*Tursiops truncatus*).
Moray Firth SPA	**Breeding:** European shag (*Phalacrocorax aristotelis*); and **Non-breeding:** Common eider (S*omateria mollissima*); Common goldeneye (*Bucephala clangula*); and Red-breasted merganser.
Inner Moray Firth SPA	**Breeding:** Common tern; and **Non-breeding:** Bar-tailed godwit; Red-breasted merganser; Redshank; Curlew; Goosander (*Mergus merganser*); Common goldeneye; Wigeon; Cormorant (*Phalacrocorax carbo*); and Oystercatcher.
Dornoch Firth and Loch Fleet SPA	**Non-breeding:** Bar-tailed godwit; Wigeon; Curlew; Redshank; Dunlin; and Oystercatcher.
Dornoch Firth and Morrich More SAC	Common seal (*Phoca vitulina*).

Confirmation is sought to determine whether the qualifying features, detailed in Table 4.1, are considered to require AA, to allow sufficient information to be provided with the Marine Licence application, to allow the competent authority to complete the AA's. This will include consideration of cumulative effects.

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5 References

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6 Glossary

Acronym	Definition
AA	Appropriate Assessment
BPEO	Best Practicable Environmental Options
EIA	Environmental Impact Assessment
GB	Great Britain
HRA	Habitat Regulations Appraisal
ISB	Invergordon Service Base
JNCC	Joint Nature Conservation Committee
km	Kilometres
LSE	Likely Significant Effect
m	Metres
NBN	National Biodiversity Network
NIEA	Northern Ireland Environment Agency
NRW	Natural Resource Wales
PoCF	Port of Cromarty Firth
Ro/Ro	Roll-on Roll-off
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
SST	Sea Surface Temperature

Appendix 1: Winter Bird Survey Data

In order to gain understanding of the ornithological interest of the proposed works site, wintering bird surveys were undertaken between March and October in 2015/16, 2017/18, 2020/21 and 2022/23 by suitable experienced ecologists, Yvonne Brown, Lucy Quinn, Kirsty Macdonald and Ffion Maguire (respectively). The winter bird surveys were undertaken in line with the methodology provided within the RSPB's Bird Monitoring Methods book. The shoreline was divided into ten survey areas, labelled A – J. The location of each survey area is shown in Drawing 71_DRG_9_1. Results of the wintering bird surveys are shown in Table A1.1.

Table A1.1: Counts of Bird Species (Relevant to this HRA Screening Report) Recorded within Each Survey Area (see Figure A1.1) During the Wintering Bird Surveys in 2015/16, 2017/18, 2020/21 and 2022/23

Species	J	I	H	G	F	E	D	C	B	A	Tide	Month	Year
Curlew	3		4	8	2			1			Low	October	2015/16
Oystercatcher	3	4	8	6	30	29		1	3		Low	October	2015/16
Redshank	3					1	1		3		Low	October	2015/16
Curlew						1	1	1			Mid	October	2015/16
Oystercatcher		1				61	5				Mid	October	2015/16
Redshank							1		7		Mid	October	2015/16
Oystercatcher						52					High	October	2015/16
Curlew		1	4	1	1	1		1	1		Low	November	2015/16
Oystercatcher		2	12	2	4	28	6	7	8		Low	November	2015/16
Redshank			1	1			1				Low	November	2015/16
Curlew			3			1		1	1		Mid	November	2015/16
Oystercatcher			5		3	28	25	3	20		Mid	November	2015/16
Red-breasted merganser							1				Mid	November	2015/16
Redshank									1		Mid	November	2015/16
Curlew		1			1				1		High	November	2015/16
Oystercatcher		1			73	6					High	November	2015/16
Redshank	1				1			3	2		High	November	2015/16
Curlew	1	1		1					1		Low	November 2.0	2015/16
Oystercatcher		4		8	7	28			2		Low	November 2.0	2015/16
Redshank				4	1						Low	November 2.0	2015/16

Species	J	I	H	G	F	E	D	C	B	A	Tide	Month	Year
Curlew		1	1								Mid	November 2.0	2015/16
Oystercatcher	1	2	2			13	22	8	24		Mid	November 2.0	2015/16
Redshank							1		6		Mid	November 2.0	2015/16
Oystercatcher					82	7			6		High	November 2.0	2015/16
Redshank					2						High	November 2.0	2015/16
Curlew				1		1	2				Low	November 3.0	2015/16
Oystercatcher	4	6	2	2		6	13	4	3		Low	November 3.0	2015/16
Red-breasted merganser			1								Low	November 3.0	2015/16
Redshank							1				Low	November 3.0	2015/16
Common eider				2							Mid	November 3.0	2015/16
Curlew		1	2			2			1		Mid	November 3.0	2015/16
Oystercatcher		4	12		16	3			2		Mid	November 3.0	2015/16
Oystercatcher						29	2		39		High	November 3.0	2015/16
Redshank			2			1		1	1		High	November 3.0	2015/16
Curlew			2		3			1	1		Low	December	2015/16
Oystercatcher		2	6		5	9	2	1	4		Low	December	2015/16
Oystercatcher			3	2	26	6	4	10	32		Mid	December	2015/16
Redshank				1					1		Mid	December	2015/16
Oystercatcher					67	6			2		High	December	2015/16
Common eider					2						Low	December 2.0	2015/16
Common goldeneye					1						Low	December 2.0	2015/16
Curlew	1	1	1			2		2	2		Low	December 2.0	2015/16
European shag				1							Low	December 2.0	2015/16
Oystercatcher	1	2	4	6	1	2	17		14		Low	December 2.0	2015/16
Redshank									4		Low	December 2.0	2015/16
Curlew		1	1								Mid	December 2.0	2015/16
Oystercatcher						41			18		Mid	December 2.0	2015/16
Redshank						4		1	1		Mid	December 2.0	2015/16
Oystercatcher						34		6	14		High	December 2.0	2015/16
Redshank			1			8					High	December 2.0	2015/16
Curlew			1	1		2	1		1		Low	January	2015/16
Oystercatcher	2	5	5	1	8	12	6		4		Low	January	2015/16
Redshank					1	1			1		Low	January	2015/16
Curlew	1			1	1		1				Mid	January	2015/16
Oystercatcher	2	2	2			9	27		17		Mid	January	2015/16

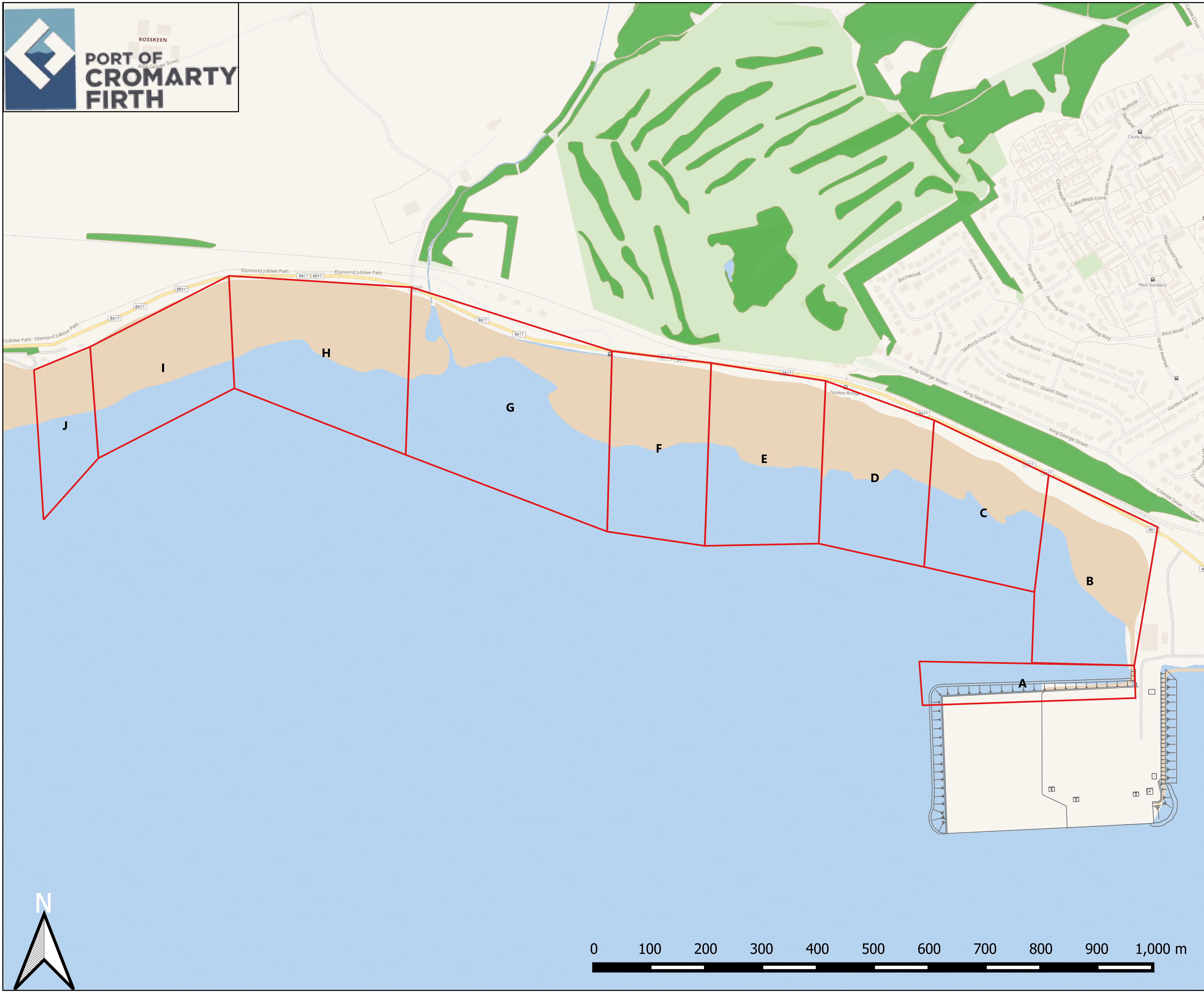
Species	J	I	H	G	F	E	D	C	B	A	Tide	Month	Year
Redshank							1		1		Mid	January	2015/16
Oystercatcher	1					27			61		High	January	2015/16
Redshank									5		High	January	2015/16
Curlew		2	1	3	2	1					Low	January 2.0	2015/16
Oystercatcher	1	3	5	5	4	33	2		2		Low	January 2.0	2015/16
Red-breasted merganser	3										Low	January 2.0	2015/16
Redshank	1					1	1				Low	January 2.0	2015/16
Oystercatcher	1					37		13	1		Mid	January 2.0	2015/16
Redshank						3					Mid	January 2.0	2015/16
Oystercatcher						27		17	14		High	January 2.0	2015/16
Redshank						2					High	January 2.0	2015/16
Curlew				3		1	1			1	Low	February	2015/16
Oystercatcher	3	2	4	6	10	10	12	6		8	Low	February	2015/16
Redshank				1		1	1			1	Low	February	2015/16
Curlew	1	24	2	1	1	1					Mid	February	2015/16
Oystercatcher	1	5	5	4	2	45			10		Mid	February	2015/16
Redshank		1	5			9			2		Mid	February	2015/16
Curlew						4	1				High	February	2015/16
Oystercatcher						46	10				High	February	2015/16
Common eider			2								Low	March	2015/16
Common goldeneye			3								Low	March	2015/16
Cormorant			1								Low	March	2015/16
Curlew	1	1		2	2		1	1			Low	March	2015/16
Oystercatcher	1	2	2	38	7	54		1	2		Low	March	2015/16
Red-breasted merganser										3	Low	March	2015/16
Redshank	1			1			2				Low	March	2015/16
Curlew	1										Mid	March	2015/16
Oystercatcher	1	3		2		56			4		Mid	March	2015/16
Redshank	1										Mid	March	2015/16
Curlew		1									High	March	2015/16
Oystercatcher		6			7	50			2		High	March	2015/16
Redshank	1					1					High	March	2015/16
Common goldeneye			1	4							Mid	December	2017/18
Cormorant			1		1						Mid	December	2017/18

Species	J	I	H	G	F	E	D	C	B	A	Tide	Month	Year
Curlew									5		Mid	December	2017/18
Oystercatcher	3	1				8			32		Mid	December	2017/18
Redshank			1			9			2		Mid	December	2017/18
Cormorant		1		1							Mid	January	2017/18
Curlew		1	1		1	1					Mid	January	2017/18
Dunlin		20									Mid	January	2017/18
Oystercatcher		16			57						Mid	January	2017/18
Redshank			1		7				2		Mid	January	2017/18
Bar-tailed godwit						1					Mid	February	2017/18
Curlew		1	1		1	1					Mid	February	2017/18
Oystercatcher		13	4	1	8	11					Mid	February	2017/18
Redshank					2						Mid	February	2017/18
Common eider				1							Mid	March	2017/18
Curlew		1	1				1				Mid	March	2017/18
Oystercatcher		38	11			12	2		24		Mid	March	2017/18
Redshank		4	3	1	1	9					Mid	March	2017/18
Common goldeneye										1	Low	November	2020/21
Curlew								2	2		Low	November	2020/21
Oystercatcher		1	5	2	3	9	1	1	12		Low	November	2020/21
Redshank									4		Low	November	2020/21
Curlew				1	1		1		11		Mid	November	2020/21
Oystercatcher		2	5	4		20	5		8		Mid	November	2020/21
Common goldeneye									1		High	November	2020/21
Cormorant				1							High	November	2020/21
Curlew		3									High	November	2020/21
Oystercatcher									52		High	November	2020/21
Red-breasted merganser									2		High	November	2020/21
Redshank		1									High	November	2020/21
Common eider				1							Low	December	2020/21
Curlew	1		1	2	1	1		1	2		Low	December	2020/21
Oystercatcher		2	7	5	2	7	5	3	10		Low	December	2020/21
Common eider		1			1	1					Mid	December	2020/21
Common goldeneye									1		Mid	December	2020/21
Curlew	1		1	1			1		1		Mid	December	2020/21
Oystercatcher	2	6	2	1		13	1		19		Mid	December	2020/21

Species	J	I	H	G	F	E	D	C	B	A	Tide	Month	Year
Common eider							1				High	December	2020/21
Common goldeneye				1							High	December	2020/21
Goosander							1				High	December	2020/21
Oystercatcher						13	17	26	10		High	December	2020/21
Curlew		2	1	1	2	1	1	1			Low	January	2020/21
Oystercatcher	1	8	1	4		4	2	2	2		Low	January	2020/21
Redshank			1	1							Low	January	2020/21
Curlew			1	2	1	2	2		2		Mid	January	2020/21
Oystercatcher	2	6	2	2	1	1	2	2	3		Mid	January	2020/21
Redshank			1						2		Mid	January	2020/21
Curlew		1									High	January	2020/21
Oystercatcher		15				9			4		High	January	2020/21
Curlew					1	1	1		1		Low	February	2020/21
Oystercatcher		1	4	4			9	9	1		Low	February	2020/21
Curlew	1					1					Mid	February	2020/21
Oystercatcher	2						1	17	2		Mid	February	2020/21
Curlew						1					High	February	2020/21
Oystercatcher			3					4	32		High	February	2020/21
Curlew							2	2	1		Low	March	2020/21
Oystercatcher		1	3			5	5	7	2		Low	March	2020/21
Wigeon					1						Low	March	2020/21
Curlew		1	1			3		1			Mid	March	2020/21
Oystercatcher		8	5				1	15			Mid	March	2020/21
Redshank		1		1							Mid	March	2020/21
Wigeon					1						Mid	March	2020/21
Curlew		1	1			2					High	March	2020/21
Oystercatcher		10	5			4			19		High	March	2020/21
Redshank			2			6					High	March	2020/21
Wigeon						1					High	March	2020/21
Common eider				1		16					Low	March 2.0	2020/21
Common goldeneye										3	Low	March 2.0	2020/21
Curlew		2		2	1	2	1	1	1		Low	March 2.0	2020/21
Oystercatcher			7	5	1	4	9	2	1		Low	March 2.0	2020/21
Curlew			1								Mid	March 2.0	2020/21
Oystercatcher	1	9	5	2	1			1	5		Mid	March 2.0	2020/21

Species	J	I	H	G	F	E	D	C	B	A	Tide	Month	Year
Redshank				4					2		Mid	March 2.0	2020/21
Common goldeneye				2							High	March 2.0	2020/21
Oystercatcher			12	3		2			1		High	March 2.0	2020/21
Curlew	1							2			Low	October	2022/23
European shag				1							Low	October	2022/23
Oystercatcher	3	1				4			19	22	Low	October	2022/23
Redshank									1		Low	October	2022/23
Curlew		1	1		1		1				Mid	October	2022/23
European shag			3								Mid	October	2022/23
Oystercatcher		2	3						19		Mid	October	2022/23
Common eider										1	High	October	2022/23
Curlew						1		1			High	October	2022/23
European shag				1	1						High	October	2022/23
Oystercatcher	2			8	6	16	1		37		High	October	2022/23
Redshank				2		1					High	October	2022/23
Common eider			1	1							Low	November	2022/23
Curlew		1			3		1		1		Low	November	2022/23
European shag			1		1						Low	November	2022/23
Oystercatcher	3	3	2		4	3	1		18	8	Low	November	2022/23
Common eider									2		Mid	November	2022/23
European shag	1										Mid	November	2022/23
Oystercatcher			1						30		Mid	November	2022/23
Curlew		1			1						High	November	2022/23
Oystercatcher	1				30			1			High	November	2022/23
Redshank					1						High	November	2022/23
Curlew				2		1	1	1			Low	January	2022/23
Dunlin								1			Low	January	2022/23
European shag			1								Low	January	2022/23
Oystercatcher	3	11	5	17	5	5	6	1			Low	January	2022/23
Redshank			3								Low	January	2022/23
Curlew	1										Mid	January	2022/23
Greylag goose				1							Mid	January	2022/23
Oystercatcher	6	2			29						Mid	January	2022/23
Redshank	1										Mid	January	2022/23
Wigeon			1								Mid	January	2022/23

Species	J	I	H	G	F	E	D	C	B	A	Tide	Month	Year
Oystercatcher						1			20		High	January	2022/23
Common eider			2								Low	February	2022/23
Curlew		1	1		4						Low	February	2022/23
European shag				1							Low	February	2022/23
Oystercatcher		6	3	1	7	2	3				Low	February	2022/23
Redshank		1	5		4						Low	February	2022/23
Common eider	4										Mid	February	2022/23
Common goldeneye				2							Mid	February	2022/23
Cormorant				1							Mid	February	2022/23
Curlew		1	1		1	1					Mid	February	2022/23
Oystercatcher	3	7	5		1	4	2		6		Mid	February	2022/23
Redshank			1		9	5			2		Mid	February	2022/23
Common goldeneye			2								High	February	2022/23
Curlew	1	1	1		1	1					High	February	2022/23
Oystercatcher	9	2	1						29		High	February	2022/23
Redshank	2				6		2				High	February	2022/23
Cormorant			1								Low	February 2.0	2022/23
Curlew	1	1	1	2	1						Low	February 2.0	2022/23
European shag				1							Low	February 2.0	2022/23
Oystercatcher	7	5	1	5	5	1	2	2	4		Low	February 2.0	2022/23
Redshank			1								Low	February 2.0	2022/23
Oystercatcher	11	5	4						13		Mid	February 2.0	2022/23
Oystercatcher		3	3						1	6	High	February 2.0	2022/23
Curlew		1		1	2						Low	March	2022/23
European shag				1							Low	March	2022/23
Oystercatcher	6	6		3	1		2				Low	March	2022/23
Curlew					1						Mid	March	2022/23
Oystercatcher	4	1	5		7	1			12		Mid	March	2022/23
Common eider				1				1			High	March	2022/23
Common goldeneye			1	1							High	March	2022/23
Oystercatcher	6	10			4		2	1	14		High	March	2022/23



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Title: 71_DRG_9_1 Bird Survey Sections

Projection: OSGB 1936/British National Grid
EPSG:27700

Page 1	Rev No: 1	Drawing Date: 22/05/2023

Legend

- Bird Survey Sections
- Foreshore
- Tidal Water
- Woodland

Appendix 2 - Phase 4 Benthic Survey

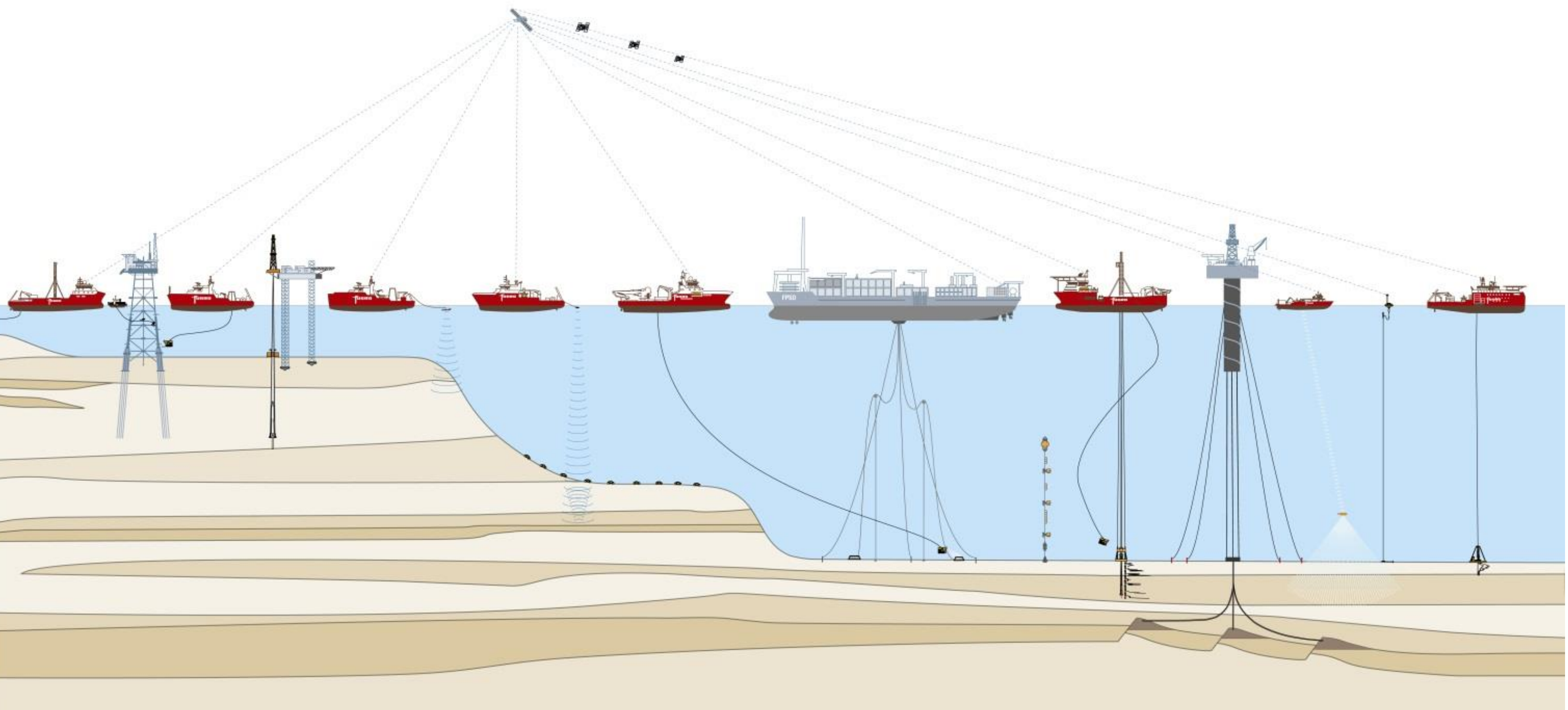
Fugro

Invergordon Ground Investigation
Benthic Report
Pre-Construction Benthic Survey
Cromarty Firth

Fugro Document No.: 160868_01rev1
06 April 2017

Fugro Geoservices

Draft



Invergordon Ground Investigation Benthic Report Pre-Construction Benthic Survey

Cromarty Firth

24 to 25 February 2017
Fugro Document No.: 160868_01rev1

Volume 1 of 1

Prepared for: Fugro Geoservices
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01	Draft	E. Capasso	S. De Gregorio	J. Greig	06 April 2017
Issue	**Report Status**	**Prepared**	**Checked**	**Approved**	**Date**

Our ref: 160868_01rev1
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Attention: Andi Hagan

Dear Sir

Pre-Construction Benthic Survey, Invergordon Ground Investigation Benthic Report, Cromarty Firth

We have the pleasure of submitting the Invergordon Ground Investigation Benthic Report for Pre-Construction Benthic Survey.

This Invergordon Ground Investigation Benthic Report was prepared by Evelina Capasso under the supervision of Jessica Greig.

We hope that you find this report to your satisfaction; should you have any queries, please do not hesitate to contact us.

Yours faithfully
Fugro GB Marine Limited
[Redacted]

Jessica Greig
Project Manager

Distribution: One electronic copy to Andi Hagan

EXECUTIVE SUMMARY

The Port of Cromarty Firth required to undertake a pre-construction benthic survey of the Phase 4 area (Berth 6 and 7) of the Invergordon Service Base. The aim of the survey was to gain a better understanding of the benthic environment within the proposed development area.

The survey comprised seabed video transects, covering the length and width of the development area, and grab sampling at seven stations within the area. All samples were collected successfully.

Analysis of the video footage showed the presence of one habitat within the survey area, characterised by highly heterogeneous seabed sediment, comprising a mix of mud and sand with gravel and shells, including pebbles and cobbles. The epibenthic communities reflected this sediment complexity, with sessile epifauna ranging from abundant to common in areas with high percentage of hard substrate, and less so in sandier areas, which, consequently, showed less diverse communities.

The epibenthic communities recorded by the seabed video footage included taxa from each major taxonomic group and were broadly comparable to those reported for the shallower sediment areas of the Cromarty Firth and similar coastal areas of the North Sea. Taxa encountered included *Laminaria* sp. (kelp), the common starfish *Asterias rubens*, the brittlestar *Ophiura albida* and the edible-sea-urchin *Echinus esculentus*. The polychaete *Spirobranchus* sp. was also common and the molluscs recorded included mainly unidentified gastropods and the blue mussel *Mytilus edulis*. Crustacea recorded included the hermit crab *Pagurus bernhardus* and the common shore crab *Carcinus maenas*. The plumose anemone *Metridium dianthus* and the anthozoan *Alcyonium digitatum* were recorded within the survey area as well as turf forming species which included Hydroid/Bryozoan taxa, which were not possible to identify at a lower taxonomic level. Fragments of *Lithothamnion* sp. (maerl) were also present along each transect, and the only two fish taxa encountered included the European plaice *Pleuronectes platessa* and the dragonet *Callionymus* sp.

The sediment data included field description of the grab samples only, as no grab samples for sediment particle size analysis were collected during this survey. The results of the video analysis and photographic records were also used to support the assessment. All samples were described as gravelly muddy sand (gmS) with shells and shell fragments; the shells were mainly *Mytilus edulis* and at one grab site also oyster shells were identified. The video analysis showed that the surface of the seabed appeared as coarse mixed sediment gravelly, muddy sand, with varying amounts of shells, pebbles and cobbles.

Results of the biological analyses indicated that, in terms of species diversity, most stations hosted a moderately rich community, whilst few stations were characterised by a less diverse community. In terms of abundances (i.e. total number of individuals per stations), these were generally high and related to infaunal taxa such as Nematoda, *Pholoe inornata* and *Scoloplos* (*Scoloplos*) *armiger*. To the higher species diversity and, particularly, abundances contributed the presence of epibenthic species (e.g. the ascidian *Dendrodoa grossularia* and the polychaete *Spirobranchus lamarki*) that, with the presence of more heterogeneous sediment including large fraction of shells and shell fragments, finds hard substrate suitable for the settlement. This sediment type is also suitable for the attachment of kelp species (*Laminaria* sp.) which in turn provide suitable habitat for a number of epibenthic species. The observed biological diversity and distribution, together with granulometry, are typical of the shallow depth areas of the North Sea. This is in line with the literature which refers to bathymetry and sediment type as being the major physical variables affecting macrofaunal occurrence and distribution in the North Sea.

Sessile, non-enumerated taxa recorded from the grab samples were largely represented by organisms belonging to the phylum Bryozoa, which was the more diverse. These included *Escharoides coccinea*, *Schizoporella* sp., *Fenestrulina malusii*, *Celleporella hyalina*, *Membranipora membranacea*, *Conopeum reticulum*, *Electra pilosa*, and *Amphiblestrum auritum*.

The multivariate analysis was run excluding the juvenile taxa. Results highlighted the presence of three major benthic groups, however these were not considered to represent ecologically different communities, but rather variation of the same community. The main differences observed were related to differences in the average abundance of the same species, with differences in community composition being small by comparison.

The group which encompassed the higher number of samples (group B) was characterised by a heterogeneous sandy sediment, hosting overall higher faunal richness and diversity, with fauna typical of communities adapted to withstand physical disturbance, such as crustacean amphipods and polychaete worms including *P. inornata* and *S. armiger,* as well as *Abra alba* and *Mediomastus fragilis*, which are typical of habitats with a certain degree of compactness and hence stability. Group A included the two samples from the two shallowest stations, described as gravelly muddy sand and characterised by the presence of boulders and pebbles. The fauna characterising the group was similar to the fauna of the other groups, but with a higher mean abundance of sessile species such as *D. grossularia* and *S. lamarki*. Group C encompassed samples from the three least diverse stations, with the sediment described as coarse mixed sediment where pebbles and cobbles were also present. These stations were also located along the existing sea wall of the port. The top three, most abundant, taxa included Nematoda and the polychaetes *S. lamarki* and *S. armiger*. Phylum Nemertea and the ascidian *D. grossularia* were also common within this group, although the abundances of the individual taxa were lower compared to the abundances of the same taxa within other groups. Within this group, station ST01 was characterised by the presence of the polychaete *Phyllodoce mucosa*, which occurred at particularly high abundance. This species is known to occur mainly on intertidal sand and mud but also at depths of up to 20 m, on seabed sediments comprising of stones and shell gravel.

Thirty-two newly settled juveniles were recorded, largely represented by species of Mytilidae which occurred at all stations. The phylum Mollusca was the most diverse and numerically dominant in terms of juveniles, with species such as *Mya* sp. juv., *Lucinoma borealis* juv., Nuculidae juv. and Trochidae juv. being mostly represented. Of the Echinodermata, the family Ophiuroidea was the most abundant, followed by Echinoidea juv. and Cucumariidae juv. The remaining taxa belonged to the phyla 'Annelida', with species such as Polynoidae juv., Nephtyidae juv. and Arenicolidae juv. Juvenile 'Crustacea', included *Ampelisca* sp. juv., Paguridae juv., *Carcinus maenas* juv. and *Atelecyclus rotundatus* juv., 'Echinodermata', including Echinoidea juv. Cucumariidae juv., 'Mollusca', including *Mya* sp. juv., *Lucinoma borealis* juv., Nuculidae juv. Trochidae juv. and 'Others', including Ascidiacea juv. and Sipuncula juv.

Using video and grab data, the biotope complex SS.SMX.IMx (Infralittoral mixed sediment) was identified as the most widespread across the survey area, together with the biotope complex SS.SSA.IMuSa (Infralittoral muddy sand), the latter being more localised.

No species or habitats of conservation importance, nor non-indigenous species, were found within the survey area.

CONTENTS

APPENDICES

TABLES IN THE MAIN TEXT

FIGURES IN THE MAIN TEXT

ABBREVIATIONS

cSAC	Candidate Special Area of Conservation
DDV	Drop-down video
DEFRA	Department for Environment Food and Rural Affairs
dGPS	Differential Geo-Positioning System
EEC	European Economic Community
EIA	Environmental Impact Assessment
GI	Ground Investigation
gmS	Gravelly muddy sand
IDA	Industrial Denatured Alcohol
IUCN	International Union of Conservation of Nature
JNCC	Joint Nature Conservation Committee
MCZ	Marine Conservation Zone
MDS	Multi-dimensional Scaling
MNCR	Marine Nature Conservation Review
MPA	Marine Protected Area
N	Number of Individuals
NMBAQC	National Marine Biological Analytical Quality Control
NNR	Natural Nature Reserve
OSPAR	Oslo/Paris Conventions
P	Present
PMFs	Primary Marine Features
pSAC	Proposed Special Area of Conservation
QC	Quality Control
S	Number of Taxa
SAC	Special Area of Conservation
SCI	Site of Community Importance
SIMPER	Similarity Percentage
SIMPROF	Similarity Profile
SPA	Special Protected Area
SSSI	Site of Specific Scientific Interest
WoRMS	World Register for Marine Species

1. INTRODUCTION

1.1 Study Background

The Port of Cromarty Firth required to undertake a pre-construction Benthic Survey of the Phase 4 area (Berth 6 and 7) of the Invergordon Service Base. The survey aimed at gaining a better understanding of the benthic environment in the vicinity of the proposed development area (Port of Cromarty Firth, 2016). The results of the analysis of the data collected during the benthic survey are presented in this report.

1.2 Environmental Context

The Cromarty Firth is a large estuary with a narrow, deep water entrance to the Moray Firth. The entrance is approximately 50 m deep and 1.5 km wide between the headlands of the North and South Sutors. The outer Cromarty Firth consists of bays of Nigg, Udale and Cromarty, reaching, in places, a width of 6.5 km. Within the Firth, the width narrows to 2 km at Invergordon, extending south-west round Alness Bay to Dingwall and the mouth of the River Conon. Landwards of Invergordon the Firth is estuarine whereas the deep waters seaward of Invergordon are highly saline (Intertek, 2015).

Due to its location, the Cromarty Firth presents a range of estuarine habitats including sandflats, mudflats, shingle banks, saltmarsh, mussel beds and coastal lagoons. Sandflats and mudflats support a rich and abundant invertebrate faunal community together with mussel beds and extensive growths of seagrass in Alness, Nigg and Udale Bays. There is some saltmarsh habitat present in the estuary, with the most relevant areas being located at the head of Dingwall and Udale Bays, at Alness Point, Nigg Bay and at the Conon Islands; these are however not very extensive (The Highlands Council, 2009).

The habitats within the Cromarty Firth provide roosting and feeding grounds for internationally important populations of four species of waterfowl: Icelandic greylag goose *Anser anser*, redshank *Tringa totanus*, wigeon *Anas penelope* and bartailed godwit *Limosa lapponica*; and nationally important populations of a further four species: red-breasted merganser *Mergus serrator*, goldeneye *Bucephala clangula*, curlew *Numenius arquata*, and scaup *Aythya marila*. Other bird species present include: slavonian grebe *Podiceps auritus*, whooper swan *Cygnus cygnus*, teal *Anas crecca*, oystercatcher *Haematopus ostralegus* and pink footed geese *Anser brachyrhynchus* (The Highland Council, 2009; Intertek, 2015).

There is also a shingle bar and coastal lagoon at Alness Point which supports important breeding bird populations, such as colonies of herring gull, fulmar, common gull and greater black backed gull (Moray Partnership, 2007). The North and South Sutors rocky headlands support the largest breeding group of cormorants in eastern Britain and third largest in Scotland. Other breeding seabirds include fulmar, shag, kittiwake, herring gull, great black-backed gull, guillemot and razorbill. The coast to the north and south of the Sutors is also steep and supports other coastal habitats such as grassland and scrub. The coastal waters provide habitats for finfish, flatfish and shellfish, whilst the coast is rich in wildlife; otters and common seals are known to occur on the estuary and seals particularly on the sandbanks east of Cromarty Bridge, whilst a population of bottlenose dolphins regularly visits the Cromarty Firth. This population is one of only two known resident populations in the UK and the only resident inshore population in the North Sea (Moray Firth Partnership, 2007).

1.3 Benthic Habitats and Communities

In addition to the range of intertidal and coastal habitats, the Cromarty Firth has one of the best examples of seagrass beds, a UK Biodiversity Action Plan (UKBAP) priority habitat (JNCC, 2016), found around the coasts of the British Isles, with the main component being the dwarf eelgrass *Zostera* (*Zosterella*) *noltei* and the common eelgrass *Zostera marina/angustifolia*. Within the Cromarty Firth, both Nigg and Udale bays have extensive seagrass beds whose physical and biological characteristics are suitable for the occurrence of the biotopes *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand (SS.SMp.SSgr.Zmar) and *Ruppia maritima* in reduced salinity infralittoral muddy sand (SS.SMp.SSgr.Rup) (JNCC, 2012).

Protected areas within the Firth include aquatic part of Natura 2000 sites, with Special Protection Areas (SPAs) designated under the Birds Directive (79/409/EEC) and Special Areas of Conservation (SACs) designated under the Habitats Directive (92/43/EEC) (SEPA, 2017). These include the Cromarty Firth SPA, primarily designated as wetland of international importance as it supports 34 847 individual waterfowl including: redshank *T. totanus*, curlew *N. arquata*, dunlin *Calidris alpina alpina*, knot *Calidris canutus*, oystercatcher *H. ostralegus*, red-breasted merganser *M. serrator*, scaup *A. marila*, pintail *Anas acuta*, wigeon *A. penelope*, Icelandic greylag goose *A. anser*, bartailed godwit *L. lapponica*, whooper swan *C. cygnus* (JNCC, 2005), and the Moray Firth SAC, primarily designated for the protection of the bottlenose dolphin *Tursiops truncatus* (JNCC, 2017). The Cromarty Firth is also an international RAMSAR site due to the presence of extensive, undisturbed intertidal flats with *Zostera* spp. beds as well as to the presence of birds' assemblages of international importance including bartailed godwit *L. lapponica*, Icelandic greylag goose *A. anser*, and waterfowl assemblage (RIS, 2008; SEPA, 2011).

Nationally designated sites include the Cromarty Firth SSSI, protecting habitat such as mud and sand flat, saline lagoon, saltmarsh, and shingle, as well as species, including bartailed godwit *L. lapponica*, red-breasted merganser *M. serrator*, redshank *T. totanus*, whooper swan *C. cygnus*, wigeon *A. penelope* (SEPA, 2011) and Lower River Conon SSSI, which is a component of the Cromarty Firth SPA (JNCC, 2005). Habitats for the designation of the Cromarty Firth SSSI included intertidal sandflats and mudflats, saltmarsh (SNH, 2017a), whilst the Lower River Conon SSSI was designated for its saltmarsh habitat (SNH, 2017b).

Nigg and Udale Bays are designated as a National Nature Reserve (NNR), under the IUCN category IV (Protect Planet, 2016), which includes protected areas aiming to protect particular species or habitats, with management reflecting this priority (IUCN, 2017). The important species and habitats for the whole designated area include *Zostera* spp. on intertidal mudflats and sandflats as well as a number of breeding and overwintering birds (The Highland Council, 2009)

The invertebrate fauna of the lower Cromarty Firth is, in general, rich compared to many intertidal flats in north-east Scotland. Intertidal sand and mud flats within Nigg and Udale Bays are dominated by lugworm (*Arenicola marina)* communities, mussel *Mytilus edulis*, spireshell *Hydrobia ulvae*, Baltic tellin *Macoma balthica* and cockle *Cerastoderma edule*. Cromarty Firth's soft shores appear to have high bivalve species richness, but limited abundance of individuals, probably due to the sandy, relatively silt-free sediment (Intertek, 2015).

At the entrance to Cromarty Firth, the rocky shores of the North and South Sutor headlands provide examples of slightly sheltered shores whilst those of Balintraid Pier, Invergordon are classed as sheltered rocky shores. Generally, the slightly sheltered shores have upper-shore fucoid stands, a well-developed mid-shore barnacle zone and a low shore zone or red turf-forming algae with associate amphipods and isopods. Additionally, abundant grazing populations of littorinids and limpets are common in the mid-shore (Intertek, 2015).

The bivalves *Fabulina fabula* and *Gari fervensis* tend to dominate the sandy sediment at Invergordon, whilst the muddier with scattered boiler clinker (ash and partially fused residues from a coal-fired furnace) sediment, found further seaward, host faunal assemblages characterised by the bivalve *Abra alba*. Strong tidal currents and firmer sandier sediment are characteristic of the narrow entrance to the Firth, offering suitable habitats for species such as the polychaete worms *Ophelia borealis*, *Aonides oxycephala*, *Glycera capitata*, *Prionosplo cirrifera*, *Microphthalmus* sp. and *Nephtys longosetosa* and the amphipod *Atylus falcatus*. To the east of the Firth entrance, where finer sediments occur, species diversity is recorded to be lower than that within the Firth. In May 1992, A Marine Nature Conservation Review (MNCR) sublittoral survey was carried out between the North and South Sutors at the entrance to the Cromarty Firth. The results indicated a more diverse, but not unusual fauna including hydroids and anemones. A richer epifauna was recorded on sandy mud east of old Shandwick (Bennet and McLoad, 1998).

Of the non-indigenous species of concern known to occur in Scotland (SNH, 2016), four are present within the Cromarty Firth (NBN Gateway, 2013). These include: the common cord-grass *Spartina anglica*, the acorn barnacle *Elminius modestus*, the Japanese skeleton shrimp *Caprella mutica* and a red alga *Heterosiphonia japonica*.

2. METHODOLOGIES

2.1 Survey Design

The benthic ecology study area was defined as the area of seabed within the proposed Port of Cromarty First Phase 4 area (Berths 6 and 7), as shown in Appendix B.

The survey comprised seabed video transects and grab sampling, covering the survey area. Details of the survey design are summarised in Table 2.1, whilst the survey array is presented in Figure 2.1.

Table 2.1: Summary of Sampling Techniques

Sampling Technique	Proposed Number Transects/Sampling Stations	Actual Number of Samples	Purpose
Drop-down video (DDV)	9	9	Underwater camera survey (both video and still photographs) including transects covering the entire length and width of the survey site.
0.1 m^2 Day grab	9 (FA)	9 (FA)	Collection of seabed sediment samples for macrofauna analysis only. Sediment description in situ only.

2.2 Sampling Survey

The benthic operations within the Phase 4 area (Berths 6 and 7) were undertaken on board the MV Amanda J between the 24 and 25 February 2017.

Details of the seabed video and grab survey, including sampling coordinates and any associated field observations are provided in Appendix C.

2.2.1 Seabed Drop-down Video (DDV) Footage and Photographic Stills Sampling

Seabed video footage was acquired using a Kongsberg OE-208 camera system mounted on a drop-down video (DDV). The frame was equipped with an adjustable weight system, and was connected to the surface by a subsea telemetry cable system. The bespoke topside control unit, comprised a hard disc drive (HDD), and incorporated a digital versatile disc (DVD) recorder for use as the primary video recording system, with differential global positioning system (dGPS) overlay. A mini-DV player was used for simultaneous backup. The camera was towed approximately 0.5 m above the seabed at approximately 0.7 knots. Along each environmental transect a seabed video footage was acquired together with still images (five or more). Positions for the video survey were logged throughout each drop at each static image location, and overlaid on the video footage to ensure accurate geo-referencing. Field logs were kept throughout the video survey and are presented in Appendices C.1 and C.2.

2.2.2 Sediment Grab Sampling for Macrofauna

Seabed sediment samples for macrofauna were collected using a 0.1 m^2 Day grab. The positions of all benthic sample stations were recorded using dGPS with a nominal accuracy of <1 m and taken at the time when the winch wire went slack indicating that the grab was on the seabed.

Upon retrieval of the grab sample, the sediment within the grab bucket was viewed in order to assess whether the sample was acceptable (i.e. had not been subject to partial washout during retrieval, had sealed correctly and was of sufficient volume relating to depth of bite), with those of 5 litres and above considered to be acceptable. Samples with a lower volume than this were generally rejected and sampling re-attempted up to three times. Where samples of low volume were continuously obtained, best judgment was used as whether to accept or reject these samples, with all details recorded in the field log. For all accepted grab samples, a description of the sediment surface, noting sediment type and characteristics, as well as conspicuous species, was recorded. The remaining sediment was gently washed over a 0.5 mm sieve with retained material transferred into a pre-labeled container and preserved with 8 % formalin solution. The sample containers were then sealed, hazard labelled and stored securely on deck. All the samples were successfully collected. Macrofauna sampling logs including a description of the sediment (sediment features and conspicuous species), are presented in Appendix C.3. Photographs of the sediment surface were taken prior to any sample processing (Appendix C.4).

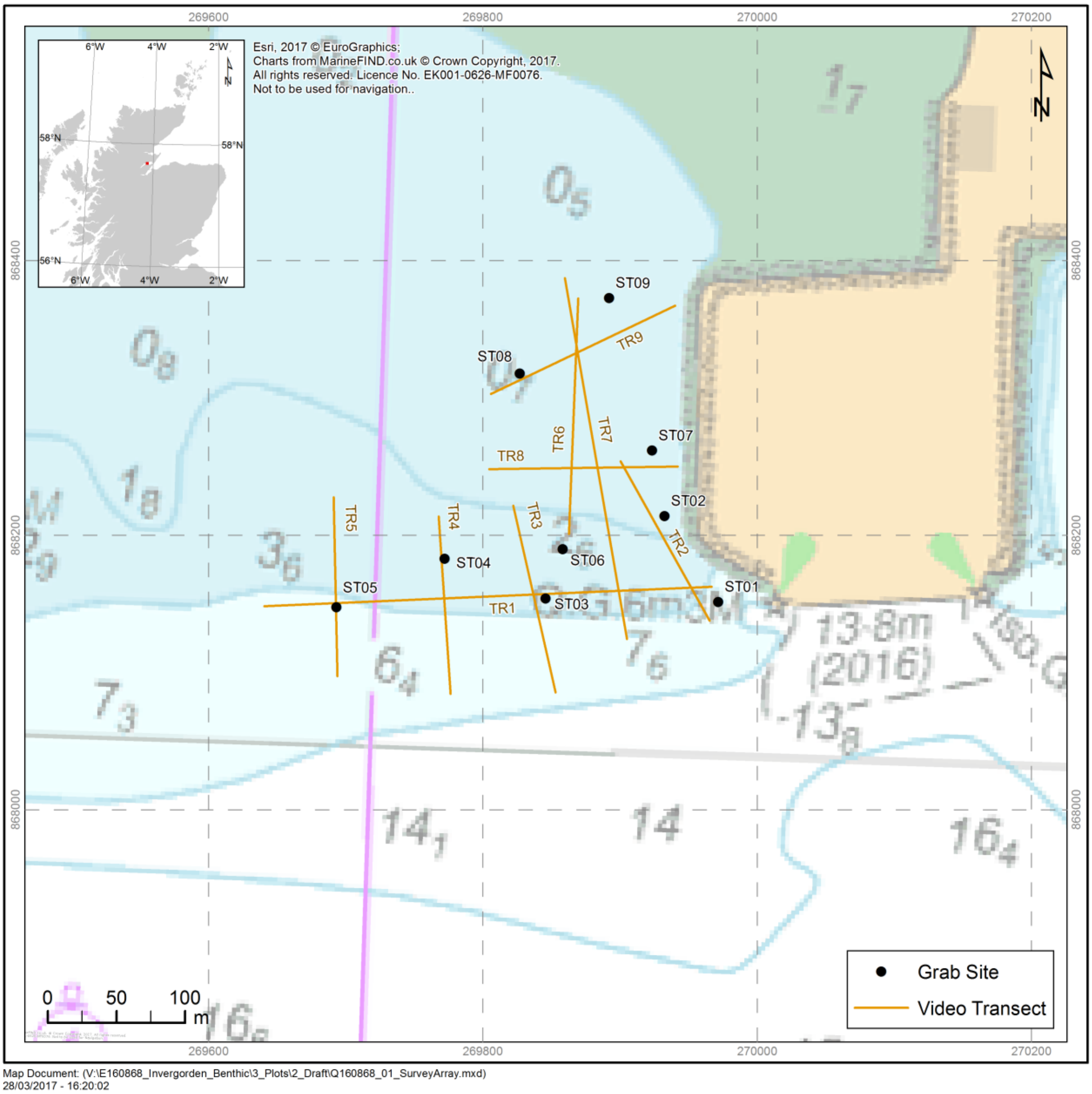


Figure 2.1: Survey array within the survey area

3. SAMPLE ANALYSIS

3.1 Seabed Video Footage and Photographic Stills Analysis

Video footage and still images collected at each station were analysed to assess the seabed habitat type and epibenthic communities. The analysis was carried out by reviewing the video footage from each station describing the sediment type and conspicuous species recorded along the transect. The digital still images were used to assist identification of species and improve habitat descriptions. The video footage provided a more complete and detailed description of the communities observed, as the less frequently occurring species would have been under represented from static image analysis alone. Species abundance was estimated using the industry standard SACFOR abundance scale (JNCC, 2015a) shown in Table 3.1 which uses the average species size to classify the population.

Table 3.1: Marine Nature Conservation Review (MNCR) SACFOR* Abundance Scale

Growth Form			Size of Individuals/Colonies				Density
% Cover	Crust/ Meadow	Massive/ Turf	< 1 cm	1 - 3 cm	3 - 15 cm	> 15 cm	
> 80 %	S		S				> 1/0.001 m^2
40 – 79 %	A	S	A	S			1 - 9/0.001 m^2
20 – 39 %	C	A	C	A	S		1 - 9/0.01 m^2
10 – 19 %	F	C	F	C	A	S	1 - 9/0.1 m^2
5 – 9 %	O	F	O	F	C	A	1 - 9/1 m^2
1 – 5 % or density	R	O	R	O	F	C	1 - 9/10 m^2
< 1 % or density		R		R	O	F	1 - 9/100 m^2
					R	O	1 - 9/1000 m^2
						R	< 1/1000 m^2

Notes:
S = Superabundant A = Abundant C = Common
F = Frequent O = Occasional R = Rare

3.2 Laboratory Analysis

3.2.1 Grab Macrofauna Abundance

Grab samples were returned to Fugro's benthic laboratory for analysis. The laboratory is a full participant in the National Marine Biological Analytical Quality Control (NMBAQC) scheme. Fugro's in-house procedures for benthic macro-invertebrate analyses are in line with procedures recommended by the NMBAQC scheme (Worsfold et al., 2010) and BSI 16665:2013.

Macrofaunal grab samples were sieved over a 0.5 mm mesh to remove all fine sediment and fixative. Fauna were sorted from the sieved sample under a dissecting microscope and subsequently identified to the lowest possible taxonomic level and enumerated. Colonial, encrusting epifaunal species were identified to species level, where possible, and allocated a P (present) value. All biological faunal material retained were stored in 70 % industrial denatured alcohol (IDA). A reference collection was prepared with a minimum of one individual of all species identified retained.

Fugro undertook quality control (QC) checks on a representative number of whole samples, as well as the entire reference collection in compliance with internal analytical QC criteria.

4. DATA ANALYSES

4.1 Sediment Data

As per scope of work, no grab sampling for sediment analysis was undertaken. The in situ descriptions of the sediment of each macrofaunal grab sample was used to inform the sedimentary characteristics of the survey.

4.2 Macrofauna Data Analysis

The macrofaunal data set was imported into Primer v6 and analysed by means of univariate and multivariate analyses. Prior to analysis being undertaken, the faunal data set was subjected to a degree of rationalisation, specifically individuals which were identified belonging to specific phyla, but for which no heads were counted, were removed, as only presence was recorded.

Juvenile benthic species were also present in the dataset and, as these may at times dominate the macrofauna, their contribution to the community structure needs to be addressed. Due to heavy post-settlement mortality, they should be considered an ephemeral component and not representative of prevailing bottom conditions (OSPAR, 2004). OSPAR (2004) further states that "*Should juveniles appear among the ten most dominant organisms in the data set, the statistical analysis should be conducted both with and without these in order to evaluate their importance*". This was applied to the present study.

4.2.1 Univariate Analysis

Univariate analyses are used to extract features of communities which are not the function of specific taxa, i.e. these methods are species independent. They are not sensitive to spatio-temporal variations in species composition, so that assemblages with no species in common can theoretically have equal diversities. Univariate analyses included the primary variables: number of taxa (S) and abundance (N), together with the Margalef's index of Richness (d), Pielou's index of Evenness (*J*), Shannon-Wiener index of Diversity ($H'\mathrm{Log}_2$) and the Simpson's index of Dominance (λ).

Margalef's index of richness incorporates the total number of individuals and is a measure of the number of species present for a given number of individuals. Unlike the total number of species, this index is less dependent from sample size.

Pielou's index of evenness expresses how evenly distributed the individuals are among the different species. In general, the higher the evenness, the more balanced the sample is, as it indicates that the individuals are evenly distributed between the species recorded.

The Shannon-Wiener index of diversity incorporates richness and evenness as it is expresses the number of species within a sample and the distribution of abundance across these species.

The Simpson's index has a number of forms, with λ representing the probability that any two individuals from the sample, chosen at random, are from the same species. As such the index is a dominance index in the sense that its largest value corresponds to assemblages the total abundance of which is dominated by one or very few of the species present.

Assessment of benthic faunal diversity, calculated using Shannon-Wiener Index, ($H'Log_2$) followed the threshold values outlined in Dauvin et al. (2012), whereby values of Shannon-Wiener index greater than four indicate high diversity; values between three and four indicate good diversity; values between three and two indicate moderate diversity; values between one and two indicate poor diversity; and valued less than one indicate bad diversity (Dauvin et al., 2012).

Rank dominance analysis was also included. This method allows to identify which taxon (or taxa) was (were) consistently dominant throughout the survey area; it is less susceptible to bias towards those taxa which may occur in higher densities, but only at a few stations, compared to others which could be less abundant, but widespread across the survey area.

4.2.2 Multivariate Analysis

In the initial stage, multivariate analysis may involve transformation of data, particularly when the fauna data set is numerically dominated by a few species which may mask the underlying community composition. Transformation reduces the influence of these more dominant species allowing the whole faunal assemblages to be assessed.

The transformed data were then analysed employing the hierarchical agglomerative clustering analysis. The cluster analysis groups samples on the basis of nearest neighbour sorting of a matrix of sample similarities, using the Bray-Curtis similarity measure, the results of which are displayed in a dendrogram. The Multi-dimensional Scaling (MDS) or ordination analysis was undertaken in conjunction with the cluster analysis. The MDS analysis uses the same similarity matrix as that of the cluster analysis to produce a multi-dimensional ordination of samples, which attempts to construct a map of the samples, in which the more similar two samples are, the closer they appear on the map. The extent to which these relations can be adequately represented in a two-dimensional map is expressed as the stress coefficient statistic, low values (< 0.1) indicating a good ordination with no real prospect of misleading interpretation. The combination of clustering and ordination analysis allows checking the adequacy and mutual consistency of both representations (Clarke and Warwick, 2001).

The Similarity Profile (SIMPROF) test was run in conjunction with the cluster analysis in order to identify station groupings that are significantly different in statistical terms. Results are displayed by colour convention, with samples connected by red lines indicating a difference which is not statistically significant. It is noteworthy however, that samples which may be considered statistically different, based on the SIMPROF output, may host similar faunal communities which differ e.g. in terms of abundance rather than species composition. In such case, the samples may be interpreted as being not significantly different, from an ecological point of view. The SIMPROF output was therefore always considered in terms of statistical and ecological significance in line with Clarke et al. (2008), who indicate that creating coarser groupings is entirely appropriate, provided that the resulting clusters are always supersets of the SIMPROF groups.

The Similarity Percentage Analysis (SIMPER) was undertaken following the clustering analysis, in order to gauge the faunal distinctiveness of each of the identified group of samples. SIMPER provides a ranked list of taxa which contributes most to the similarity/dissimilarity within/between groups of samples.

4.3 Biotope Classification

Biotope code allocations were made using the Marine Habitat Classification of the British Islands (JNCC, 2015b). The task was carried out by an experienced ecologist practised in matching UK biotopes to field survey data with codes applied through experienced judgment and knowledge of the classification systems. All survey data were used to inform the biotope allocation process including the in situ descriptions of the sediment, macrofaunal data and the videographic and photographic data.

4.4 Habitats and Species of Nature Conservation Interest

Habitats and Species encountered within the survey area were compared against UK Biodiversity Action Plan (BAP) (now Habitats of Principal Importance/Priority Habitats) priority species and habitats (JNCC, 2016), International Union of Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2016), The OSPAR List of Threatened and/or Declining Species & Habitats (Region II – Greater North Sea) (OSPAR Commission, 2017). As the project was in Scottish territorial waters, habitats and specioes encountered were also compared against the Priority Marine Features (PMFs) list for Scotland’s saes (SNH, 2014). Any observed habitats and species of nature conservation interest encountered are reported in Section 5.5.

5. RESULTS

5.1 Seabed Video Footage and Photographic Stills Analysis

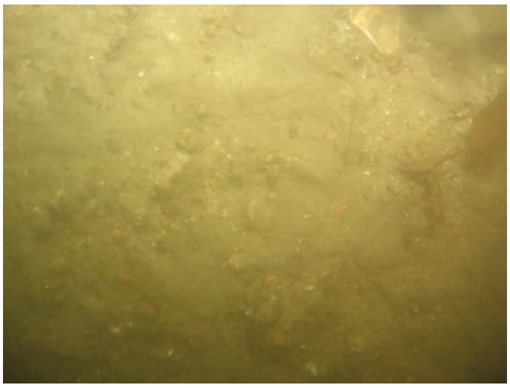
Digital photographic stills and video footage were successfully acquired along all the proposed transects. Underwater visibility although not optimal, allowed the assessment of the nature of the seabed.

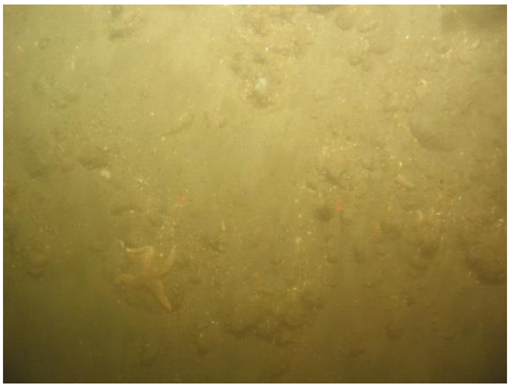
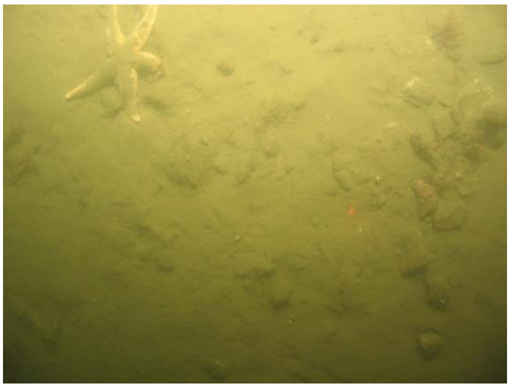
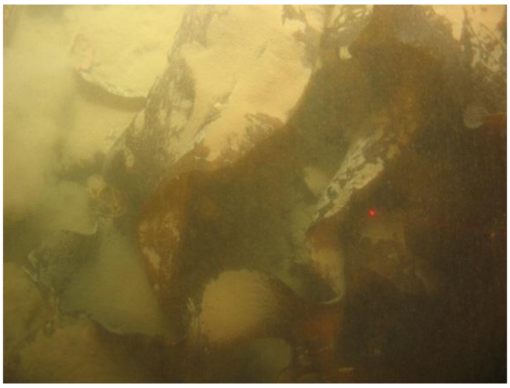
All proposed nine video transects were completed. This section describes the finding of the video analysis, the details of which can be found in Appendix E.1.

The physical environment encountered was similar at all transects, comprising a mix of mud and sand with gravel and shells, including pebbles and cobbles. A layer of silt was easily removed from the seabed surface when stormy conditions occurred, re-suspending the sediment and causing turbidity and, consequently, poor visibility across the site. Epibenthic fauna encountered reflected the environmental conditions, with sessile epifauna being abundant to common in areas with high percentage of hard substrate, and less so in sandier areas, which showed, consequently, less diverse communities. The fauna recorded was similar along all transects and included representatives from each of the main taxonomic groups. Taxa encountered included kelp *Laminaria* sp. which was present along each transect, as well as in the grab samples, occasionally also quite common. Echinodermata recorded included common starfish *Asterias rubens*, brittlestar *Ophiura albida* and edible sea urchin *Echinus esculentus*; Polychaeta recorded included *Spirobranchus* sp. as well as other tube-dwelling species; Mollusca recorded included unidentified gastropods and the blue mussel *Mytilus edulis*; the Crustacea recorded included hermit crab *Pagurus bernhardus* and common shore crab *Carcinus maenas*. The plumose anemone *Metridium dianthus* was seen along transect TR5 and the anthozoan *Alcyonium digitatum* was recorded along transects TR1, TR2, TR3, TR4 and TR5. Turf forming species included Hydroid/Bryozoan taxa. Fragments of maerl *Lithothamnion* sp. were also present along each transect. Fish taxa were also encountered and included the European plaice *Pleuronectes platessa*, along transect TR5, and the dragonet *Callionymus* sp., along transect TR1.

A single habitat was identified from the video analysis and example images of this are presented in Table 5.1.

Table 5.1: Examples of Habitat Described by the DDV and Stills Analysis within the Proposed Development Area

Station	Detailed Sediment Notes	Conspicuous Species	Photographic Example
TR4	Gravelly muddy sand with cobbles and pebbles	*Laminaria* sp. *Asterias rubens* Hydroid/Bryozoan turf *Spirobranchus* sp. *Alcyonium digitatum* Corallinacea Paguridae Ascidiacea *Mytilus edulis*	

Station	Detailed Sediment Notes	Conspicuous Species	Photographic Example
TR1	Gravelly muddy sand with cobbles and pebbles	*Laminaria* sp. *Asterias rubens* Hydroid/Bryozoan turf *Spirobranchus* sp. Gastropoda Hexacorallia *Alcyonium digitatum* *Echinus esculentus* *Ophiura albida* Corallinacea ?Bivalvia Paguridae Ophiuridae *Callionymus* sp. *Metridium dianthus* Decapoda *Urticina* sp.	
TR7	Gravelly muddy sand with pebbles	*Laminaria* sp. *Lithothamnion* sp. *Asterias rubens* Hydroid/Bryozoan turf *Pagurus bernhardus* Sagartiidae Paguridae *Spirobranchus* sp. Rodophycota Majidae	 

5.2 Sediment Data

No grab samples for sediment analysis were collected during this survey, therefore the sediment description presented in this section is based on field notes and description of each grab sample collected, carried out by an experienced ecologist.

Following Folk (1954), all samples were described as gravelly muddy sand (gmS) with shells and shell fragments. Within samples ST07 and ST08 oyster shells were identified, whist the shells identified within samples ST09 belonged largely to the blue mussel *Mytilus edulis*. *M. edulis* shells were also largely present in ST03 and ST08. Table 5.2 presents a summary of the sediments observed at each station, before and after sieving took place. Photos of the sieved samples at station ST09 was not available. A detailed description of the observations for each sample is presented in Appendix C.4.

The video analysis showed the surface of the seabed as a coarse mixed sediment comprising a mix of mud and sand with gravel and shells, including pebbles and cobbles (see Section 5.1).

Table 5.2: In situ Sediment Description of Each Grab Sample

Station	Folk (1954)*	In situ Description	Photo	
ST01	gmS	Gravelly muddy sand with shells, shell fragments and pebbles	 Before sieving	 After sieving
ST02	gmS	Gravelly muddy gravelly sand with shell fragments	 Before sieving	 After sieving
ST03	gmS	Gravelly muddy sand with shells (including *Mytilus edulis* shells), shell fragments and pebbles	 Before sieving	 After sieving
ST04	gmS	Gravelly muddy sand with shells, shell fragments and pebbles	 Before sieving	 After sieving
ST05	gmS	Gravelly muddy sand with shell fragments and pebbles	 Before sieving	 After sieving

Station	Folk (1954)*	In situ Description	Photo	
ST06	gmS	Gravelly muddy sand with shell fragments	 Before sieving	 After sieving
ST07	gmS	Gravelly muddy sand with shell fragments and oyster shells	 Before sieving	 After sieving
ST08	gmS	Gravelly muddy sand with shell fragments, *Mytilus edulis* shells, and pebbles		
			Before sieving	
ST09	gmS	Gravelly muddy sand with shell fragments and *Mytilus edulis* shells	 Before sieving	

Note:
* = Based on in situ assessment by an experienced ecologist

5.3 Macrofauna Data Analysis

The invertebrate fauna from the grab samples included infauna and epifauna, the latter comprising sessile solitary and colonial organisms. Sessile solitary epifauna were identified to the lowest taxonomic level and enumerated; sessile colonial epifauna were equally identified to the lowest taxonomic level and recorded as present/absent only. For analytical purposes, the infauna and the sessile solitary epifauna were combined and assessed together as enumerated fauna in terms of species diversity, abundance and distribution, whereas the colonial epifauna were assessed separately, providing information on species diversity and distribution. Full species lists and abundance data of fauna from the grab samples are presented in Appendices D.1 (infauna) and D.2 (epifauna).

5.3.1 Enumerated Fauna

After the rationalisation of the dataset (see Section 4.2), the juvenile taxa were removed prior to the analysis. The analysis presented in the report was run excluding the juveniles; however alternative analysis was also run including the juveniles and it is presented in Appendix E.2. The analysis which included the juvenile taxa returned more statistical groupings, particularly station ST07, which alone formed group, was mainly separating on the basis of two juvenile taxa, Ascidiacea juv. and Anomiidae juv., both not collected at this station.

5.3.1.1 The Juvenile Taxa

Thirty-two newly settled juveniles were recorded, the total abundance of which across the survey area ranged from 1 to 163 individuals. Mollusca comprised 56 % of the total juveniles' abundance found within the survey area, followed by Crustacea (19 %), Echinodermata and Annelida (9 % each), and Others (6 %). With 18 taxa recorded within the survey area, the phylum Mollusca was also the most diverse. Within the survey area, the most abundant taxon, with a total of 870 individuals, was Mytilidae, followed by *Abra* sp., with a total of 497 individuals, Anomiidae with a total of 212 and *Polititapes*/*Venerupis*, with a total of 138 individuals. These taxa occurred at all stations. The echinoderms Ophiuroidea juveniles were also abundant (130 individuals) and occurred at all stations as well. Although less abundant (60 individuals), the juvenile bivalve *Mya* sp. also occurred at all stations. The remaining taxa belonged to the phyla: 'Annelida', including Polynoidae juv. (occurring at eight stations), Nephtyidae juv. (occurring at seven stations) and Arenicolidae juv. (occurring at five stations); 'Crustacea', including *Ampelisca* sp. juv. (occurring at six stations), Paguridae juv. (occurring at four stations), *Carcinus maenas* juv. (occurring at two stations) and *Atelecyclus rotundatus* juv. (occurring at one station); 'Echinoderamta', including Echinoidea juv. and Cucumariidae juv. (both occurring at one single station); Mollusca, including *Mya* sp. juv., *Lucinoma borealis* juv., Nuculidae juv. and Trochidae juv. (occurring at seven stations); and 'Others', including Ascidiacea juv. (occurring at seven stations) and Sipuncula juv. (occurring at three stations). The full list of juveniles found within the survey area and their occurrence at each station is presented in Appendix D.3.

The dataset uploaded in the statistical software (Primer v6) to perform the analysis presented in this report is included in Appendix D.4.

5.3.1.2 Phyletic Composition

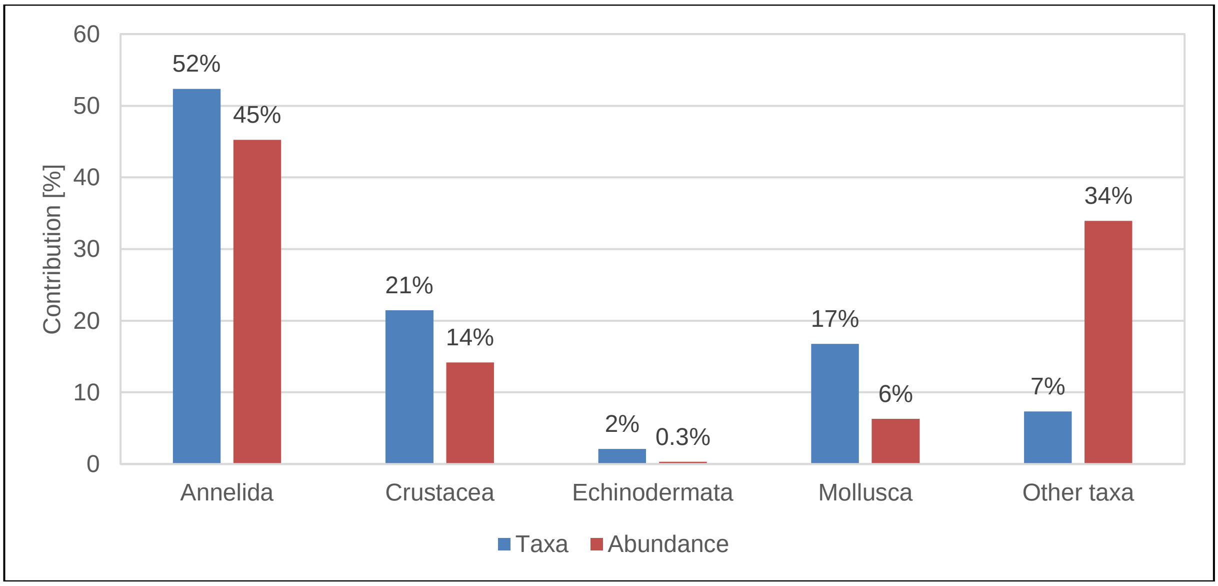
The phyletic composition of the enumerated benthic fauna is summarised in Table 5.3 and graphically represented in Figure 5.1.

Annelida were dominant in terms of taxa composition, accounting for 100 taxa, equivalent to 52 % of the benthic diversity; they were followed by Crustacea (41 taxa, 21 %) and Mollusca (32 taxa, 17 %), whereas "Other Taxa" and Echinodermata comprised, respectively, 7 % (with 7 taxa) and 0.3 % (with 4 taxa) of the benthic faunal diversity. Annelida were also dominant in terms of abundance with 5 060 individuals (45 %) of the benthic abundance. The 'Other Taxa' were the second most abundant with 3 793 individuals (34 %), followed by Crustacea (1 585 individuals, 14 %), Mollusca (705 individuals, 6 %) and Echinodermata (36 individuals, 0.3 %).

Table 5.3: Phyletic Composition of Enumerated Fauna from Grab Samples

Taxonomic Group	Number of Taxa	Abundance [Number of Individuals]
Annelida (Polychaete)	100	5060
Crustacea (shrimps, prawns, crabs)	41	1585
Mollusca (bivalves, gastropods, chitons)	32	705
Echinodermata (sea urchins, brittlestars, starfish)	4	36
Other taxa	14	3793
Total	**191**	**11179**

Note:
"Other taxa" included Chordata (Ascidiacea), Cnidaria, Nemertea, Cephalorhyncha, Chaetognatha, Platyhelminthes, Pycnogonida and Sipuncula



Note:
"Other taxa" included Chordata (Ascidiacea), Cnidaria, Nemertea, Cephalorhyncha, Chaetognatha, Platyhelminthes, Pycnogonida and Sipuncula

Figure 5.1: Percentage contribution to abundance of major taxonomic groups

Amongst the polychaetes, *Pholoe inornata* and *Scoloplos* (*Scoloplos*) *armiger* were the two most abundant species, with 1015 and 771 individuals, respectively. These accounted together for 35 % of the abundance of the taxon Annelida. Other polychaete species comprising over 200 individuals each included *S. lamarcki* (458), *Phyllodoce mucosa* (312), *Galathowenia oculata* (243), *Psamathe fusca* (240) and *Sphaerosyllis* sp. (203), comprising together to a further 29 % of the abundance of the taxon Annelida. These taxa occurred at all stations. Amongst the phylum Annelida 12 % of the taxa occurred at all stations and 11 % of the taxa occurred at five stations, whilst 25 % and 18 % of the taxa occurred at one and two stations, respectively.

Crustaceans were dominated by *Tanaopsis graciloides* which, with 535 individuals, accounted for 34 % of the abundance of this phylum and occurred in all but one sample (ST01). The amphipods belonging to the family Corophiidae, with 416 individuals, accounted for further 26 % of the abundance for this phylum, whilst the amphipod *Dexamine thea* (216 individuals) accounted for further 13 %. Both taxa were also the only ones occurring at all stations. Ostracoda (111 individuals), which occurred at six stations, accounted for a further 7 % of the phylum abundance. The remaining taxa contributed less than 5 % each to the abundance of Crustacea.

Amongst the molluscs, the bivalve *Abra alba* (212 individuals) dominated the phylum representing 30 % of the total abundance of Mollusca. Together with *Kurtiella bidentata* (59 individuals, 8 %) these two mollusc bivalves were the only species occurring at all stations. The second most abundant mollusc was the gastropod *Rissoa parva* (73 individuals, 10 %), which occurred at only four stations. The bean-like tellin *Fabulina fabula* (59 individuals) accounted for further 8 % of the abundance of the phylum Mollusca. The remaining taxa within this phylum accounted each for less than 7 % of the abundance of Mollusca.

The phylum Echinodermata included only four species. The brittlestar *Ophiura albida* was the most abundant species, comprising 58 % of the abundance of the phylum (21 individuals). The other three species recorded were the starfish *Asterias rubens* (1 individual, 3 %) and the brittlestars *Amphipholis squamata* (13 individuals, 36 %) and *Amphiura filiformis* (1 individual, 3 %). *O. albida* occurred at seven stations and *A. squamata* occurred at five stations, whilst both the other two species occurred at one station only.

'Other taxa' were dominated by Nematoda (2777 individuals), followed by the ascidian *D. grossularia* (737 individuals) and Nemertea (204 individuals). These were the three most abundant taxa within this group and accounted for 73 %, 19 % and 5 %, respectively, of the total abundance of this group, and were also the three taxa occurring at all stations. The remaining taxa accounted, each, for less than 1 % of the total abundance for this group. These included Platyhelminthes, Sipuncula, Cephalorhyncha, Chaetognatha, Chordata, Cnidaria and two identified species belonging to the Phylum Nemertea.

Of the top ten most abundant species, which were also recorded at all stations, only six were listed within the top ten dominance rank (Table 5.4). The others included the ascidian *D. grossularia*, which was the third most abundant species, but presented a dominance rank of 11, the polychaete *Galathowenia oculata*, which was the eighth most abundant taxa, but showed a dominance rank of 12, the amphipod *Dexamine thea*, which was the tenth most abundant taxa, but showed a dominance rank of 13 and the polychaete *Phyllodoce mucosa,* which was the seventh most abundant taxa, but showed a dominance rank of 28. This indicates that these species, all of which were recorded at all stations, show differences in the abundances they occur within each sample (e.g. 288 individuals of *P. mucosa* were counted in the sample collected at station ST01, whilst its abundance at all other stations varied between one and six individuals).

Table 5.4: Top Ten Most Abundant and Dominant Taxa in Grab Samples

Most Abundant Taxa		Dominant Taxa [n = 9]	
Taxa	**Total**	**Taxa**	**Rank Dominance**
NEMATODA	2777	NEMATODA	1
Scoloplos armiger	771	*Scoloplos armiger*	2
Dendrodoa grossularia	737	*Spirobranchus lamarcki*	3
Tanaopsis graciloides	535	*Psamathe fusca*	4
Spirobranchus lamarcki	458	*Sphaerosyllis* sp.	5
Corophiidae	416	*Tanaopsis graciloides*	6

Most Abundant Taxa		Dominant Taxa [n = 9]	
Taxa	**Total**	**Taxa**	**Rank Dominance**
Phyllodoce mucosa	312	Corophiidae	6
Galathowenia oculata	243	*Eteone longa* agg	7
Psamathe fusca	240	NEMERTEA	9
Dexamine thea	216	*Abra alba*	10

5.3.2 Sessile Colonial Epifauna from Grab Samples

The non-enumerated taxa (whole, damaged or fragments) included organisms belonging to the phylum Bryozoa, which was the more diverse, with seven species and one genus occurring within the survey area. These included *Escharoides coccinea* recorded at three stations, *Schizoporella* sp., recorded at six stations, *Fenestrulina malusii*, recorded at three stations, *Celleporella hyalina*, recorded at six stations, *Membranipora membranacea*, recorded at one station, *Conopeum reticulum*, recorded at seven stations, *Electra pilosa*, recorded at four stations, and *Amphiblestrum auritum*, recorded at three stations. Other taxa included the family Ascidiacea which occurred at three stations and the family Campanulariidae which occurred at three stations, whilst the Entoprocta genus *Pedicellina* occurred at one station. Other sessile taxa included Porifera, recorded at one station, Actinaria, recorded at eight stations and Cirripedia, which was recorded at four stations.

5.3.3 Univariate Analysis

Univariate analysis was undertaken with a view to assessing faunal richness and diversity, together with evenness and dominance, the latter highlighting areas of numerically dominant taxa.

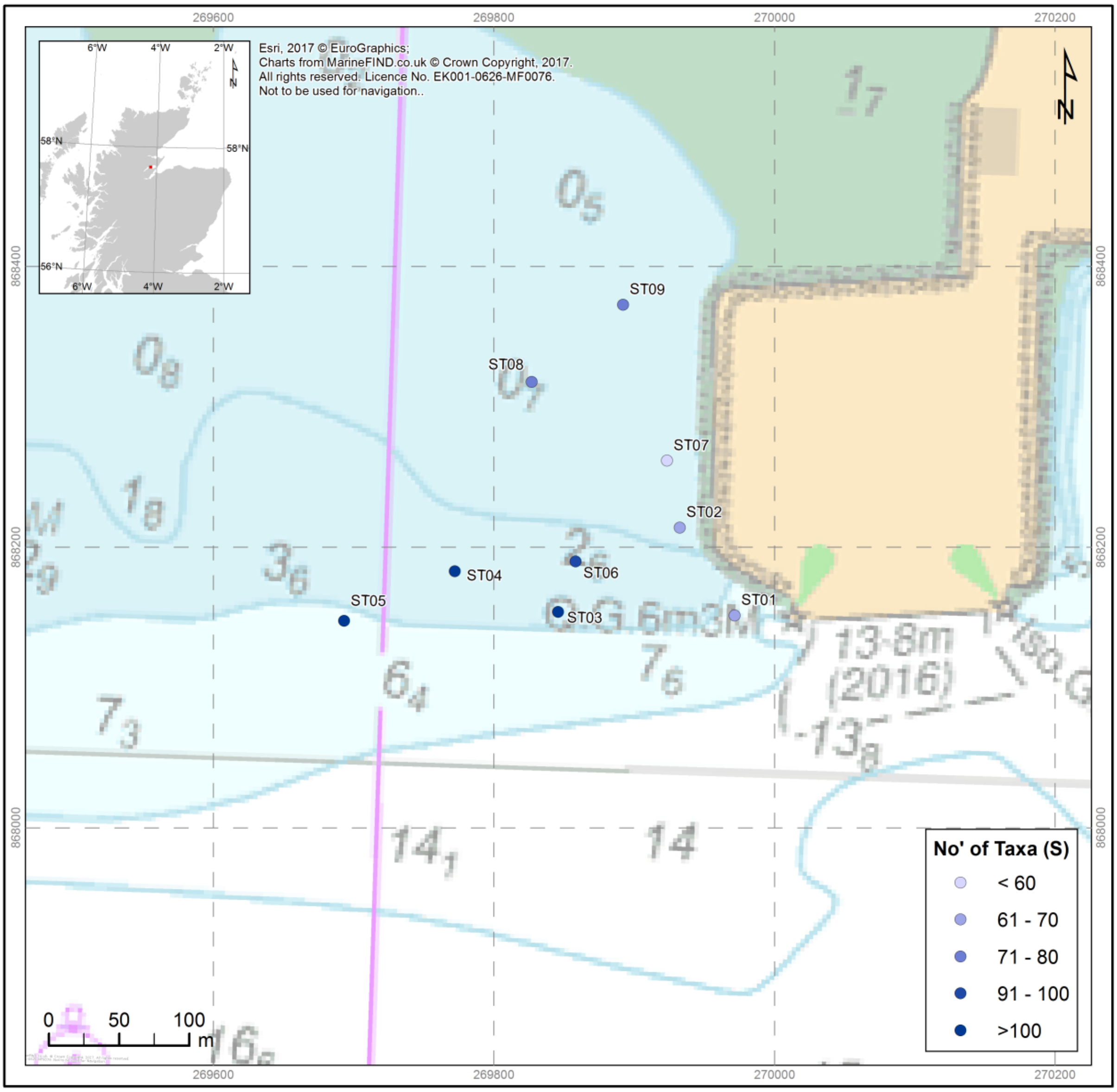
The total number of taxa ranged from 54 (ST07) to 109 (ST04), with an average of 83 ± 19 taxa across the survey area (Table 5.5). Faunal abundances were between 443 individuals (ST07) and 1 864 individuals (ST01), with an average of 1 242 ± 420 individuals across the survey area (Table 5.5). The distribution across the survey area is presented in Figure 5.2 and Figure 5.3, respectively.

Values of diversity were on average high ($H'\ log_2$ = 4.24), with six samples (67 %) showing high diversity ($H'\ log_2 > 4$); two samples (22 %) showing good diversity ($4 \leq H'\ log_2 \leq 3$); and one sample (11 %) showing moderate diversity ($3 \leq H' log_2 \leq 2$) (Table 5.5, Dauvin et al., 2012). The spatial distribution of species diversity within the survey area is shown in Figure 5.4.

Values of evenness were between 0.48 (ST01) and 0.78 (ST05) with an average of 0.67 across the survey area (Table 5.5). The lowest evenness value (J' = 0.48) in sample ST01 was associated with a numerical dominance of NEMATODA (roundworms) and the polychaete *Phyllodoce mucosa*, which accounted for 52 % and 15 % respectively of the faunal abundance at this station. This was further confirmed by the highest value of dominance (λ = 0.30) at this station. Conversely, the high value of evenness (J' = 0.78) in sample ST05 was associated with more evenly distributed species abundances at this station, which comprised 1 132 individuals across 102 taxa. This was also reflected in the low dominance index of 0.05 (λ) at this station. The distribution of Pielou's evenness index (J') and Simpson's dominance index (λ) across the survey area are presented in Figure 5.5 and Figure 5.6, respectively.

Table 5.5: Macrofaunal Community Statistics

Station	Numbers		Diversity Indices		Evenness
	Taxa [S]	Individuals [N]	Simpsons [λ]	Shannon-Weiner [H' Log_2]	Pielou [J']
ST01	68	1864	0.30	2.94	0.48
ST02	67	831	0.16	3.73	0.62
ST03	102	1156	0.12	4.55	0.68
ST04	109	1387	0.07	4.83	0.71
ST05	102	1132	0.05	5.19	0.78
ST06	92	1312	0.08	4.62	0.71
ST07	54	443	0.14	3.95	0.69
ST08	74	1595	0.10	4.08	0.66
ST09	76	1459	0.10	4.25	0.68
Summary Statistics					
Minimum	**54**	**443**	**0.05**	**2.94**	**0.48**
Mean	**83**	**1242**	**0.12**	**4.24**	**0.67**
Maximum	**109**	**1864**	**0.3**	**5.19**	**0.78**
SD	**19**	**420**	**0.07**	**0.67**	**0.08**



Map Document: (V:\E160868_Invergorden_Benthic\3_Plots\2_Draft\Q160868_02_NoTaxa.mxd)
28/03/2017 - 13:40:15

Figure 5.2: Number of taxa (S) from the grab samples across the survey area

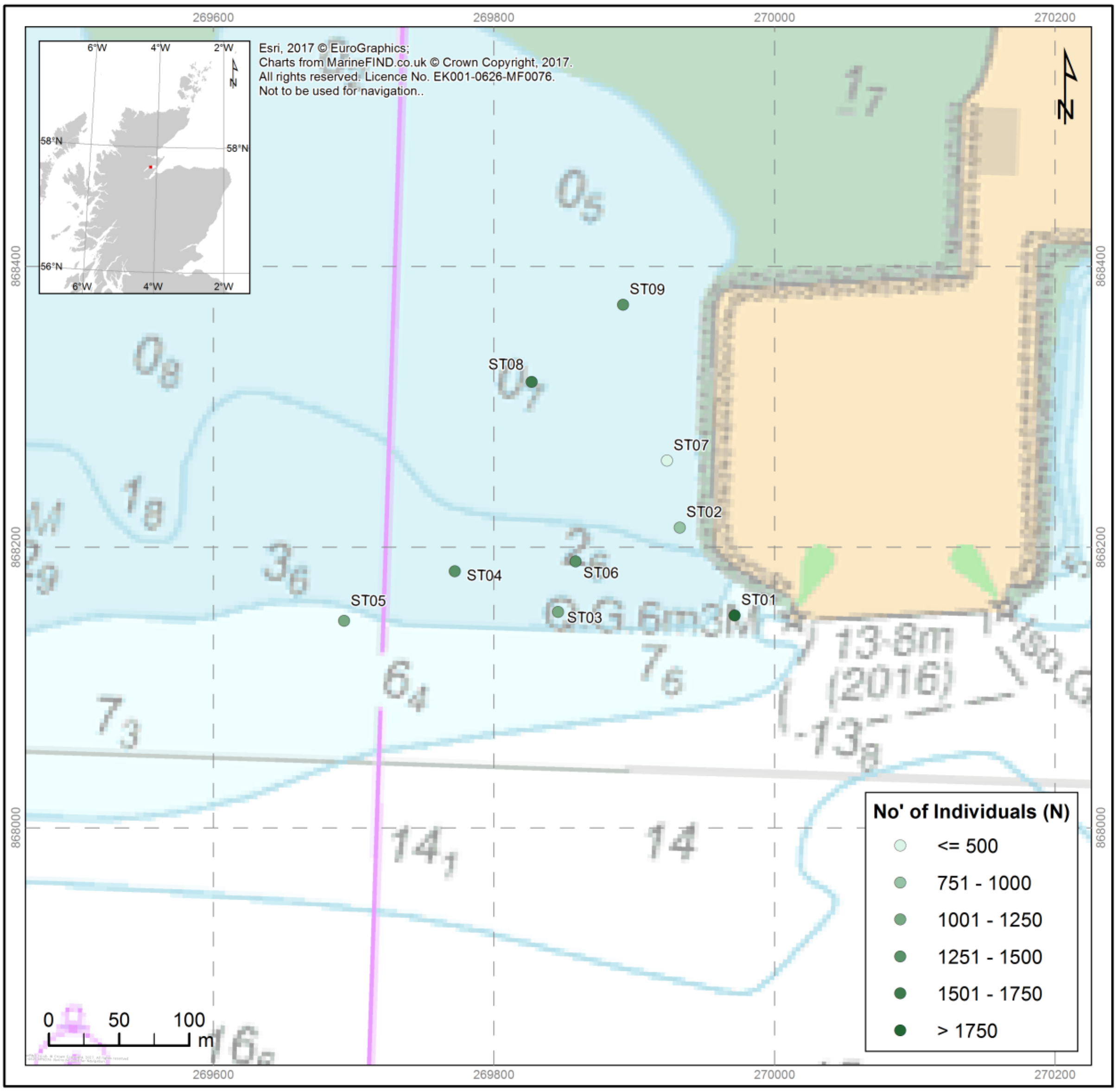


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Figure 5.3: Number of individuals (N) within the faunal grab samples across the survey area

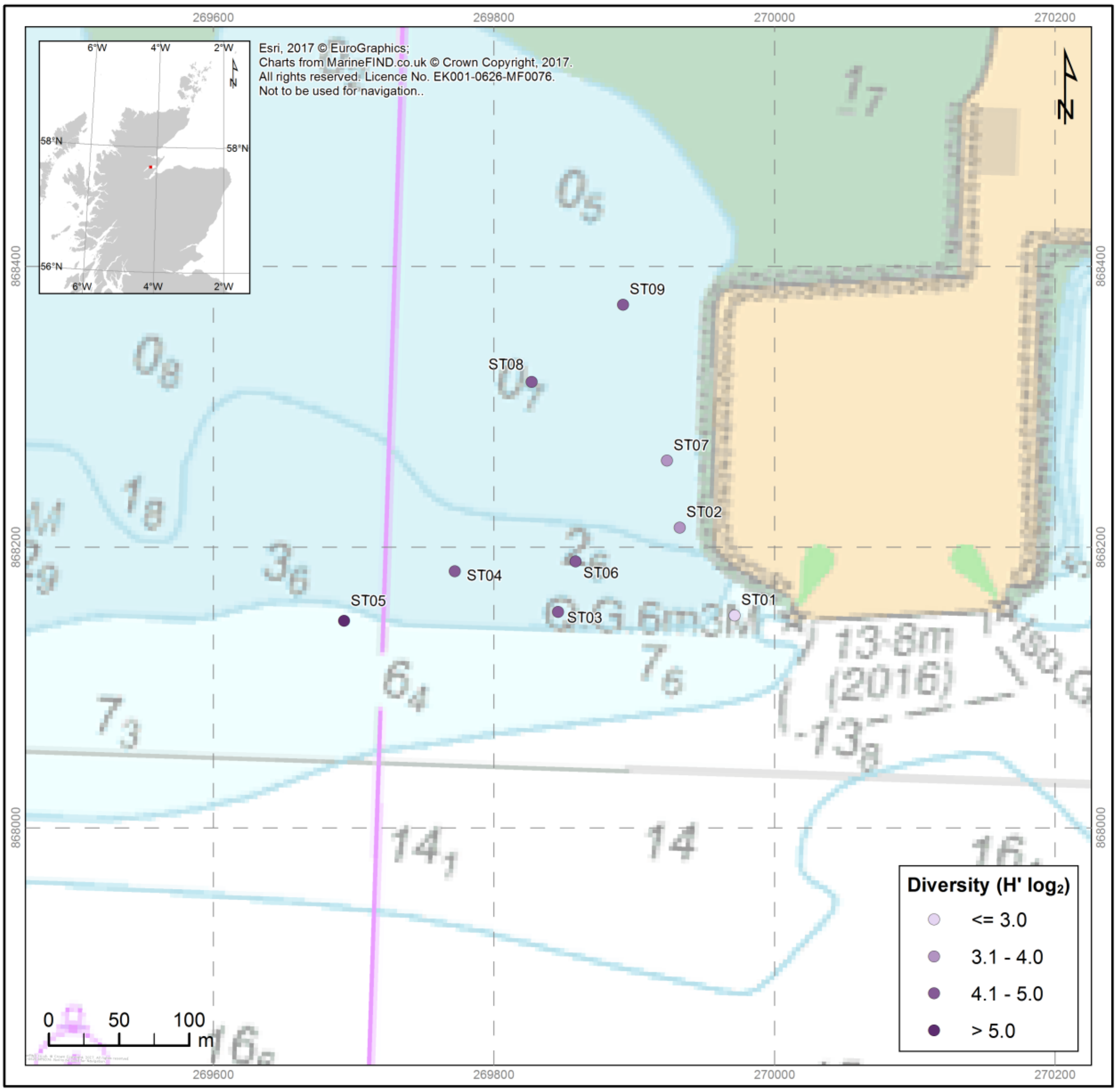

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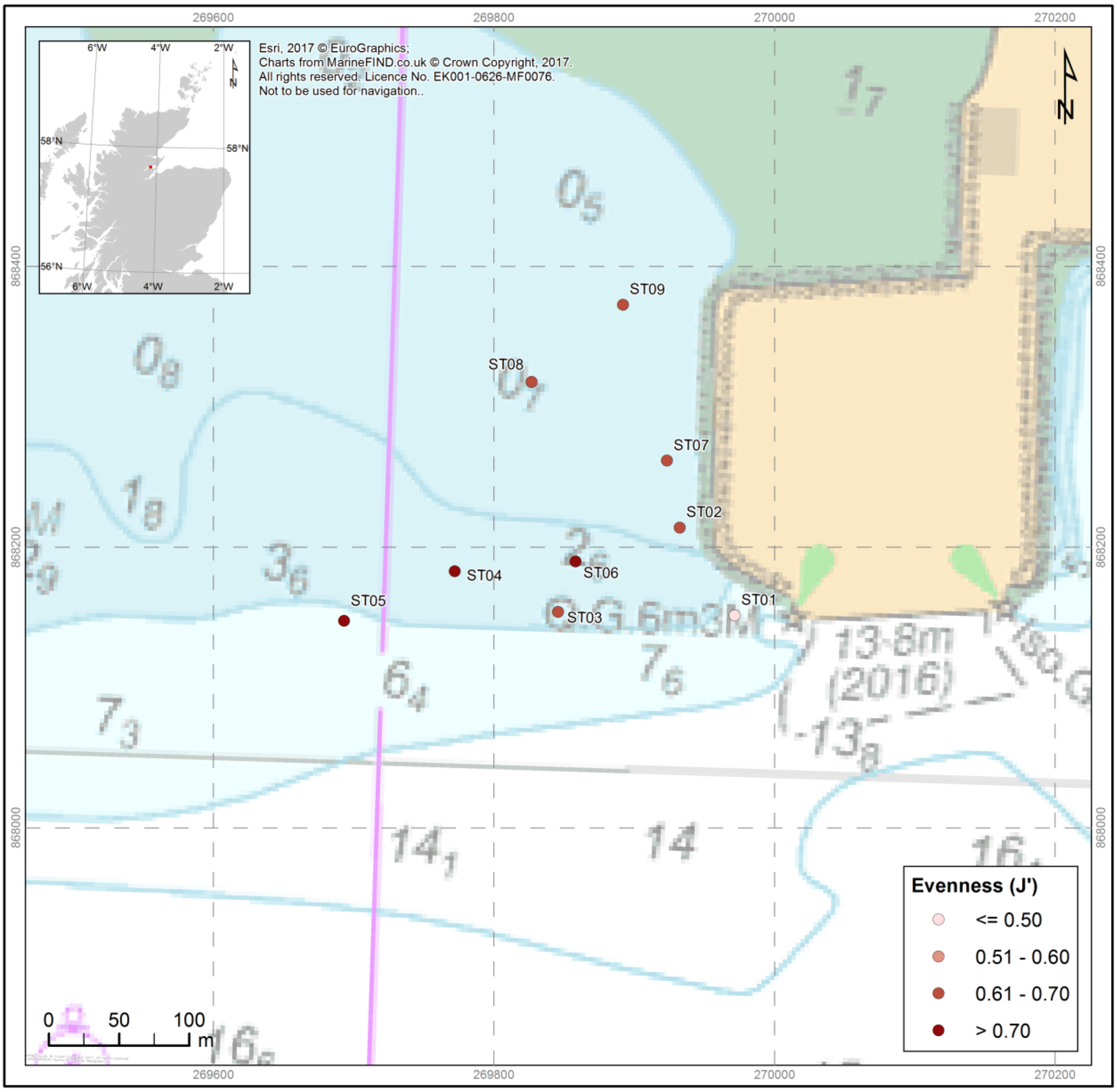
Figure 5.4: Taxonomic diversity based on Shannon-Weiner [H' Log$_2$] within the faunal grab samples



Map Document: (V:\E160868_Invergorden_Benthic\3_Plots\2_Draft\Q160868_04_Evenness.mxd)
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Figure 5.5: The distribution of Pielou's evenness index (J') for grab samples across the survey area

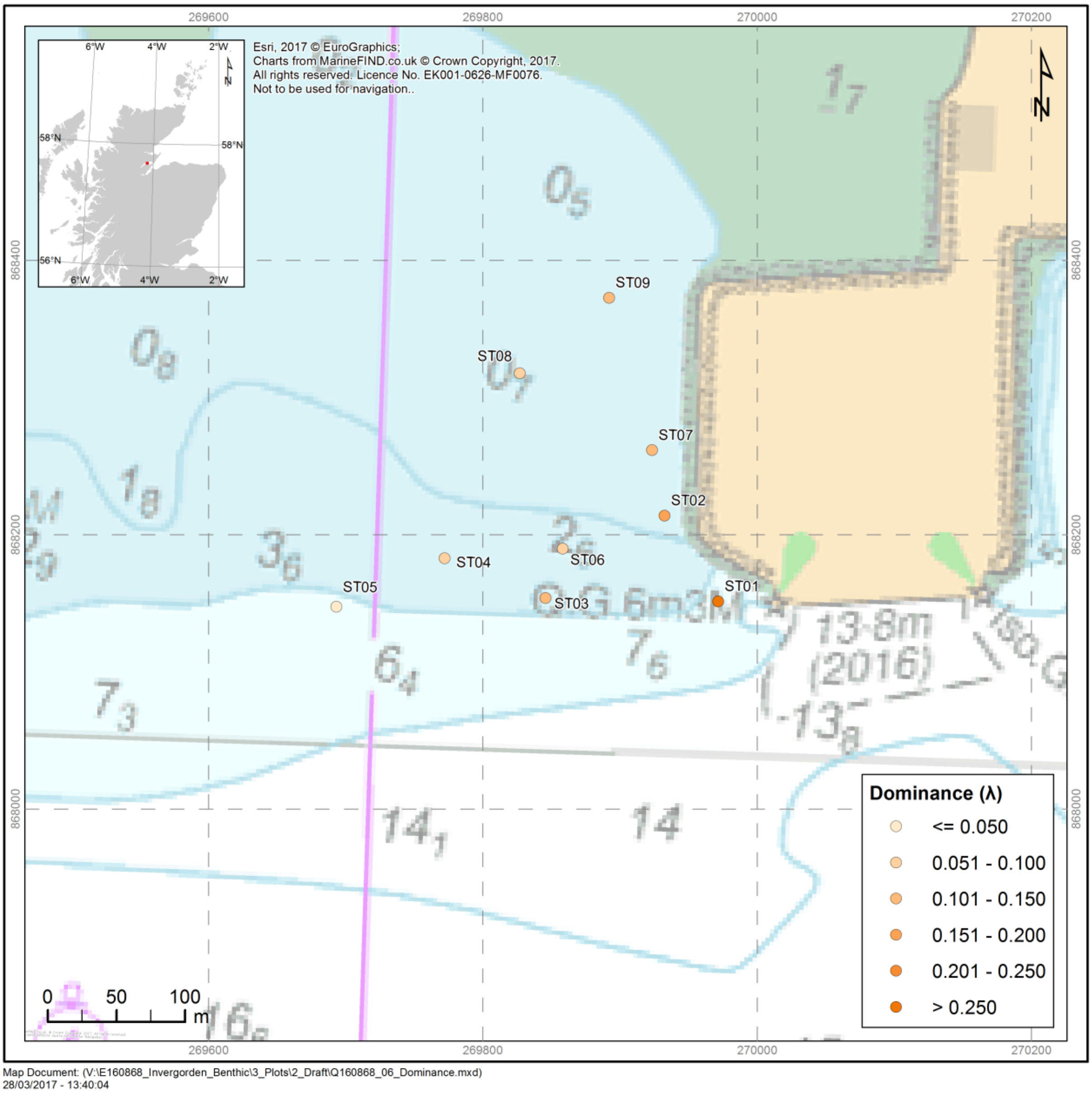

Figure 5.6: The distribution of Simpson's dominance index (λ) for grab samples across the survey area

5.3.4 Multivariate Analysis

Prior to multivariate analysis, the enumerated faunal dataset was transformed. A fourth root transformation provided the best assessment of the enumerated faunal community, down-weighting the numerically dominant species (> 1 000 individuals) which represented 1 % of the fauna, giving the right weight to the abundant taxa (> 100 individuals), which comprised 10 % of the fauna, as well as to species with intermediate abundance (> 10 individuals), which represented 31 % of the fauna, and the underlying community (≤ 10 individuals), which represented 58 % of the fauna.

Community structure of the enumerated fauna within the survey area was assessed employing the hierarchical clustering analysis, applying the SIMPROF routine set to a significance level of 5 %. The resulting dendrogram shows three main groups of stations (Figure 5.7) and the description of each group is presented in Table 5.6. Figure 5.8 illustrates the MDS which is an ordination technique that arranges the samples on a two-dimensional plot, so that their relative distances from each other reflect their faunal similarities. The stress coefficient of 0.07 resulting from the procedure, indicates that the plot is a ‘good’ representation of the multi-dimensional relationship between samples (Clarke and Warwick, 2001).

The SIMPER analysis was used to identify the taxa characterising the multivariate grouping, as well as the taxa driving the differences between the groups.

Group a comprised of two samples characterised by gravelly muddy sand with shell fragments, in water depths of 4.1 ± 0.6 m LAT. It comprised of relatively high faunal diversity and abundance. Characterising taxa included the ascidian *D. grossularia*, the polychaetes *P. inornata*, *S. armiger*, *S. lamarki* and *Sphaerosyllis* sp., the amphipod *Dexamine thea* as well as species belonging to the family Corophiidae and the tanaid *Tanaopsis graciloides*. The oligochaete *Tubificoides amplivasatus* and species belonging to the phylum Nematoda also occurred in the top ten characterising taxa.

Group b comprised of four samples characterised by gravelly muddy sand with shell fragments and pebbles, in water depths of 6.8 ± 1.6 m LAT. Characterising taxa included the phylum Nematoda, the polychaetes *P. inornata* and *S. armiger*, *Galathowenia oculata*, *Pholoe baltica*, *Mediomastus fragilis* and *Psamathe fusca*, the tanaid *T. graciloides*, amphipod species belonging to the family Corophiidae and the bivalve *Abra alba.*

Group c comprised of three samples characterised by gravelly muddy sand with shell fragments and gravel, average water depth of 6.1 ± 0.9 m LAT. Characterising taxa included individuals within the phylum Nematoda phyla, the polychaetes *S. armiger* and *S. lamarcki*, P. fusca, *Protodorvillea kefersteini*. *P. inornata* and *Spaerosyllis* sp. The ascidian *D. grossularia* and the amphipod *Dexamine thea* also occurred in the top ten characterising species. This group included those stations with the lowest diversity across the survey area.

The SIMPER analysis also highlighted the differences between groups, both in terms of species composition and their average abundances. The top five species contributing to this difference are presented in Table 5.7.

The dissimilarity between Group b and Group c was driven by the polychaete *Ampharete lindstroemi* agg. which was not recorded in samples within Group c, whilst the amphipod *Pariambus typicus* was not recorded in samples from Group c but present in samples within Group b. Within the top five taxa, contributing to the observed dissimilarity, the tanaid *Tanaopsis graciloides*, the polychaete *Mediomastus fragilis* and species belonging the class Ostracoda were all recorded in both groups, with higher abundance in samples within Group b.

The dissimilarity between Group a and Group c was mainly determined by differences in average abundance of the top four taxa driving the differences. These included the tanaid *T. graciloides*, the ascidian *D. grossularia* and the polychaetes *T. amplivasatus* and *P. inornata*, with their average abundance being lower in samples within Group c. The polychaete *Prosphaerosyllis* sp. was not recorded in samples within Group c but occurred in Group a.

The dissimilarity between Groups a and b was determined by the polychaetes *Aricidea* (*Aricidea*) *minuta* and *Sabellaria spinulosa*, as well as the amphipod *Pariambus typicus*, which were not recorded in samples within Group a. The other two taxa within the top five species showed differences in average abundance between the groups, with the class Ostracoda being more abundant in samples within Group b, whilst the ascidian *D. grossularia* being more abundant in samples within Group a.

As presented in Table 5.7, dissimilarity levels between groups vary between 40.55 % for Groups b and a, and 47.94 % for Groups c and b. The main species characterising the differences between groups are shown in Figure 5.9a) to f).

Figure 5.10 shows the distributions of the faunal clusters groups across the survey area. Group a, mainly differing for higher abundance of the ascidian *D. grossularia*, included two stations located in the shallowest part of the survey area (-5 m LAT). Stations within the Group c, which were the less diverse, were located closer to the port, whilst the stations within Group b were located in the deeper part of the survey area between -5 m and -8 m LAT.

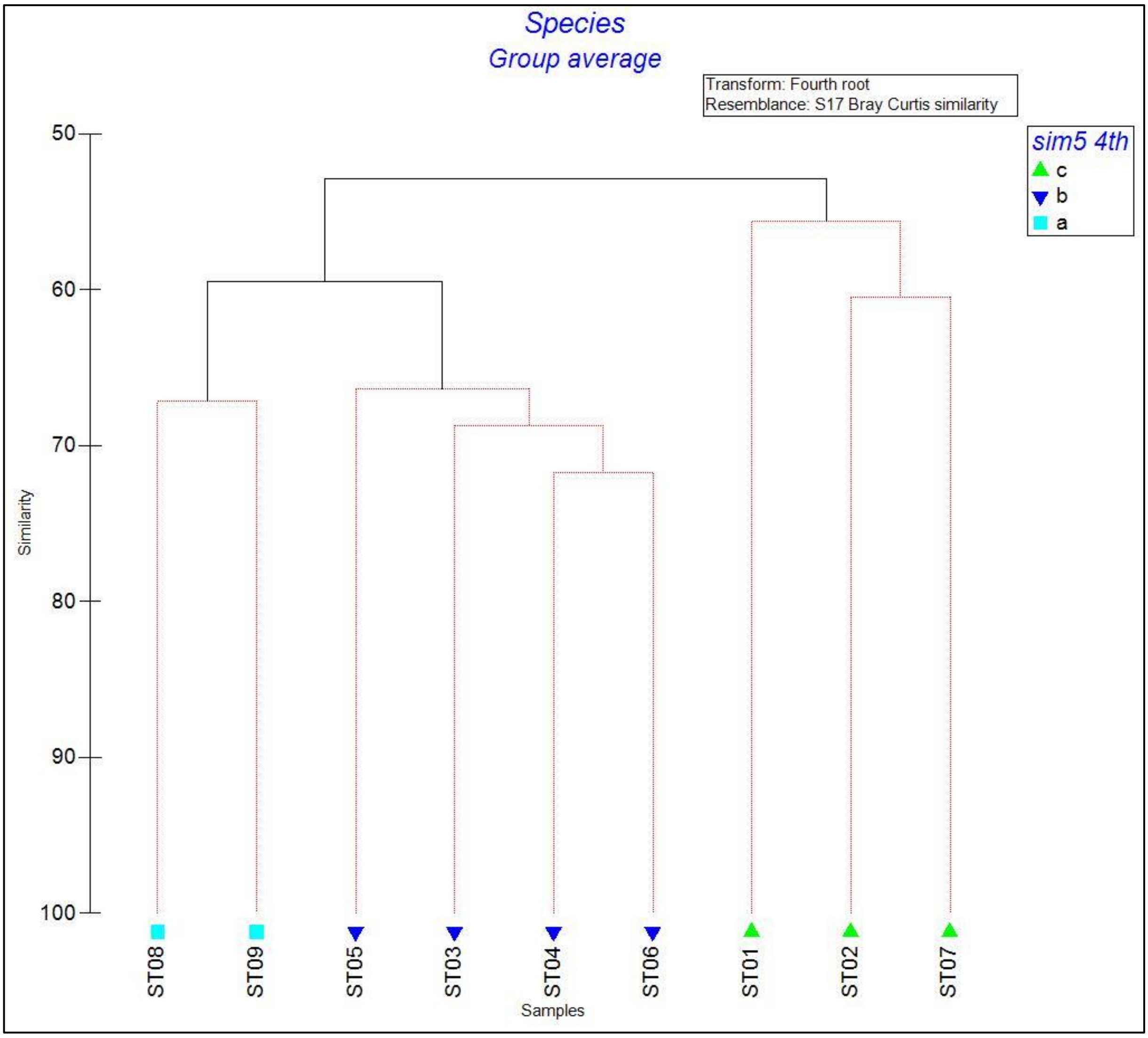

Figure 5.7: Dendrogram of Bray-Curtis similarity index of enumerated fauna from grab samples

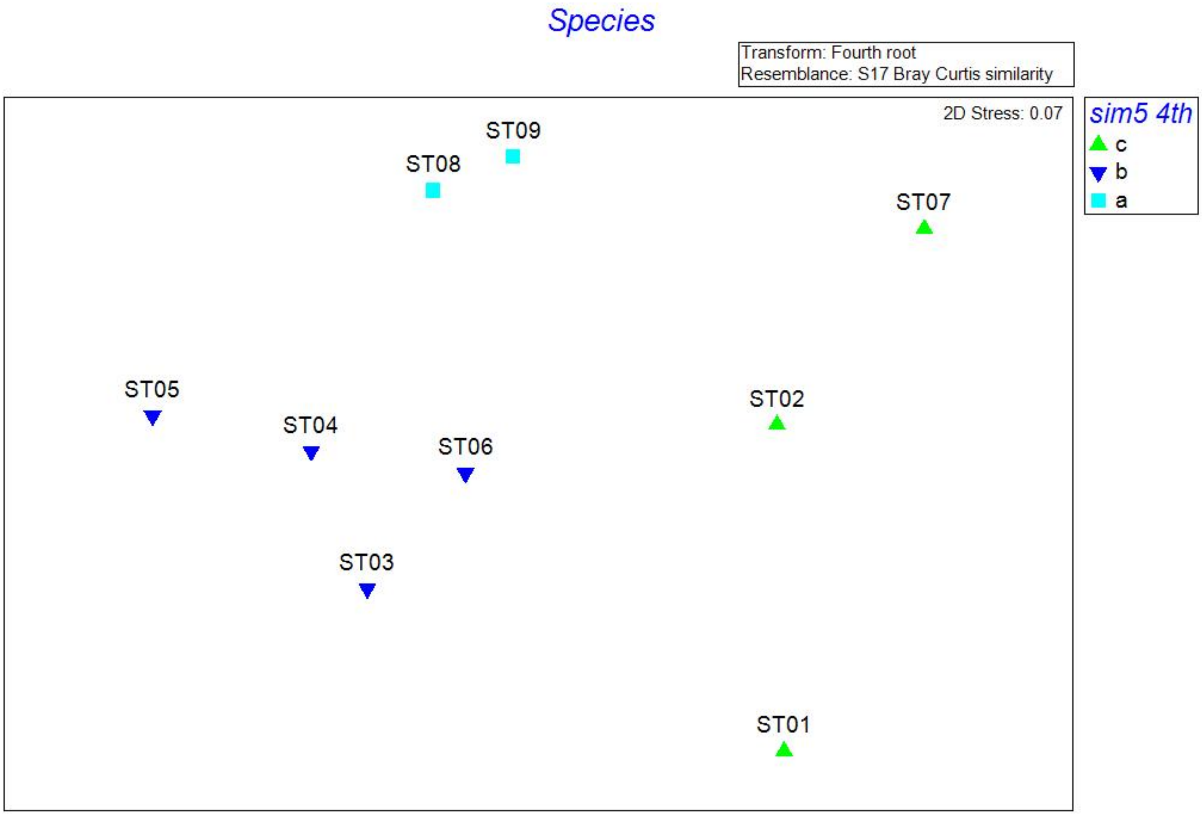

Figure 5.8: MDS plot of Bray-Curtis similarity index of enumerated fauna from grab samples

Table 5.6: Summary Attributes of the Faunal Group Derived from Multivariate Analysis of Enumerated Fauna from Grab samples (derived from the SIMPER analysis).

Group	Samples	Characterising Features	Species	Mean Abundance	Contributing to the Similarity [% Samples]
a ■ Average similarity: 67.17 %	ST08 ST09	S = 75 ± 1 N = 1527 ± 96 Depth [m]= 4.1 ± 0.6	*Dendrodoa grossularia*	3.98	4.66
			Pholoe inornata	3.65	4.56
			NEMATODA	3.86	4.29
			Scoloplos (Scoloplos) armiger	3.56	4.20
			Corophiidae	2.74	3.02
			Spirobranchus lamarcki	2.67	2.98
			Sphaerosyllis	2.62	2.98
			Tubificoides amplivasatus	2.65	2.98
			Dexamine thea	2.51	2.93
			Tanaopsis graciloides	2.98	2.91
b ▼ Average similarity: 68.04 %	ST03 ST04 ST05 ST06	S = 101 ± 7 N = 1247 ± 123 Depth [m]= 6.8 ± 1.6	NEMATODA	3.66	3.08
			Pholoe inornata	3.39	3.04
			Scoloplos (Scoloplos) armiger	2.81	2.64
			Tanaopsis graciloides	2.87	2.49
			Abra alba	2.48	2.37
			Corophiidae	2.73	2.32
			Galathowenia oculata	2.53	2.22
			Pholoe baltica	2.31	2.19
			Mediomastus fragilis	2.31	2.18
			Psamathe fusca	2.35	2.08

Group	Samples	Characterising Features	Species	Mean Abundance	Contributing to the Similarity [% Samples]
c Average similarity: 57.21 %	ST01 ST02 ST07	S = 63 ± 8 N = 1046 ± 734 Depth [m]= 6.1 ± 0.9	NEMATODA	4.39	7.14
			Spirobranchus lamarcki	2.96	5.38
			Scoloplos (Scoloplos) armiger	2.80	5.28
			Dendrodoa grossularia	2.31	4.30
			NEMERTEA	2.41	3.85
			Psamathe fusca	1.88	3.38
			Protodorvillea kefersteini	1.87	3.29
			Pholoe inornata	2.12	3.25
			Dexamine thea	1.54	2.96
			Sphaerosyllis	1.64	2.95

Notes:
S = number of species
N = number of individuals
Abundance refers to untransformed data and is expressed as mean value within the multivariate group
% samples indicate the contribution of each sample to the multivariate grouping

Table 5.7: Output of SIMPER Analysis Indicating Differences Between Groups

Taxa	Av. Abund	Av. Abund	Av. Diss	Diss/SD	Contrib%	Cum.%
Groups c and b			**Average Dissimilarity = 47.94%**			
Species	**Group c**	**Group b**				
Ampharete lindstroemi agg	0.00	1.83	0.76	7.48	1.59	1.59
Tanaopsis graciloides	1.06	2.87	0.74	2.09	1.55	3.14
OSTRACODA	0.64	2.10	0.63	1.49	1.31	4.45
Mediomastus fragilis	0.83	2.31	0.62	2.20	1.30	5.75
Pariambus typicus	0.00	1.41	0.59	5.78	1.23	6.98
Groups c and a			**Average Dissimilarity = 45.49%**			
	Group c	**Group a**				
Tanaopsis graciloides	1.06	2.98	0.91	1.84	2.00	2.00
Dendrodoa grossularia	2.31	3.98	0.80	5.59	1.75	3.75
Tubificoides amplivasatus	1.06	2.65	0.76	5.64	1.67	5.42
Pholoe inornata	2.12	3.65	0.74	2.30	1.63	7.05
Prosphaerosyllis	0.00	1.44	0.69	5.33	1.51	8.57
Groups b and a			**Average Dissimilarity = 40.55 %**			
	Group b	**Group a**				
Dendrodoa grossularia	2.05	3.98	0.72	2.23	1.77	1.77
Aricidea (Aricidea) minuta	1.64	0.00	0.61	11.51	1.51	3.28
OSTRACODA	2.10	0.66	0.53	1.84	1.31	4.59
Pariambus typicus	1.41	0.00	0.53	5.97	1.29	5.89
Sabellaria spinulosa	1.40	0.00	0.52	3.00	1.28	7.17

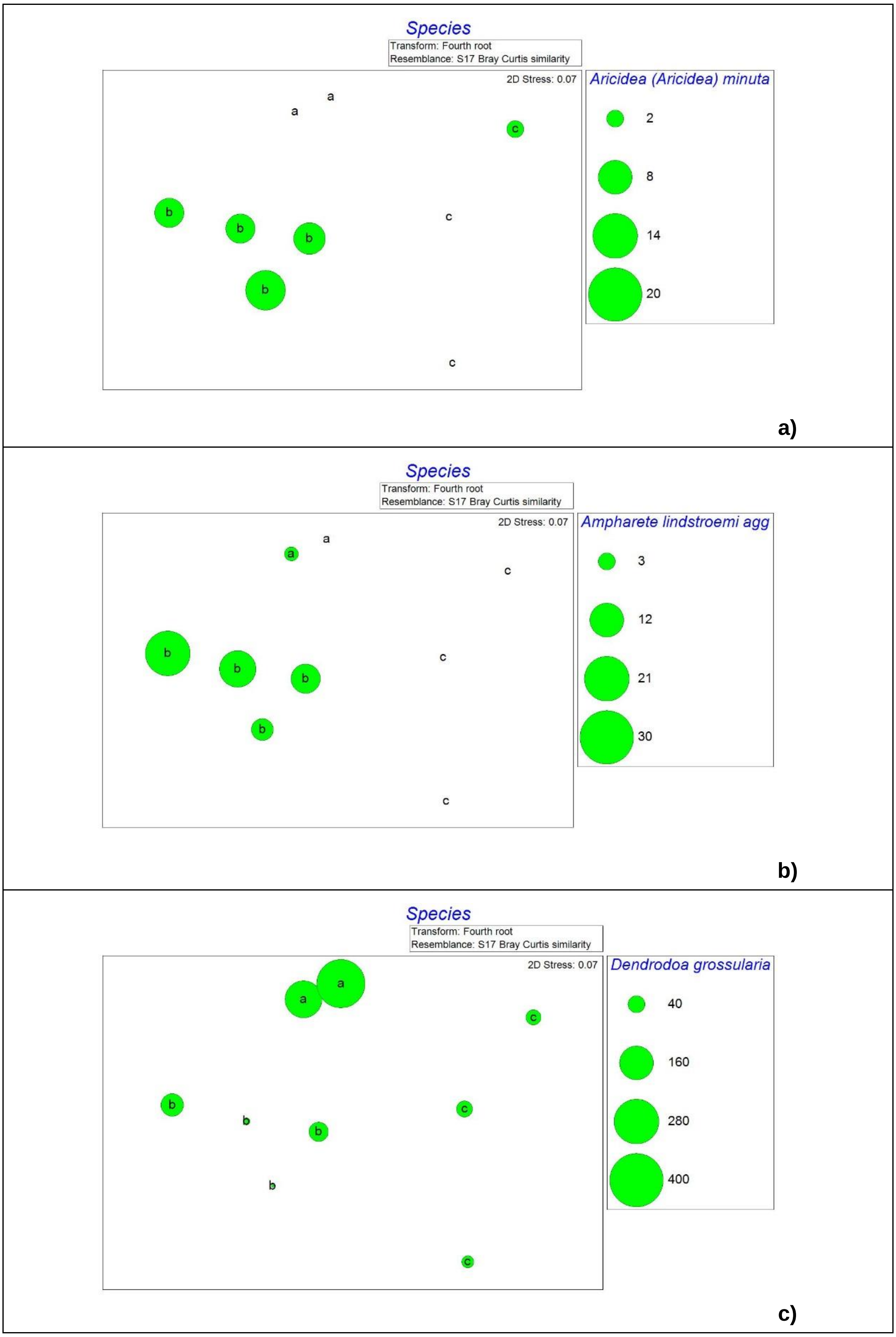

Figure 5.9: Main contributing species to the differences between groups identified by the cluster analysis, overlaid with the relative abundance

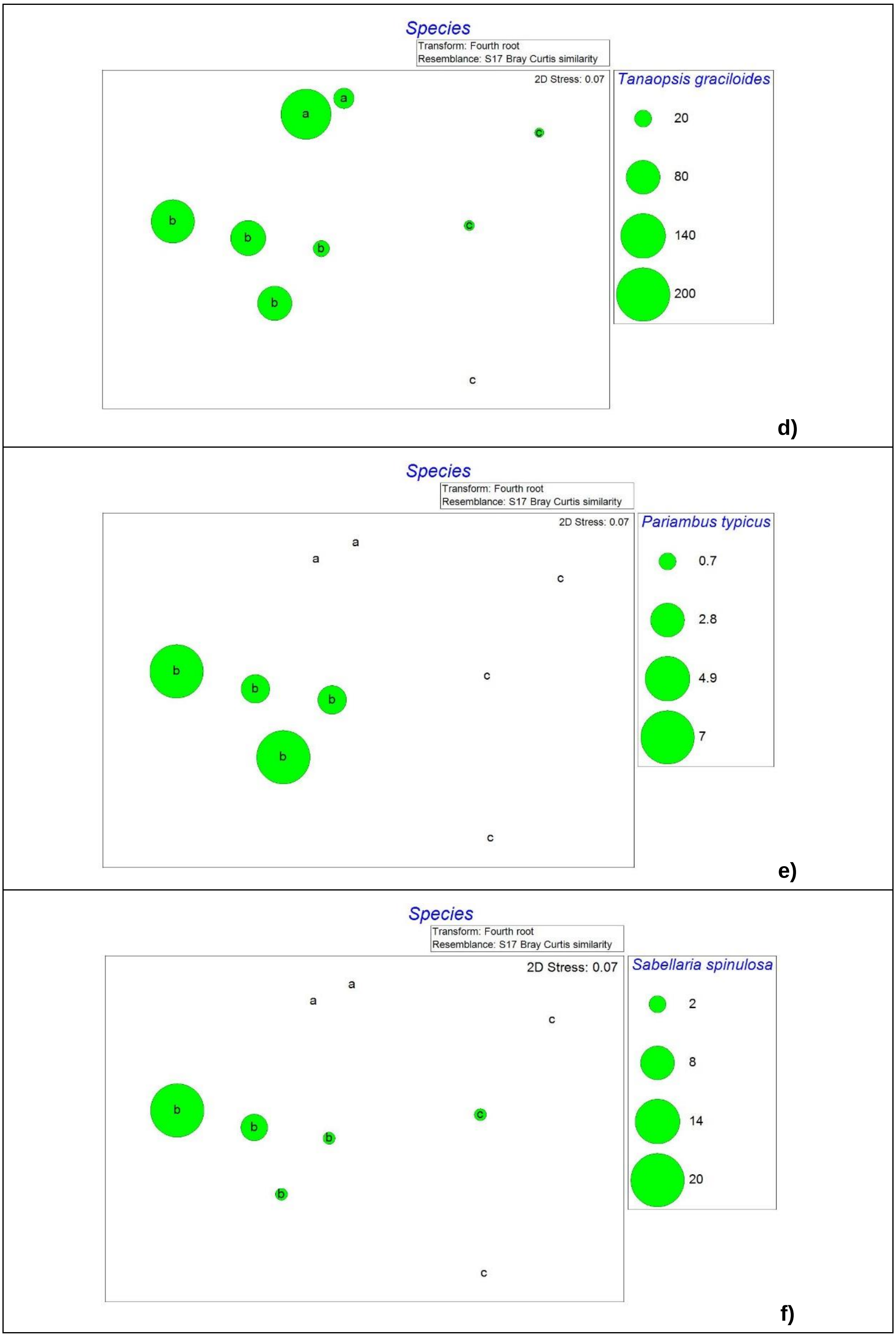

Figure 5.9: Main contributing species to the differences between groups identified by the cluster analysis overlaid with the relative abundance continued

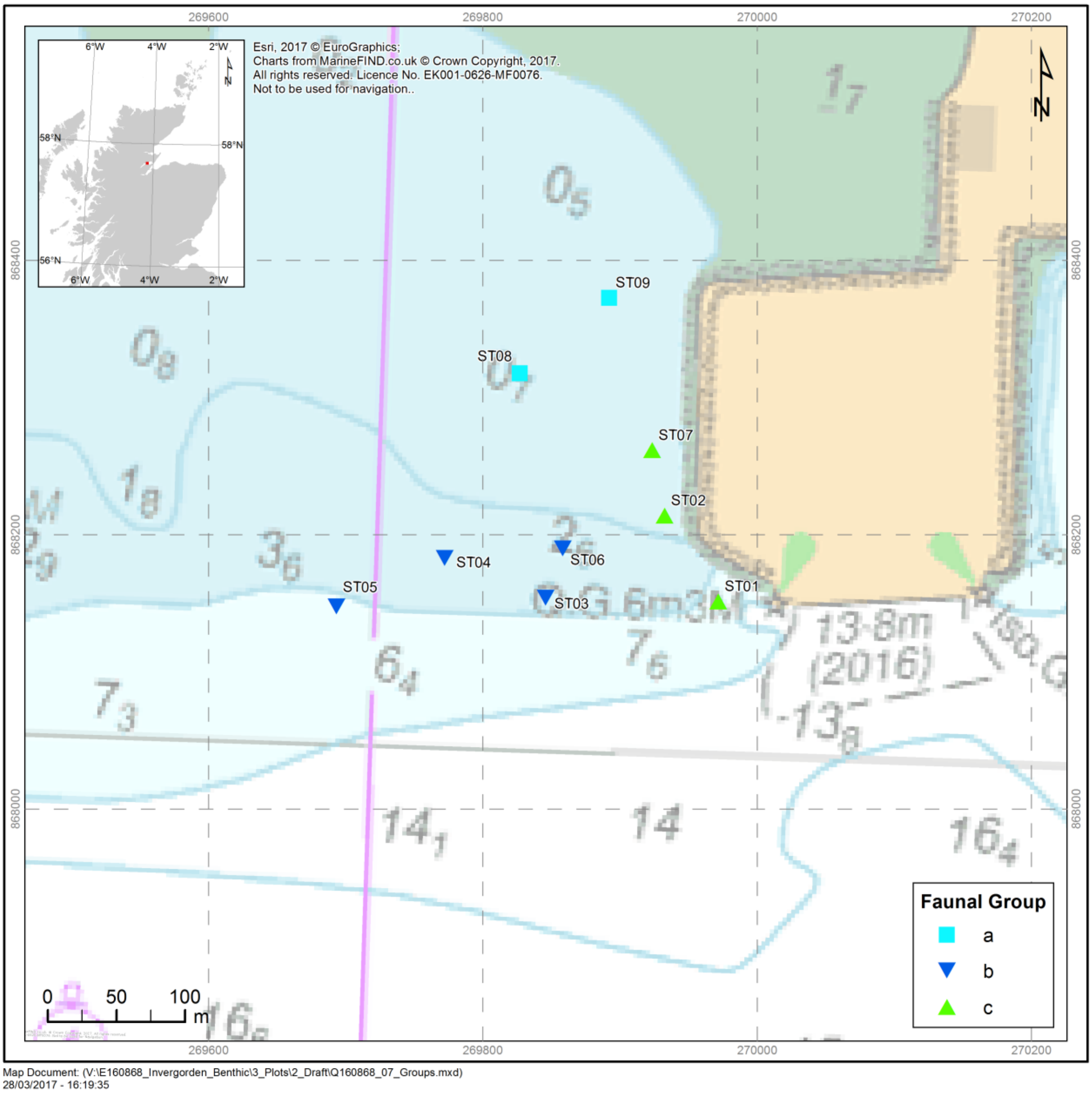

Figure 5.10: Distribution of fauna groups identified by hierarchical agglomerative cluster analysis across the survey area

5.4 Biotope Classification

A mosaic of two biotope complexes was assessed to better describe the survey area. The assessment was based on biological data from grab samples and descriptive sediment data, as well as the results of the video analysis and the photographic records of the grab samples in the field.

The biotope complexes identified are SS.SMX.IMx (Infralittoral mixed sediment) and SS.SSA.IMuSa (Infralittoral muddy sand). The former reflects the presence of gravel and pebbles in grab samples collected at the sampling sites, as well as the coarser nature of sections of the video transects run across the survey area (see Section 5.1), characterised by the presence of pebbles and cobbles. The coarser nature of some areas is also confirmed by the presence of kelp *Laminaria* sp., commonly occurring within the survey area and high abundance of epibenthic polychaete *S. lamarki* and the ascidian *D. grossularia*. However, it is worth noting that also the presence of a high percentage of large shells offers suitable substrate for such species to occur. SS.SSA.IMuSa, on the other hand, reflects the nature of the sediment described areas of less coarse sediments described by the video analysis (e.g. TR02). Some species found across the survey area (e.g. *P. inornata*, *Eteone longa* agg.) are typically found within biotopes characterised by finer sediment.

SS.SMX.IMx. is typical of shallow mixed (heterogeneous) sediments in fully marine or near fully marine conditions, supporting various animal-dominated communities, with relatively low proportions of seaweeds. This habitat may include well mixed muddy gravelly sands or very poorly sorted mosaics of shell, cobbles and pebbles embedded in mud, sand or gravel. Due to the quite variable nature of the sediment type, a widely variable array of communities may be found, including those characterised by bivalves, polychaetes and file shells.

SS.SSA.IMuSa is described as non-cohesive muddy sand in the infralittoral zone, extending from the extreme lower shore down to more stable circalittoral zone at about 15 m to 20 m. The habitat supports a variety of animal-dominated communities, particularly polychaetes, bivalves and echinoderms.

5.5 Habitats and Species of Nature Conservation Interest

No species or habitats of conservation importance were found within the survey area.

It is worth noting the presence of live blue mussel *Mytilus edulis*. Mussel beds, a protected habitat under the UK Priority Habitats and listed in the OSPAR List and listed as a PMF (see Section 4.4) are known to occur within the Cromarty Firth, hence the presence of *M. edulis* is not unusual; however, no blue mussel beds were found within the survey area.

Non-indigenous species were not identified within the survey area.

6. DISCUSSION

6.1 Seabed Video Footage

Analysis of the video footage showed the presence of one main habitat within the survey area, featuring highly heterogeneous seabed sediment, comprising a mix of mud and sand with gravel and shells, including pebbles and cobbles. The video footage analysis also identified localised areas where the coarser fraction (pebbles and cobbles) of the sediment was reduced. The encountered epibenthic communities reflected this sediment complexity, with sessile epifauna ranging from abundant to common in areas with high percentage of hard substrate, and less so in sandier areas, which, consequently, showed less diverse epibenthic communities.

The epibenthic communities recorded by the seabed video footage included taxa from each major taxonomic group and were broadly comparable to those reported for the shallower sediment areas of the Cromarty Firth and similar coastal areas of the North Sea (e.g. EOL, 2017). Taxa encountered included kelp *Laminaria* sp., the common starfish *Asterias rubens*, the brittlestar *Ophiura albida* and the edible-sea urchin *Echinus esculentus*; the polychaete *Spirobranchus* sp. was also common and the molluscs recorded included mainly unidentified gastropods and the blue mussel *Mytilus edulis*. Crustacea recorded included the hermit crab *Pagurus bernhardus* and the common shore crab *Carcinus maenas*. The plumose anemone *Metridium dianthus* and the anthozoan *Alcyonium digitatum* were recorded within the survey area as well as turf forming species which included Hydroid/Bryozoan taxa. Fragments of maerl *Lithothamnion* sp. were also present along each transect and two fish taxa, the European plaice *Pleuronectes platessa* and the dragonet *Callionymus* sp., were encountered along transect TR1.

6.2 Grab Samples

6.2.1 Sediment Data Analysis

The sediment assessment was based on field description of the grab samples collected for macrofauna analysis. As per scope of work, no grab samples for sediment analysis were collected during this survey. The results of the video analysis and photographic records of samples, before and after the sieving process took place, were also used to support the assessment. All samples were described as gravelly muddy sand (gmS) with shells and shell fragments; the shells were mainly *Mytilus edulis* and at one grab site oyster shells were also recorded. The video analysis showed that the surface of the seabed appears as a mix of mud and sand with gravel and shells, including pebbles and cobbles.

Sediment description of the seabed of the Cromarty Firth, as well as predicted habitats, are available from EMODnet (2017). The substrate type predicted for the survey area is sand, although with low confidence. This agrees with the main sediment fraction described by the grab and video data.

6.2.2 Macrobenthic Communities

The macrobentic community described by the analysis of grab data included taxa from all major taxonomic groups. Results of the biological analysis indicated that, in terms of species diversity, most stations hosted a moderately rich community, with few stations being characterised by less diverse communities. In terms of abundances (i.e. total number of individuals per stations), this was generally high and related to infaunal taxa such as Nematoda, *P. inornata* and *S. armiger*. To the higher species diversity and, particularly, abundances, also contributed the presence of epibenthic species (e.g. the ascidian *D. grossularia* and the polychaete *S. lamarki*). With the presence of more heterogeneous sediment and large fraction of shells and shell fragments, these taxa find suitable substrate available for the settlement. The sediment type described also favours the attachment of kelp species (such as *Laminaria* sp.), which in turn provide suitable habitat for a number of epibenthic species. The observed biological diversity and distribution, together with granulometry, are typical of the shallow depth areas of the North Sea. This is in line with the literature which refers to bathymetry and sediment type as being the major physical variables affecting macrofaunal occurrence and distribution in the North Sea (Glémarec, 1973; Künitzer et al., 1992; Reiss et al., 2010; Callaway et al., 2002; McGlade, 2002; ICES, 2008).

Sessile, non-enumerated taxa recorded from the grab samples were largely represented by organisms belonging to the phylum Bryozoa, which was the more diverse. These included species such as *Escharoides coccinea*, *Schizoporella* sp., *Fenestrulina malusii*, *Celleporella hyalina*, *Membranipora membranacea*, *Conopeum reticulum*, *Electra pilosa* and *Amphiblestrum auritum*.

The multivariate analysis highlighted the presence of three major benthic groups. These were however, not considered to represent ecologically different communities, but rather variation of the same community. This was also confirmed by the low dissimilarity percentages highlighted by the multivariate analysis, which were less than 50 % for all comparisons between groups. The main differences observed were related to differences in the average abundance of the same species, as well as differences in community composition, which were, however, small by comparison.

The group which encompassed the higher number of samples (group b) was characterised by a heterogeneous sandy sediment, hosting overall high faunal richness and diversity. The samples forming the other groups showed the presence of fauna typical of communities adapted to physical disturbance, such as crustacean amphipods and polychaete worms including *P. inornata* and *S. armiger,* which are typically found in sediment such as gravelly muddy sand (MarLIN, 2006), as well as *Abra alba* and *Mediomastus fragilis*, which are typical of habitats with a certain degree of compactness and hence stability (Dewarumez, 1992, JNCC, 2015b).

Group a included the two shallowest stations, which were described as gravelly muddy sand and characterised by the presence of boulders and pebbles. The fauna characterising the group was similar to the fauna of the other groups, but with a higher mean abundance of sessile species such as *D. grossularia* and *S. lamarki*.

Group c encompassed the three least diverse stations, with the sediment described as coarse mixed sediment where pebbles and cobbles were also present. The top three, most abundant, taxa included Nematoda and the polychaetes *S. lamarcki* and *S. armiger*. Phylum Nemertea and the ascidian *D. grossularia* were also common within this group, although the abundance of the individual taxa was lower. Within this group, station ST01 was particularly characterised by the presence of the polychaete *P. mucosa*, which occurred in very high abundance at this station, compared to the other stations, where it was however present. This species is known to occur to about the depth of 20 m, mainly common on intertidal sand and mud, but also occurring on bottoms with stones and shell gravel (de Kluijver et al., 2017). It is considered a carrion-feeding species, as individuals do not appear to prey on living preys; the species was also observed being attracted by freshly crushed molluscs and injured, with low motility, polychaetes. However, these observations refer to the polychaete on the tidal flats, whilst little to no information is available for the worm living in the subtidal habitat (Lee et al., 2004). *P. mucosa* was also associated with detached kelp in subtidal habitats (Tzetlin et al., 1997). These were also the sites located around the existing port.

Thirty-two newly settled juveniles were recorded, largely represented by species of Mytilidae juv., which occurred at all stations. The phylum Mollusca was the most diverse and numerically dominant in terms of juveniles, with species such as *Mya* sp. being abundant, together with the Echinodermata family Ophiuroidea. The remaining taxa belonged to the phyla 'Annelida', including Polynoidae juv., Nephtyidae juv. and Arenicolidae juv., 'Crustacea', including *Amplelisca* sp. juv., Paguridae juv., *Carcinus maenas* juv. and *Atelecyclus rotundatus* juv., 'Echinoderamta', including Echinoidea juv. Cucumariidae juv., 'Mollusca', including *Mya* sp. juv., *Lucinoma borealis* juv., Nuculidae juv. And Trochidae juv. and 'Others', including Ascidiacea juv. and Sipuncula juv.

Juveniles were removed prior to the analysis. The analysis which included the juveniles showed more statistical groupings and particularly station ST07, which separated due to the absence of two juvenile taxa, namely Ascidiacea juv. and Anomiidae juv. These two taxa are epibenthic, meaning that they settle and grow on a hard surface, therefore their presence or absence is most likely driven by the availability of suitable substrate. Moreover, as only one replicate was collected per station, the dataset may not be robust enough and the juvenile species which were not collected at some stations, or more abundant at others, could be simply a consequence of the sampling effort applied for the survey.

It was not possible to define lower level biotopes for the survey area. The microbenthic fauna collected, in fact, presented characteristic of different biotopes without satisfying the features of any specific one. Biotopes considered during the analysis were characterised by sediments that ranged between finer and mixed; the two main ones considered included the biotopes SS.SMu.ISaMu.NhomMac (*Nephtys hombergii* and *Macoma balthica* in infralittoral sandy mud) and SS.SMx.IMx.VsenAsquAps (*Venerupis senegalensis*, *Amphipholis squamata* and *Apseudes latreilli* in infralittoral mixed sediment). The former was a good fit, as it occurs in nearshore shallow sandy muds and muds, but it can also be found in mixed sediments. Of the typifying species, only the polychaete *N. hombergii* occurred in the survey area with a total of seven individuals within three samples, but the bivalve *M. balthica* was not recorded. The presence of *Abra alba*, and/or *Nucula nitidosa* may be important in this biotope and in some areas *S. armiger* may also be present. These species were all found in the survey area, however other taxa occurring within the biotope where not recorded. The community appears to be quite stable and the substratum is typically rich in organic content (JNCC, 2015b), as could potentially indicate the high abundance of the carrion-feeding species *P. mucosa*. The second biotope was considered as the physical environment was reflecting more the one observed in the study, as well as being described as occurring in marine inlets and estuaries. Of the typifying species for this biotope, only the brittlestar *A. filiformis* was recorded in low abundance (13 individuals across the survey area). Other characterising taxa occurred in the survey area and included taxa belonging to the Phyla Nematoda and Nemertea, the polychaetes *P. mucosa*, *S. lamarckii*, *Mediomastus fragilis*, and oligochaete species belonging to the genus *Tubificoides*. It is also suggested that the same biotope located at northern latitudes (northern than the locations where it has been described, mainly English Channel) may present lower species diversity (JNCC, 2015b). Despite the survey data reflected several features of these biotopes, none of them satisfied the characteristics of a single one, suggesting that the environment is influenced by environmental factors which were not possible to highlight through this study.

By using video and grab data, and with the considerations exposed above, the biotope complex SS.SMX.IMx (Infralittoral mixed sediment) was identified as the most widespread across the survey area, together with the biotope complex SS.SSA.IMuSa (Infralittoral muddy sand), the latter being more localised. Areas where SS.SSA.IMuSa occurred were however mainly identified by the video analysis. The selected biotope mosaic is in agreement with the predicted habitats and sediment types for the area of the Cromarty Firth explored during this study (EMODNet, 2017).

No species or habitats of conservation importance, nor non-indigenous species, were found within the survey area.

7. CONCLUSIONS

Analysis of the video footage showed the presence of one habitat within the survey area, featuring highly heterogeneous seabed sediment, comprising a mix of mud and sand with gravel and shells, including pebbles, cobbles. The epibiotic communities reflected the sediment complexity with sessile epifauna being abundant and common in the survey area, as well as areas of impoverished epibenthic communities.

All samples were described as gravelly muddy sand (gmS) with shells and shell fragments; the shells were mainly *Mytilus edulis* and at one grab site also oyster shells were identified. The video analysis showed that the surface of the seabed appears as a mix of mud and sand with gravel and shells, including pebbles and cobbles.

Results of the biological analyses indicated that, in terms of species diversity, most stations hosted a moderately rich community, whilst other stations were characterised by a less diverse communities. The multivariate analysis highlighted the presence of three major benthic groups, however these were not considered to represent ecologically different communities, but rather variation of the same community. Abundances were generally higher in areas of mixed sediment types, where the heterogeneity of the seabed offered suitable substrate for the attachment of epibenthic species, which in turn provided further microhabitats for additional species. All major groups were represented within the survey area.

Juvenile taxa were removed prior to the analysis. The analysis which included the juveniles showed more statistical groupings mainly separating on the basis of two juvenile taxa, namely Ascidiacea juv. and Anomiidae juv. These two taxa are epibenthic, meaning that they settle and grow on a hard surface, on a plant or on another animal, therefore their presence or absence could potentially be a consequence of suitable substrata being, or not being, available. Moreover, as only one replicate was collected per station, the dataset may not be robust enough and the juvenile species which were not collected at some stations, or more abundant at others, could be simply a consequence of the sampling effort applied for the survey.

Using video and grab data the biotope complex SS.SMX.IMx (Infralittoral mixed sediment) was identified as the most widespread across the survey area, although areas where the biotope complex SS.SSA.IMuSa (Infralittoral muddy sand) was a better fit also occurred. These were however, mainly identified by the video analysis.

No species or habitats of conservation importance, nor non-indigenous species, were found within the survey area.

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APPENDICES

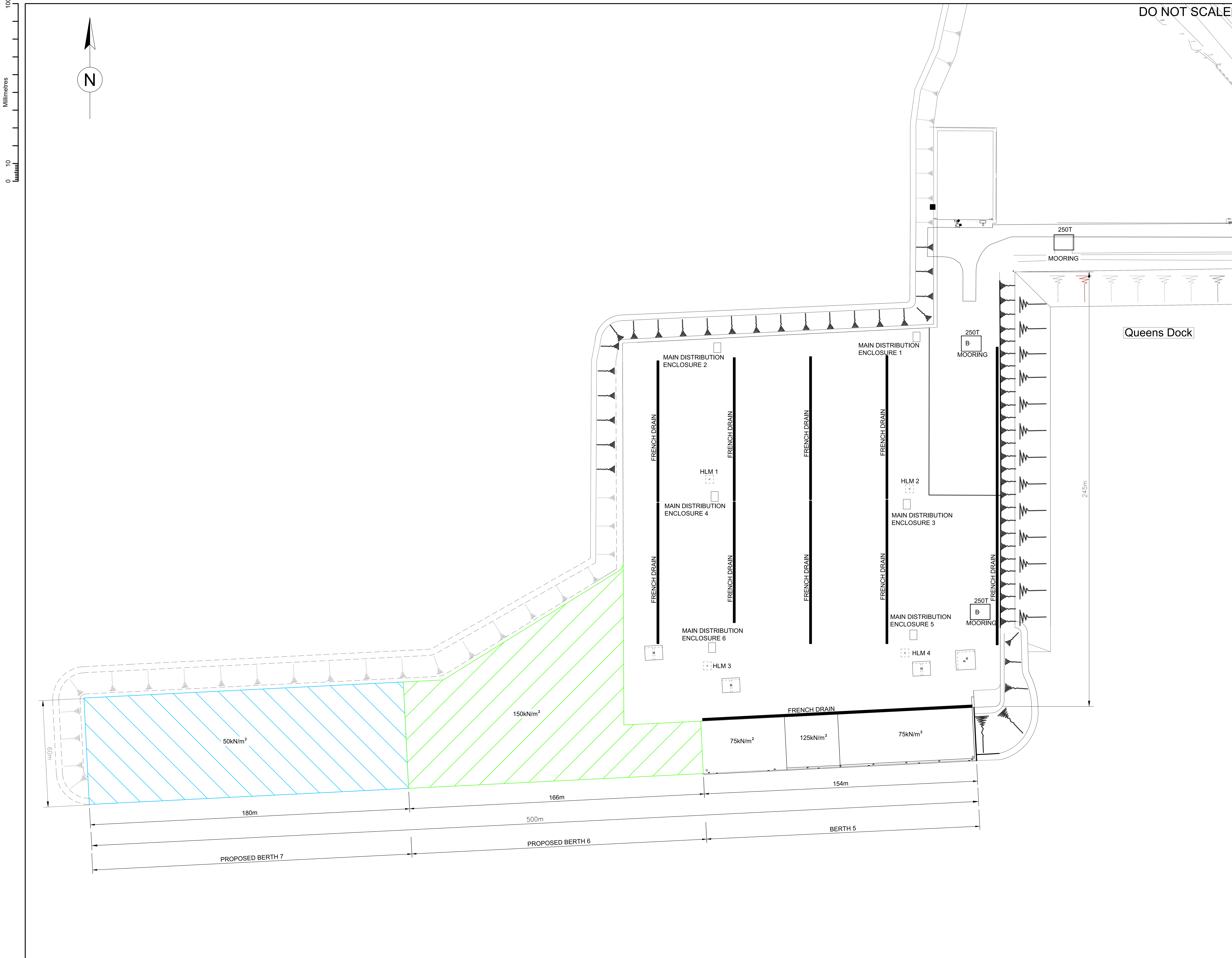
A. GUIDELINES ON USE OF REPORT

This report (the "Report") was prepared as part of the services (the "Services") provided by Fugro GB Marine Limited (''Fugro'') for its client (the "Client") and in accordance with the terms of the relevant contract between the two parties (the Contract"). The Services were performed by Fugro in accordance with the obligations in the Contract and based on requirements of the Client set out in the Contract or otherwise made known by the Client to Fugro and any other information affecting the Services at the time; save that the extent to which Fugro relied on Client or third party information in carrying out the Services was set out in the Contract.

Fugro's obligations and liabilities to the Client or any other party in respect of the Services and this Report are limited to the extent and for the time period set out in the Contract (or in the absence of any express provision in the Contract as implied by the law of the Contract) and Fugro provides no other representation or warranty whether express or implied, in relation to the Services, or for the use of this Report, for any other purpose. Furthermore, Fugro has no obligation to update or revise this Report based on any future changes in conditions or information which emerge following issue of this Report unless expressly required by the provisions of the Contract.

The Services were performed by Fugro exclusively for the Client and any other party expressly identified in the Contract, and any use and/or reliance on the Report or the Services for purposes not expressly stated in the Contract, will be at the Client's sole risk. Any other party seeking to rely on this Report does so wholly at its own and sole risk and Fugro accepts no liability whatsoever for any such use and/or reliance."

B. SURVEY AREA SITE PLAN



SITE PLAN
SCALE 1:1000

NOTES

1. EXISTING LAYOUT INFORMATION DERIVED FROM MCLAUGHLIN □ HARVEY DRAWING 131024-10 AB NOVEMBER 2013.

KEY

PROPOSED BERTH 6

PROPOSED BERTH 7

Rev.	Date	Description	By	Chk'd	App'd
P1	11/04/16	FOR INFORMATION	SM	SKC	GM

Drawing Status: FOR INFORMATION

Suitability: S2

ATKINS
200 Broomielaw
Glasgow
G1 4RU
Tel: +44 (0)1412 202000
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Client: PORT OF CROMARTY FIRTH

Project Title: PORT EXPANSION OF INVERGORDON SERVICE BASE PHASE 4 DEVELOPMENT

Drawing Title: PROPOSED PHASE 4 SITE LAYOUT

Scale	Designed	Drawn	Checked	Authorised
AS SHOWN	SKC	LJA	DF	GMcC
Original Size	Date	Date	Date	Date
A1	08/04/16	08/04/16	08/04/16	08/04/16

Drawing Number: PCF4-ATK-PH4-ZZ-DR-C-0003

Revision: P 1

C. FIELD LOGS

C.1 VIDEO TRANSECTS FIELD LOG

Date	Transect	Time [UTC]	Point on Line	WGS84 UTM Z30N		British National Grid OSGB36		Length [m]
				Easting [m]	Northing [m]	Easting [m]	Northing [m]	
25/02/2017	TR1	09:09:28	SOL	429 488.5	6394 193.2	269 966.9	868 162.6	327
		09:17:10	EOL	429 162.4	6394 174.2	269 640.5	868 148.4	
25/02/2017	TR2	10:22:14	SOL	429 420.6	6394 283.7	269 900.3	868 254.0	133
		10:26:01	EOL	429 487.4	6394 168.4	269 965.4	868 137.7	
25/02/2017	TR3	10:06:58	SOL	429 343.0	6394 249.9	269 822.2	868 221.5	139
		10:09:39	EOL	429 375.8	6394 114.4	269 853.0	868 085.5	
25/02/2017	TR4	09:42:54	SOL	429 288.5	6394 241.4	269 767.6	868 213.7	130
		09:45:52	EOL	429 299.2	6394 112.3	269 776.4	868 084.4	
25/02/2017	TR5	09:22:26	SOL	429 211.9	6394 254.3	269 691.2	868 227.7	130
		09:25:17	EOL	429 216.6	6394 123.9	269 694.0	868 097.3	
25/02/2017	TR6	10:33:54	SOL	429 388.0	6394 401.7	269 869.4	868 372.6	172
		10:38:00	EOL	429 383.8	6394 230.1	269 862.7	868 201.0	
25/02/2017	TR7	10:44:45	SOL	429 378.2	6394 416.5	269 859.9	868 387.5	267
		10:51:19	EOL	429 427.3	6394 154.2	269 905.1	868 124.5	
25/02/2017	TR8	11:19:11	SOL	429 462.4	6394 280.3	269 942.1	868 250.1	138
		11:23:10	EOL	429 324.9	6394 276.4	269 804.6	868 248.2	
25/02/2017	TR9	11:02:51	SOL	429 458.9	6394 397.5	269 940.3	868 367.3	149
		11:07:47	EOL	429 325.4	6394 331.2	269 805.8	868 302.9	

Notes:
SOL = Start of Line
EOL = End of Line

C.2 PHOTOGRAPHIC STILLS LOG

Date	Time [UTC]	Transect	Still No.	WGS84 UTM Z30N		British National Grid OSGB36	
				Easting [m]	Northing [m]	Easting [m]	Northing [m]
24/02/2017	09:11:02	TR1	160868_TR1_01	429 444.0	6 394 189.3	269 922.3	868 159.3
25/02/2017	09:11:18	TR1	160868_TR1_02	429 430.5	6 394 186.8	269 908.8	868 157.0
25/02/2017	09:11:38	TR1	160868_TR1_03	429 417.2	6 39 4184.2	269 895.5	868 154.6
25/02/2017	09:11:49	TR1	160868_TR1_04	429 407.5	6 394 181.7	269 885.7	868 152.3
25/02/2017	09:12:04	TR1	160868_TR1_05	429 396.5	6 394 181.0	269 874.7	868 151.7
25/02/2017	09:12:17	TR1	160868_TR1_06	429 383.1	6 394 181.1	269 861.3	868 152.0
25/02/2017	09:12:36	TR1	160868_TR1_07	429 369.9	6 394 185.3	269 848.2	868 156.4
25/02/2017	09:12:57	TR1	160868_TR1_08	429353.0	6 394 190.3	269 831.4	868 161.7
25/02/2017	09:13:28	TR1	160868_TR1_09	429 331.7	6 394 190.9	269 810.1	868 162.6
25/02/2017	09:13:54	TR1	160868_TR1_10	429 308.2	6 394 188.4	269 786.5	868 160.4
25/02/2017	09:14:22	TR1	160868_TR1_11	429 289.7	6 394 182.5	269 767.9	868 154.8
25/02/2017	09:14:38	TR1	160868_TR1_12	429 273.4	6 394 180.1	269 751.6	868 152.6
25/02/2017	09:15:11	TR1	160868_TR1_13	429 239.9	6 394 178.9	269 718.1	868 151.9
25/02/2017	09:15:24	TR1	160868_TR1_14	429 232.2	6 394 178.7	269 710.4	868 151.9
25/02/2017	09:15:47	TR1	160868_TR1_15	429 215.4	6 394 174.8	269 693.5	868 148.2
25/02/2017	09:16:00	TR1	160868_TR1_16	429 205.5	6 394 174.4	269 683.6	868 147.9
25/02/2017	09:16:15	TR1	160868_TR1_17	429 196.1	6 394 173.9	269 674.2	868 147.6
25/02/2017	09:16:45	TR1	160868_TR1_18	429 177.2	6 394 172.8	269 655.3	868 146.8
25/02/2017	09:17:04	TR1	160868_TR1_19	429 165.3	6 394174.1	269 643.4	868 148.2
25/02/2017	10:23:03	TR2	160868_TR2_01	429 437.0	6 394 255.2	269 916.3	868 225.3
25/02/2017	10:23:12	TR2	160868_TR2_02	429 439.3	6 394 252.1	269 918.6	868 222.2
25/02/2017	10:23:24	TR2	160868_TR2_03	429 442.3	6 394 248.1	269 921.5	868 218.2
25/02/2017	10:23:40	TR2	160868_TR2_04	429 446.6	6 394 243.4	269 925.7	868 213.4
25/02/2017	10:23:53	TR2	160868_TR2_05	429 449.9	6 394 239.9	269 929.0	868 209.8
25/02/2017	10:24:11	TR2	160868_TR2_06	429 454.9	6 394 235.6	269 933.9	868 205.5
25/02/2017	10:24:28	TR2	160868_TR2_07	429 459.6	6 394 231.0	269 938.6	868 200.8
25/02/2017	10:24:56	TR2	160868_TR2_08	429 471.2	6 394 216.0	269 949.9	868 185.6
25/02/2017	10:25:58	TR2	160868_TR2_09	429 487.3	6 394 168.8	269 965.3	868 138.2
25/02/2017	10:07:09	TR3	160868_TR3_01	429 355.5	6 394 244.9	269 834.7	868 216.2
25/02/2017	10:07:18	TR3	160868_TR3_02	429 362.2	6 394 240.1	269 841.3	868 211.3
25/02/2017	10:07:32	TR3	160868_TR3_03	429 367.0	6 394 230.6	269 845.9	868 201.8
25/02/2017	10:08:02	TR3	160868_TR3_04	429 381.8	6 394 205.9	269 860.4	868 176.8
25/02/2017	10:08:13	TR3	160868_TR3_05	429 382.7	6 394 196.7	269 861.1	868 167.6
25/02/2017	10:08:33	TR3	160868_TR3_06	429 383.6	6 394 177.1	269 861.8	868 148.0
25/02/2017	10:08:59	TR3	160868_TR3_07	429 379.7	6 394 152.3	269 857.5	868 123.3
25/02/2017	10:09:23	TR3	160868_TR3_08	429 377.0	6 394 129.8	269 854.5	868 100.8
25/02/2017	10:09:34	TR3	160868_TR3_09	429 375.6	6 394 116.5	269 852.9	868 087.5
25/02/2017	09:43:08	TR4	160868_TR4_01	429 291.5	6 394 229.5	269 770.4	868 201.8
25/02/2017	09:43:25	TR4	160868_TR4_02	429 296.4	6 394 216.9	269 775.1	868 189.1
25/02/2017	09:43:41	TR4	160868_TR4_03	429 302.9	6 394 204.8	269 781.5	868 176.9
25/02/2017	09:44:02	TR4	160868_TR4_04	429 301.6	6 394 189.2	269 779.9	868 161.3
25/02/2017	09:44:22	TR4	160868_TR4_05	429 308.4	6 394 173.7	269 786.5	868 145.7
25/02/2017	09:45:22	TR4	160868_TR4_06	429 307.7	6 394 132.7	269 785.2	868 104.7

Date	Time [UTC]	Transect	Still No.	WGS84 UTM Z30N		British National Grid OSGB36	
				Easting [m]	Northing [m]	Easting [m]	Northing [m]
25/02/2017	09:23:00	TR5	160868_TR5_01	429 218.4	6 394 226.7	269 697.3	868 200.1
25/02/2017	09:23:14	TR5	160868_TR5_02	429 213.8	6 394 213.9	269 692.5	868 187.3
25/02/2017	09:23:28	TR5	160868_TR5_03	429 208.9	6 394 205.5	269 687.5	868 179.0
25/02/2017	09:23:48	TR5	160868_TR5_04	429 209.4	6 394 190.9	269 687.8	868 164.4
25/02/2017	09:24:13	TR5	160868_TR5_05	429 213.1	6 394 174.4	269 691.2	868 147.8
25/02/2017	09:24:21	TR5	160868_TR5_06	429 214.8	6 394 170.3	269 692.8	868 143.7
25/02/2017	09:24:43	TR5	160868_TR5_07	429 218.9	6 394 153.6	269 696.7	868 127.0
25/02/2017	09:25:13	TR5	160868_TR5_08	429 216.7	6 394 125.4	269 694.1	868 098.8
25/02/2017	10:33:51	TR6	160868_TR6_01	429 388.1	6 394 401.9	269 869.6	868 372.8
25/02/2017	10:34:01	TR6	160868_TR6_02	NR		NR	
25/02/2017	10:34:12	TR6	160868_TR6_03	NR		NR	
25/02/2017	10:34:31	TR6	160868_TR6_04	NR		NR	
25/02/2017	10:34:53	TR6	160868_TR6_05	429 371.5	6 394 373.2	269 852.6	868 344.3
25/02/2017	10:35:12	TR6	160868_TR6_06	429 372.5	6 394 357.3	269 853.3	868 328.4
25/02/2017	10:36:03	TR6	160868_TR6_07	429 375.2	6 394 322.0	269 855.5	868 293.1
25/02/2017	10:36:13	TR6	160868_TR6_08	429 376.9	6 394 315.7	269 857.1	868 286.7
25/02/2017	10:36:33	TR6	160868_TR6_09	429 376.6	6 394 297.3	269 856.5	868 268.3
25/02/2017	10:36:45	TR6	160868_TR6_10	429 376.7	6 394 287.1	269 856.5	868 258.1
25/02/2017	10:37:04	TR6	160868_TR6_11	429 377.3	6 394 270.6	269 856.8	868 241.6
25/02/2017	10:37:53	TR6	160868_TR6_12	429 383.2	6 394 233.5	269 862.2	868 204.4
25/02/2017	10:45:05	TR7	160868_TR7_01	429 391.5	6 394 409.6	269 873.1	868 380.4
25/02/2017	10:45:23	TR7	160868_TR7_02	429 398.5	6 394 401.0	269 880.0	868 371.7
25/02/2017	10:45:32	TR7	160868_TR7_03	429 401.3	6 394 396.8	269 882.7	868 367.5
25/02/2017	10:46:32	TR7	160868_TR7_04	429 417.5	6 394 365.1	269 898.4	868 335.5
25/02/2017	10:46:56	TR7	160868_TR7_05	429 423.2	6 394 348.1	269 903.9	868 318.4
25/02/2017	10:47:04	TR7	160868_TR7_06	429 423.5	6 394 341.0	269 904.1	868 311.3
25/02/2017	10:47:19	TR7	160868_TR7_07	429 422.6	6 394 327.1	269 903.0	868 297.5
25/02/2017	10:47:31	TR7	160868_TR7_08	429 422.6	6 394 317.0	269 902.8	868 287.4
25/02/2017	10:48:23	TR7	160868_TR7_09	429 422.2	6 394 284.1	269 901.9	868 254.5
25/02/2017	10:48:32	TR7	160868_TR7_10	429 424.1	6 394 279.7	269 903.8	868 250.0
25/02/2017	10:48:43	TR7	160868_TR7_11	429 427.7	6 394 274.5	269 907.3	868 244.8
25/02/2017	10:48:52	TR7	160868_TR7_12	429 429.2	6 394 269.8	269 908.7	868 240.1
25/02/2017	10:49:17	TR7	160868_TR7_13	429 435.4	6 394 249.2	269 914.6	868 219.4
25/02/2017	10:49:29	TR7	160868_TR7_14	429 436.4	6 394 237.6	269 915.5	868 207.7
25/02/2017	10:49:44	TR7	160868_TR7_15	429 434.4	6 394 223.4	269 913.2	868 193.6
25/02/2017	10:50:06	TR7	160868_TR7_16	429 431.7	6 394 203.7	269 910.3	868 173.9
25/02/2017	10:50:23	TR7	160868_TR7_17	429 429.6	6 394 188.9	269 907.9	868 159.1
25/02/2017	10:50:35	TR7	160868_TR7_18	429 428.6	6 394 180.6	269 906.8	868 150.9
25/02/2017	10:50:51	TR7	160868_TR7_19	429 425.9	6 394 169.2	269 903.9	868 139.5
25/02/2017	10:51:05	TR7	160868_TR7_20	429 426.1	6 394 160.5	269 904.0	868 130.8
25/02/2017	10:51:16	TR7	160868_TR7_21	429 427.0	6 394 154.9	269 904.8	868 125.2
25/02/2017	11:19:20	TR8	160868_TR8_01	429 462.9	6 394 283.7	269 942.6	868 253.5
25/02/2017	11:19:36	TR8	160868_TR8_02	429 464.9	6 394 292.3	269 944.8	868 262.0
25/02/2017	11:19:58	TR8	160868_TR8_03	429 462.0	6 394 301.9	269 942.0	868 271.7
25/02/2017	11:20:12	TR8	160868_TR8_04	429 457.8	6 394 311.8	269 938.0	868 281.6

Date	Time [UTC]	Transect	Still No.	WGS84 UTM Z30N		British National Grid OSGB36	
				Easting [m]	Northing [m]	Easting [m]	Northing [m]
25/02/2017	11:20:32	TR8	160868_TR8_05	429 446.0	6 394 320.5	269 926.3	868 290.5
25/02/2017	11:20:45	TR8	160868_TR8_06	429 435.7	6 394 318.5	269 916.0	868 288.7
25/02/2017	11:20:57	TR8	160868_TR8_07	429 428.0	6 394 315.1	269 908.2	868 285.4
25/02/2017	11:21:17	TR8	160868_TR8_08	429 412.7	6 394 305.8	269 892.8	868 276.3
25/02/2017	11:21:29	TR8	160868_TR8_09	429 402.5	6 394 300.8	269 882.5	868 271.4
25/02/2017	11:21:44	TR8	160868_TR8_10	429 391.7	6 394 295.6	269 871.6	868 266.4
25/02/2017	11:21:55	TR8	160868_TR8_11	429 383.3	6 394 290.6	269 863.1	868 261.5
25/02/2017	11:22:09	TR8	160868_TR8_12	429 374.1	6 394 287.6	269 853.9	868 258.7
25/02/2017	11:22:22	TR8	160868_TR8_13	429 365.6	6 394 284.9	269 845.4	868 256.1
25/02/2017	11:22:35	TR8	160868_TR8_14	429 356.4	6 394 281.6	269 836.1	868 252.9
25/02/2017	11:22:49	TR8	160868_TR8_15	429 343.1	6 394 279.7	269 822.8	868 251.2
25/02/2017	11:23:02	TR8	160868_TR8_16	429 329.2	6 394 277.5	269 808.8	868 249.2
25/02/2017	11:03:05	TR9	160868_TR9_01	429 458.6	6 394 388.5	269 939.9	868 358.3
25/02/2017	11:03:57	TR9	160868_TR9_02	429 435.3	6 394 364.2	269 916.2	868 334.4
25/02/2017	11:04:12	TR9	160868_TR9_03	429 423.5	6 394 362.7	269 904.4	868 333.0
25/02/2017	11:04:27	TR9	160868_TR9_04	429 412.9	6 394 360.7	269 893.8	868 331.2
25/02/2017	11:04:54	TR9	160868_TR9_05	429 389.6	6 394 364.2	269 870.5	868 335.0
25/02/2017	11:06:13	TR9	160868_TR9_06	429 364.0	6 394 345.1	269 844.6	868 316.3
25/02/2017	11:06:31	TR9	160868_TR9_07	429 365.3	6 394 343.8	269 845.9	868 315.0
25/02/2017	11:06:38	TR9	160868_TR9_08	429 365.2	6 394 342.5	269 845.8	868 313.7
25/02/2017	11:06:50	TR9	160868_TR9_09	429 361.3	6 394 338.9	269 841.8	868 310.2
25/02/2017	11:07:01	TR9	160868_TR9_10	429 356.4	6 394 337.8	269 836.9	868 309.1
25/02/2017	11:07:11	TR9	160868_TR9_11	429 349.7	6 394 335.8	269 830.2	868 307.2
25/02/2017	11:07:23	TR9	160868_TR9_12	429 341.9	6 394 333.4	269 822.4	868 304.9
25/02/2017	11:07:37	TR9	160868_TR9_13	429 330.7	6 394 331.5	269 811.1	868 303.2

Note:
NR = Not Recorded

C.3 MACROFAUNA GRAB LOG (DAY GRAB)

Date	Time [UTC]	Station	WGS84 UTM Z30N		British National Grid OSGB36		Water Depth [m BSL]	Sample	Sample Depth [cm]	Sediment Type	Sediment Description	Notes/Conspicuous Fauna
			Easting [m]	Northing [m]	Easting [m]	Northing [m]						
24/02/17	12:26	ST01	429 490.2	6 394 184.7	-	-	7.1	NS	-	-	-	Grab did not trigger
24/02/17	12:28	ST01	429 486.4	6 394 175.5	-	-	7.1	NS	-	-	-	Rock stuck in grab
24/02/17	12:33	ST01	429 493.5	6 394 182.3	269 971.7	868 151.6	7.1	FA	5.0	gmS	Gravelly muddy sand with shell fragments and pebbles. Anoxic odour	Kelp Accepted small sample due to previous failures
24/02/17	11:43	ST02	429 453.4	6 394 244.2	269 932.6	868 214.1	5.7	FA	7.0	(g)mS	Gravelly muddy sand with shell fragments and occasional gravel. Anoxic odour	Coralline algae, kelp, *Asterias rubens*
24/02/17	13:17	ST03	429 367.5	6 394 182.9	269 845.7	868 154.1	8.0	FA	7.5	gmS	Gravelly muddy sand with shell fragments and pebbles. Anoxic odour	Brittlestars
24/02/17	13:33	ST04	429 293.5	6 394 210.9	269 772.2	868 183.2	5.7	FA	8.0	gmS	Gravelly muddy sand with shell fragments and pebbles. Anoxic odour	Juvenile *Mytilus edulis*, ascidians
24/02/17	13:44	ST05	429 215.2	6 394 174.4	269 693.3	868 147.8	8.3	FA	7.0	gmS	Gravelly muddy sand with shell fragments and pebbles. Anoxic odour	Ascidians, brittlestars, polychaete tubes
24/02/17	12:59	ST06	429 379.6	6 394 219.1	269 858.4	868 190.1	5.2	FA	9.0	mS	Gravelly muddy sand with shell fragments. Anoxic odour	Brittlestars, hermit crabs, kelp
24/02/17	11:18	ST07	429 439.6	6 394 300.4	-	-	5.4	NS	-	-	-	Rock stuck in jaws
24/02/17	11:22	ST07	429 449.0	6 394 285.2	-	-	5.4	NS	-	-	-	Kelp stuck in jaws
24/02/17	11:27	ST07	429 443.7	6 394 291.8	269 923.6	868 261.8	5.4	FA	4.0	gmS	Gravelly muddy sand with gravel, shell fragments and oyster shells. Anoxic odour	Kelp, bryozoans, *Spirobranchus* Accepted small sample due to previous failures.
24/02/17	10:56	ST08	429 346.3	6 394 346.3	269 827.0	868 317.8	4.5	FA	12.0	mS	Gravelly muddy sand with shell fragments, *Mytilus edulis* shells, and occasional pebbles. Anoxic odour	Ascidians, bryozoans, algae/hydroid, coralline algae
24/02/17	10:39	ST09	429 410.6	6 394 402.3	269 892.1	868 372.8	3.7	FA	8.5	mS	Gravelly muddy sand with shell fragments and *Mytilus edulis* shells. Anoxic odour	Ascidians, algae/hydroid

Notes:
BSL = Below sea level NS = No sample FA = Sample for faunal analysis

C.4 MACROFAUNA GRAB PHOTOS

ST01

ST02


160868
FGSL ATKINS INVERGORDON
Station: ST03
Site Survey
Sample: FA
1 2 3 4 5 6 7 8 9 10 cm

ST03


160868
FGSL ATKINS INVERGORDON
Station: ST04
Site Survey
Sample: FA
1 2 3 4 5 6 7 8 9 10 cm

ST04


160868
FGSL ATKINS INVERGORDON
Station: ST05
Site Survey
Sample: FA
1 2 3 4 5 6 7 8 9 10 cm
24/02/2017

ST05


Job Number
Job Name
Site
Sample
160868
FGSL Atkins Invergordon
ST06

ST06


160868
FGSL ATKINS INVERGORDON
Station: ST07
Site Survey
Sample: FA
1 2 3 4 5 6 7 8 9 10 cm

ST07


160868
FGSL ATKINS INVERGORDON
Station: ST08
Site Survey
Sample: FA
1 2 3 4 5 6 7 8 9 10 cm

ST08


160868
FGSL ATKINS INVERGORDON
Station: ST09
Site Survey
Sample: FA
1 2 3 4 5 6 7 8 9 10 cm

ST09

D. SAMPLES ANALYSIS

D.1 GRAB INFAUNAL ABUNDANCE RAW DATA

Species	Aphia ID	Station								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
Cerianthus lloydii	283798				1		1			
PLATYHELMINTHES	793	3	1		4	2	8		8	3
NEMERTEA	152391	60	64	12	17	11	15	7	7	11
Tubulanus polymorphus	122637			3	4	5	2		2	
Cerebratulus	122348	2	1	1	2	3	1		1	
NEMATODA	799	966	295	368	229	28	271	143	339	138
Priapulus caudatus	101160		1	1	1					1
Pedicellina	111796		P							
SIPUNCULA juv	1268		1			1	1			
Golfingia vulgaris	424332			1						
Phascolion strombus	266489					1				
Polynoidae	939	2	1			1	2		4	2
Polynoidae juv	939	3	6	6	10	3	5		5	1
Harmothoe antilopes	130754		1						2	1
Lepidonotus squamatus	130801				1					
Pholoe inornata	130601	18	62	60	220	112	184	5	179	175
Pholoe baltica	130599	4	9	29	30	20	37		2	2
Sthenelais boa	131074	1			10	3	1	1	1	1
Eteone longa agg	130616	17	4	20	20	15	17	7	10	10
Hypereteone foliosa	152250	1		4	4	2	1			1
Pseudomystides limbata	130683			1						
Phyllodoce groenlandica	334506			1						
Phyllodoce mucosa	334512	288	1	2	3	2	6	4	5	1
Eulalia aurea	130623				1	1				
Eulalia bilineata	130624				1					
Eulalia ornata	130632				2					
Eumida spp indet	129446				5					3
Eumida bahusiensis	130641		3	3	3	9	3	2	4	1
Eumida sanguinea	130644	7	1					1		
Nereiphylla lutea	130656								2	
Paranaitis kosteriensis	130662	2								
Glycera lapidum	130123		2					5		
Glycera tridactyla	130130	1	2	3				5	1	5
Goniada maculata	130140									1
Sphaerodoropsis minuta	131096								1	
Sphaerodorum gracilis	131100						1		1	
Psamathe fusca	152249	12	19	25	45	12	54	8	53	12
Oxydromus flexuosus	710680				3	1			3	4
Microphthalmus	129313			1				1		
Syllis	129680			1					1	
Syllis cornuta	157583			1						
Eusyllis blomstrandi	131290	7		4			3			
Streptosyllis websteri	131402		1	1						
Parexogone hebes	757970		1	1	2	4			3	1
Exogone naidina	327985	1	2	2	1		1	2	6	29

Species	Aphia ID	Station								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
Prosphaerosyllsi	195974			2	9				2	8
Sphaerosyllis	129677	6	12	15	18	36	12	5	67	32
Autolytinae	152231	1								
Alitta virens	234851						1			
Eunereis longissima	130375									1
Platynereis dumerilii	130417	2			1		1		1	
Nephtyidae juv	956	2		4	40	10	15		11	11
Nephtys hombergii	130359					1	2			4
Nephtys kersivalensis	130363			1	3	4		1		6
Paramphinome jeffreysii	129837						2			
Lumbrineris nr cingulata	129337			3	3	16		2		
Ophryotrocha	129266	28			2			1	1	
Protodorvillea kefersteini	130041	14	6	4	1		2	20	9	
Scoloplos armiger	130537	78	56	83	41	57	77	53	127	199
Aricidea minuta	130564			11	6	6	7	2		
Aricidea catherinae	130554				1			1	3	8
Levinsenia gracilis	130578			1	1	1				
Paradoneis lyra	130585			4	1	1	1`			
Apistobranchus tullbergi	129851	1		10	3	28	8	1		7
Aonides paucibranchiata	131107		1							
Laonice bahusiensis	131127		1							
Dipolydora coeca agg	131117		2	1		5	1		5	1
Dipolydora caulleryi	131116			1						
Dipolydora quadrilobata	131121				2	3				
Prionospio fallax	131157			2						
Aurospio banyulensis	146532			2						
Pseudopolydora pulchra	131169					1				
Spio armata agg	131180		1	5	1	4	1			
Spiophanes bombyx	131187			1						
Caulleriella alata	129943	1		1						
Chaetozone setosa	129955		3	3		3	2	8		
Chaetozone zetlandica	336485			2	1					
Cirratulus cirratus	129959	5			10	12			4	8
Cirriformia tentaculata	129964	8	3	5	3	2	3		3	
Dodecaceria	129246				1			1	1	
Aphelochaeta	129240	1	1	1	2		3			
Tharyx killariensis	152269			1		4	1			
Diplocirrus glaucus	130100				3	2	2			
Pherusa plumosa	130113			2					1	
Capitella	129211	64	3	18	29	1	35	13		9
Mediomastus fragilis	129892	5		33	33	17	34	1	32	17
Notomastus	129220	2	1	18	19	25	21	1	8	10
Peresiella clymenoides	129906				1					
Arenicolidae juv	922	1	2				2		4	4
Clymenura	129346			1		6				
Euclymene oerstedi	157376			2		2				

Species	Aphia ID	Station								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
Ophelina acuminata	130500		1	3	1	6	1			
Scalibregma inflatum	130980				2					
Scalibregma celticum	130979			1						
Owenia	129427					2				
Galathowenia oculata	146950	1	21	33	26	111	24	6	13	8
Amphictene auricoma	152448				1	1				
Lagis koreni	152367			2	5	1	1		2	
Sabellaria spinulosa	130867		1	1	5	20	1			
Ampharete lindstroemi agg	129781			5	14	21	9		2	
Amphicteis gunneri	129784			5	2	1	1		1	2
Terebellides stroemii	131573	1	1	4	8	5	2	1	22	18
Amphitritides gracilis	131480	1			1	1			1	
Pista mediterranea	131519			2	1					
Polycirrus	129710	1	2	5	2	3	3	1	5	2
Branchiomma bombyx	130878	1		1						
Parasabella langerhansi	530926					1	1			
Serpulidae	988	8			4	5	9			4
Hydroides norvegica	131009		1				1			
Spirobranchus lamarcki	560033	87	103	6	12	48	45	48	32	77
Spirobranchus triqueter	555935	1	1			2				1
Spirorbinae	989	2	4					2		
Tubificoides amplivasatus	137570	1	1	12	18	3	12	2	32	73
Tubificoides benedii	137571	4		4	3		5	3		12
Callipallene brevirostris	134643		1			2				
Anoplodactylus petiolatus	134723				2					
CIRRIPEDIA	1082		P					P	P	P
OSTRACODA	1078	14		11	56	14	13		3	
Nebalia bipes	147032	1								
Perioculodes longimanus	102915	1	3	10	3	7	4	2		1
Synchelidium maculatum	102928				3		1			
Amphilochidae	101365								2	
Apolochus neapolitanus	236495						1			
Gitana sarsi	101977	1	2	1	2					
Leucothoe lilljeborgi/incisa	101580				1					
Urothoe elegans	103228			4		8				
Harpinia antennaria	102960					10	1			
Harpinia crenulata	102963			1	3	2				
Phoxocephalus holbolli	102989		1							
Orchomene nanus	102673	4	1	1			2	1		
Iphimedia perplexa	102348	1								
Dexamine spinosa	102135				1				1	3
Dexamine thea	102136	5	6	14	59	2	42	6	52	30
Ampelisca juv	101445			8	1	1	2		1	1
Ampelisca brevicornis	101891					1				1
Ampelisca diadema	101896	1		2	7	3	1			
Ampelisca tenuicornis	101930			1	1	1				

Species	Aphia ID	Station								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
Ampelisca typica	101933			2		3	1			
Cheirocratus (female)	101669									5
Cheirocratus intermedius	102795	1				1				5
Gammaropsis palmata	102369		1	4	1	1	2			
Gammaropsis cornuta	148545		1	1	2	4	3		1	1
Photis longicaudata	102383			4	3	1				
Parajassa pelagica	102440									1
Aoridae (female)	101368	2		1	1	2			1	
Corophiidae	101376	1	19	20	121	29	100	4	88	34
Crassicorophium bonellii	237004		2	1	5		14	1	2	1
Crassicorophium crassicorne	397383	2	8	3	3		14	8	1	1
Monocorophium sextonae	148603		1			3	9			6
Pariambus typicus	101857			7	2	7	2			
Phtisica marina	101864		1	3	1				2	2
Gnathia juv	118437			1	2		1			
Pleurogonium rubicundum	118801	1			1	1				
Idotea	118454	1								
Pseudoparatanais batei	136457				1					
Tanaopsis graciloides	136458		7	82	86	131	18	6	176	29
Eudorella truncatula	110535				9	2				
Lamprops fasciatus	110516					1				
Diastylis laevis	110481			1	3		4			1
Paguridae juv	106738		1		1		2			1
Pisidia longicornis	107188	1			1		1			
Atelecyclus rotundatus juv	107273				1					
Portunidae sp juv	106763				1					
Carcinus maenas juv	107381							1	1	
CAUDOFOVEATA juv	151365				1					
POLYPLACOPHORA juv	55					1		1		
Leptochiton asellus	140199		20		1		1	1	7	19
GASTROPODA indet	101								1	
Testudinalia testudinalis	234208					1		1		4
Tectura virginea	153552									2
Trochidae spp juv	443	5	3	1	2	2	6		5	
Gibbula cineraria	141782					2	1	1	1	9
Littorina obtusata	140263	1								
Hydrobiidae	120	5	2	2	2		1			
Rissoa parva	141365	30	3	38			2			
Onoba semicostata	141320		2	11	4	1			7	8
Odostomia	138413	8	2		1	4	1			1
Turridae	152									2
Philine	138339		1	4	6	7	5	2	2	5
Diaphana minuta	139557				1		1			
Retusa obtusa	141134			2	1	1	1		1	
NUDIBRANCHIA	1762	1				1		1		
PELECYPODA	151265								1	

Species	Aphia ID	Station								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
Nuculidae juv	204	1		1		9	7	1	1	10
Nucula nucleus	140590			4	10	6	4	1	5	6
Mytilidae juv	211	98	76	103	73	163	148	30	129	50
Mytilus edulis	140480				4		6		4	
Musculus subpictus	506128	1		3	1	13	1			3
Mimachlamys varia juv	236719						1			
Anomiidae juv	214	7	33	1	34	62	40		5	30
Lucinoma borealis juv	140283			1	4	2	1	1	4	13
Lucinoma borealis	140283								1	
Thyasira flexuosa	141662				2		4		3	
Kurtiella bidentata	345281	3	10	2	14	4	6	4	4	12
Cardiidae juv	229				1	2	2			1
Parvicardium pinnulatum	181343					1				
Parvicardium scabrum	139012			1	1	2	2	1		1
Mactridae juv	230						1	1		1
Phaxas pellucidus	140737					1				
TELLINACEA juv	246044							1		
Tellina fabula	141587	14		6	9	11	3		4	12
Gari juv	138388			1						
Gari fervensis	140870					1				
Abra juv	138474	28	3	54	155	71	81	4	60	41
Abra alba	141433	24	1	35	31	48	39	3	20	11
Veneroidea juv	14638	1		1	1	1				
Veneridae juv	243					1				
Polititapes/Venerupis juv	246149/ 138647	4	7	17	22	23	28	6	17	14
Mya juv	138211	1	8	8	7	27	1	2	1	5
Mya truncata	140431					1				
Corbula gibba	139410			1	3	9				
Hiatella arctica	140103	4	1	1		3	3		1	
Thraciacea juv	382318			1		7	1			3
Thracia villosiuscula	141651						1			
Asterias rubens	123776		1							
OPHIUROIDEA juv	123084	5	2	1	8	7	8	1	72	26
Amphiura filiformis	125080			1						
Amphipholis squamata	140103					2	3	1	3	4
Ophiura albida	124913		1	8	1	6	3		1	1
ECHINOIDEA juv	123082					2				
Cucumariidae juv	123187				1					
ASCIDIACEA juv	1839	18	16	3	11	2	10		12	
Ascidiella scabra	103719				1			2		1
Dendrodoa grossularia	103882	20	36	1	7	71	52	32	191	327
Chaetognatha	2081							1		1

Note:
APHIA ID = World Register of Marine Species (WoRMS) taxon code (WoRMS Editorial Board, 2017)
juv = Juvenile

D.2 GRAB EPIFAUNAL ABUNDANCE RAW DATA

Species	Aphia ID	Station								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
Sycon ciliatum	132251					P				
Campanulariidae	1606		P	P				P		
ACTINIARIA	1360	P	P		P	P	P	P	P	P
Escharoides coccinea	111498		P	P					P	
Schizoporella	110975	P	P	P			P	P		P
Fenestrulina malusii	111418	P	P						P	
Celleporella hyalina	111397	P	P			P	P	P	P	
Membranipora membranacea	111411						P			
Conopeum reticulum	111351	P	P	P	P	P			P	P
Electra pilosa	111355	P	P				P	P		
Amphiblestrum auritum	111186			P	P	P				
ASCIDIACEA (colonial)	1839	P	P						P	

Note:
APHIA ID = World Register of Marine Species (WoRMS) taxon code (WoRMS Editorial Board, 2017)
P = Present

D.3 GRAB JUVENILES ABUNDANCE RAW DATA

Species	Aphia ID	Station								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
SIPUNCULA juv	1268		1			1	1			
Polynoidae juv	939	3	6	6	10	3	5		5	1
Nephtyidae juv	956	2		4	40	10	15		11	11
Arenicolidae juv	922	1	2				2		4	4
Ampelisca juv	101445			8	1	1	2		1	1
Gnathia juv	118437			1	2		1			
Paguridae juv	106738		1		1		2			1
Atelecyclus rotundatus juv	107273				1					
Portunidae juv	106763				1					
Carcinus maenas juv	107381							1	1	
CAUDOFOVEATA juv	151365				1					
POLYPLACOPHORA juv	55					1		1		
Trochidae juv	443	5	3	1	2	2	6		5	
Nuculidae juv	204	1		1		9	7	1	1	10
Mytilidae juv	211	98	76	103	73	163	148	30	129	50
Mimachlamys varia juv	236719						1			
Anomiidae juv	214	7	33	1	34	62	40		5	30
Lucinoma borealis juv	140283			1	4	2	1	1	4	13
Cardiidae juv	229				1	2	2			1
Mactridae juv	230						1	1		1
TELLINACEA juv	246044							1		
Gari juv	138388			1						
Abra juv	138474	28	3	54	155	71	81	4	60	41
Veneroidea juv	14638	1		1	1	1				
Veneridae juv	243					1				
Polititapes/Venerupis juv	246149/ 138647	4	7	17	22	23	28	6	17	14
Mya juv	138211	1	8	8	7	27	1	2	1	5
Thraciacea juv	382318			1		7	1			3
OPHIUROIDEA juv	123084	5	2	1	8	7	8	1	72	26
ECHINOIDEA juv	123082					2				
Cucumariidae juv	123187				1					
ASCIDIACEA juv	1839	18	16	3	11	2	10		12	

Note:
APHIA ID = World Register of Marine Species (WoRMS) taxon code (WoRMS Editorial Board, 2017)
juv = Juvenile

D.4 PRIMER V6 READY DATA

Species									
	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
NEMATODA	966	295	368	229	28	271	143	339	138
Pholoe inornata	18	62	60	220	112	184	5	179	175
Scoloplos (*Scoloplos*) *armiger*	78	56	83	41	57	77	53	127	199
Dendrodoa grossularia	20	36	1	7	71	52	32	191	327
Tanaopsis graciloides	0	7	82	86	131	18	6	176	29
Spirobranchus lamarcki	87	103	6	12	48	45	48	32	77
Corophiidae	1	19	20	121	29	100	4	88	34
Phyllodoce mucosa	288	1	2	3	2	6	4	5	1
Galathowenia oculata	1	21	33	26	111	24	6	13	8
Psamathe fusca	12	19	25	45	12	54	8	53	12
Dexamine thea	5	6	14	59	2	42	6	52	30
Abra alba	24	1	35	31	48	39	3	20	11
NEMERTEA	60	64	12	17	11	15	7	7	11
Sphaerosyllis	6	12	15	18	36	12	5	67	32
Capitella	64	3	18	29	1	35	13	0	9
Mediomastus fragilis	5	0	33	33	17	34	1	32	17
Tubificoides amplivasatus	1	1	12	18	3	12	2	32	73
Pholoe baltica	4	9	29	30	20	37	0	2	2
Eteone longa agg	17	4	20	20	15	17	7	10	10
OSTRACODA	14	0	11	56	14	13	0	3	0
Notomastus	2	1	18	19	25	21	1	8	10
Rissoa parva	30	3	38	0	0	2	0	0	0
Terebellides stroemii	1	1	4	8	5	2	1	22	18
Kurtiella bidentata	3	10	2	14	4	6	4	4	12
Fabulina fabula	14	0	6	9	11	3	0	4	12
Apistobranchus tullbergi	1	0	10	3	28	8	1	0	7
Protodorvillea kefersteini	14	6	4	1	0	2	20	9	0
Ampharete lindstroemi agg	0	0	5	14	21	9	0	2	0
Leptochiton asellus	0	20	0	1	0	1	1	7	19
Exogone naidina	1	2	2	1	0	1	2	6	29
Crassicorophium crassicorne	2	8	3	3	0	14	8	1	1
Cirratulus cirratus	5	0	0	10	12	0	0	4	8
Nucula nucleus	0	0	4	10	6	4	1	5	6
Onoba semicostata	0	2	11	4	1	0	0	7	8
Ophryotrocha	28	0	0	2	0	0	1	1	0
Aricidea (*Aricidea*) *minuta*	0	0	11	6	6	7	2	0	0
Philine	0	1	4	6	7	5	2	2	5
Tubificoides benedii	4	0	4	3	0	5	3	0	12
Perioculodes longimanus	1	3	10	3	7	4	2	0	1
Serpulidae	8	0	0	4	5	9	0	0	4

Species									
	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
PLATYHELMINTHES	3	1	0	4	2	8	0	8	3
Eumida bahusiensis	0	3	3	3	9	3	2	4	1
Sabellaria spinulosa	0	1	1	5	20	1	0	0	0
Cirriformia tentaculata	8	3	5	3	2	3	0	3	0
Crassicorophium bonellii	0	2	1	5	0	14	1	2	1
Lumbrineris nr *cingulata*	0	0	3	3	16	0	2	0	0
Polycirrus	1	2	5	2	3	3	1	5	2
Musculus subpictus	1	0	3	1	13	1	0	0	3
Prosphaerosyllis	0	0	2	9	0	0	0	2	8
Ophiura albida	0	1	8	1	6	3	0	1	1
Chaetozone setosa	0	3	3	0	3	2	8	0	0
Monocorophium sextonae	0	1	0	0	3	9	0	0	6
Sthenelais boa	1	0	0	10	3	1	1	1	1
Pariambus typicus	0	0	7	2	7	2	0	0	0
Glycera tridactyla	1	2	3	0	0	0	5	1	5
Odostomia	8	2	0	1	4	1	0	0	1
Tubulanus polymorphus	0	0	3	4	5	2	0	2	0
Nephtys kersivalensis	0	0	1	3	4	0	1	0	6
Dipolydora coeca agg	0	2	1	0	5	1	0	5	1
Eusyllis blomstrandi	7	0	4	0	0	3	0	0	0
Ampelisca diadema	1	0	2	7	3	1	0	0	0
Gibbula cineraria	0	0	0	0	2	1	1	1	9
Mytilus edulis	0	0	0	4	0	6	0	4	0
Hypereteone foliosa	1	0	4	4	2	1	0	0	1
Aricidea (Acmira) catherinae	0	0	0	1	0	0	1	3	8
Megamphopus cornutus	0	1	1	2	4	3	0	1	1
Corbula gibba	0	0	1	3	9	0	0	0	0
Hiatella arctica	4	1	1	0	3	3	0	1	0
Amphipholis squamata	0	0	0	0	2	3	1	3	4
Polynoidae	2	1	0	0	1	2	0	4	2
Parexogone hebes	0	1	1	2	4	0	0	3	1
Spio armata agg	0	1	5	1	4	1	0	0	0
Ophelina acuminata	0	1	3	1	6	1	0	0	0
Amphicteis gunneri	0	0	5	2	1	1	0	1	2
Urothoe elegans	0	0	4	0	8	0	0	0	0
Hydrobiidae	5	2	2	2	0	1	0	0	0
Cerebratulus	2	1	1	2	3	1	0	1	0
Oxydromus flexuosus	0	0	0	3	1	0	0	3	4
Lagis koreni	0	0	2	5	1	1	0	2	0
Harpinia antennaria	0	0	0	0	10	1	0	0	0
Eudorella truncatula	0	0	0	9	2	0	0	0	0
Eumida sanguinea	7	1	0	0	0	0	1	0	0

Species									
	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
Orchomenella nana	4	1	1	0	0	2	1	0	0
Gammaropsis palmata	0	1	4	1	1	2	0	0	0
Phtisica marina	0	1	3	1	0	0	0	2	2
Diastylis laevis	0	0	1	3	0	4	0	0	1
Thyasira flexuosa	0	0	0	2	0	4	0	3	0
Eumida	0	0	0	5	0	0	0	0	3
Aphelochaeta	1	1	1	2	0	3	0	0	0
Spirorbinae	2	4	0	0	0	0	2	0	0
Photis longicaudata	0	0	4	3	1	0	0	0	0
Parvicardium scabrum	0	0	1	1	2	2	1	0	1
Glycera lapidum	0	2	0	0	0	0	5	0	0
Nephtys hombergii	0	0	0	0	1	2	0	0	4
Diplocirrus glaucus	0	0	0	3	2	2	0	0	0
Clymenura	0	0	1	0	6	0	0	0	0
Cheirocratus intermedius	1	0	0	0	1	0	0	0	5
Aoridae	2	0	1	1	2	0	0	1	0
Paradoneis lyra	0	0	4	1	1	1	0	0	0
Tharyx killariensis	0	0	1	0	4	1	0	0	0
Gitana sarsi	1	2	1	2	0	0	0	0	0
Harpinia crenulata	0	0	1	3	2	0	0	0	0
Ampelisca typica	0	0	2	0	3	1	0	0	0
Testudinalia testudinalis	0	0	0	0	1	0	1	0	4
Retusa obtusa	0	0	2	1	1	1	0	1	0
Platynereis dumerilii	2	0	0	1	0	1	0	1	0
Dipolydora quadrilobata	0	0	0	2	3	0	0	0	0
Spirobranchus triqueter	1	1	0	0	2	0	0	0	1
Dexamine spinosa	0	0	0	1	0	0	0	1	3
Cheirocratus	0	0	0	0	0	0	0	0	5
Priapulus caudatus	0	1	1	1	0	0	0	0	1
Harmothoe antilopes	0	1	0	0	0	0	0	2	1
Euclymene oerstedii	0	0	2	0	2	0	0	0	0
Amphitritides gracilis	1	0	0	1	1	0	0	1	0
Synchelidium maculatum	0	0	0	3	0	1	0	0	0
Ascidiella scabra	0	0	0	1	0	0	2	0	1
Levinsenia gracilis	0	0	1	1	1	0	0	0	0
Chaetozone zetlandica	0	0	2	1	0	0	0	0	0
Dodecaceria	0	0	0	1	0	0	1	1	0
Pherusa plumosa	0	0	2	0	0	0	0	1	0
Pista mediterranea	0	0	2	1	0	0	0	0	0
Callipallene brevirostris	0	1	0	0	2	0	0	0	0
Ampelisca tenuicornis	0	0	1	1	1	0	0	0	0

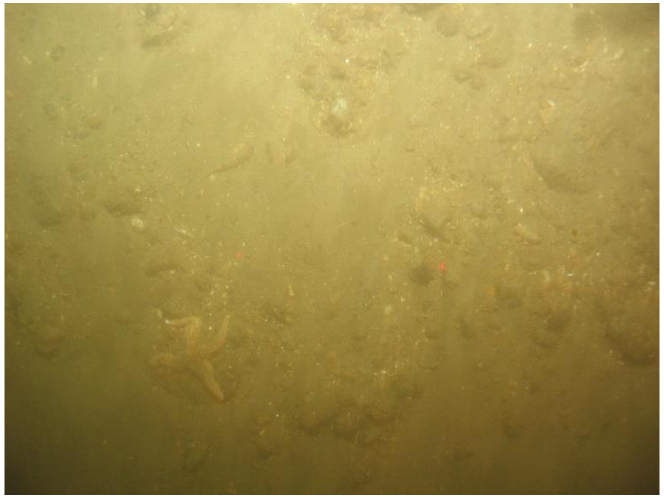
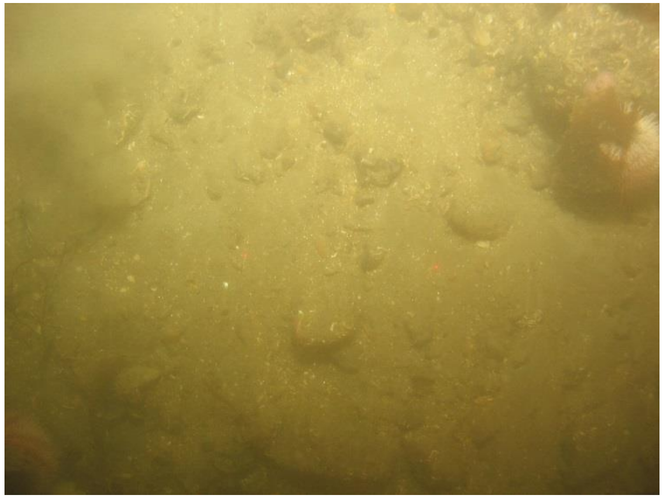
Species									
	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
Pleurogonium rubicundum	1	0	0	1	1	0	0	0	0
Pisidia longicornis	1	0	0	1	0	1	0	0	0
NUDIBRANCHIA	1	0	0	0	1	0	1	0	0
Cerianthus lloydii	0	0	0	1	0	1	0	0	0
Eulalia aurea	0	0	0	1	1	0	0	0	0
Eulalia ornata	0	0	0	2	0	0	0	0	0
Nereiphylla lutea	0	0	0	0	0	0	0	2	0
Paranaitis kosteriensis	2	0	0	0	0	0	0	0	0
Sphaerodorum gracilis	0	0	0	0	0	1	0	1	0
Microphthalmus	0	0	1	0	0	0	1	0	0
Syllis	0	0	1	0	0	0	0	1	0
Streptosyllis websteri	0	1	1	0	0	0	0	0	0
Paramphinome jeffreysii	0	0	0	0	0	2	0	0	0
Prionospio fallax	0	0	2	0	0	0	0	0	0
Aurospio banyulensis	0	0	2	0	0	0	0	0	0
Caulleriella alata	1	0	1	0	0	0	0	0	0
Scalibregma inflatum	0	0	0	2	0	0	0	0	0
Owenia	0	0	0	0	2	0	0	0	0
Amphictene auricoma	0	0	0	1	1	0	0	0	0
Branchiomma bombyx	1	0	1	0	0	0	0	0	0
Parasabella langerhansi	0	0	0	0	1	1	0	0	0
Hydroides norvegica	0	1	0	0	0	1	0	0	0
Anoplodactylus petiolatus	0	0	0	2	0	0	0	0	0
Amphilocidae	0	0	0	0	0	0	0	2	0
Ampelisca brevicornis	0	0	0	0	1	0	0	0	1
Tectura virginea	0	0	0	0	0	0	0	0	2
Turridae	0	0	0	0	0	0	0	0	2
Diaphana minuta	0	0	0	1	0	1	0	0	0
Chaetognatha	0	0	0	0	0	0	1	0	1
Golfingia (Golfingia) vulgaris	0	0	1	0	0	0	0	0	0
Phascolion (Phascolion) strombus	0	0	0	0	1	0	0	0	0
Lepidonotus squamatus	0	0	0	1	0	0	0	0	0
Pseudomystides limbata	0	0	1	0	0	0	0	0	0
Phyllodoce groenlandica	0	0	1	0	0	0	0	0	0
Eulalia bilineata	0	0	0	1	0	0	0	0	0
Goniada maculata	0	0	0	0	0	0	0	0	1
Sphaerodoridium minutum	0	0	0	0	0	0	0	1	0
Syllis cornuta	0	0	1	0	0	0	0	0	0

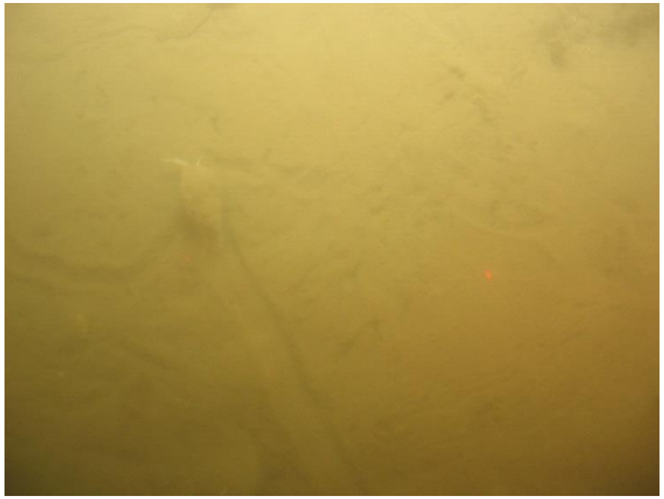
Species									
	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09
Autolytinae	1	0	0	0	0	0	0	0	0
Alitta virens	0	0	0	0	0	1	0	0	0
Eunereis longissima	0	0	0	0	0	0	0	0	1
Aonides paucibranchiata	0	1	0	0	0	0	0	0	0
Laonice bahusiensis	0	1	0	0	0	0	0	0	0
Dipolydora caulleryi	0	0	1	0	0	0	0	0	0
Pseudopolydora pulchra	0	0	0	0	1	0	0	0	0
Spiophanes bombyx	0	0	1	0	0	0	0	0	0
Peresiella clymenoides	0	0	0	1	0	0	0	0	0
Scalibregma celticum	0	0	1	0	0	0	0	0	0
Nebalia bipes	1	0	0	0	0	0	0	0	0
Apolochus neapolitanus	0	0	0	0	0	1	0	0	0
Leucothoe	0	0	0	1	0	0	0	0	0
Phoxocephalus holbolli	0	1	0	0	0	0	0	0	0
Iphimedia perplexa	1	0	0	0	0	0	0	0	0
Parajassa pelagica	0	0	0	0	0	0	0	0	1
Idotea	1	0	0	0	0	0	0	0	0
Pseudoparatanais batei	0	0	0	1	0	0	0	0	0
Lamprops fasciatus	0	0	0	0	1	0	0	0	0
GASTROPODA	0	0	0	0	0	0	0	1	0
Littorina obtusata	1	0	0	0	0	0	0	0	0
BIVALVIA	0	0	0	0	0	0	0	1	0
Lucinoma borealis	0	0	0	0	0	0	0	1	0
Parvicardium pinnulatum	0	0	0	0	1	0	0	0	0
Phaxas pellucidus	0	0	0	0	1	0	0	0	0
Gari fervensis	0	0	0	0	1	0	0	0	0
Mya truncata	0	0	0	0	1	0	0	0	0
Thracia villosiuscula	0	0	0	0	0	1	0	0	0
Asterias rubens	0	1	0	0	0	0	0	0	0
Amphiura filiformis	0	0	1	0	0	0	0	0	0
sim5 4th	c	c	b	b	b	b	c	a	a

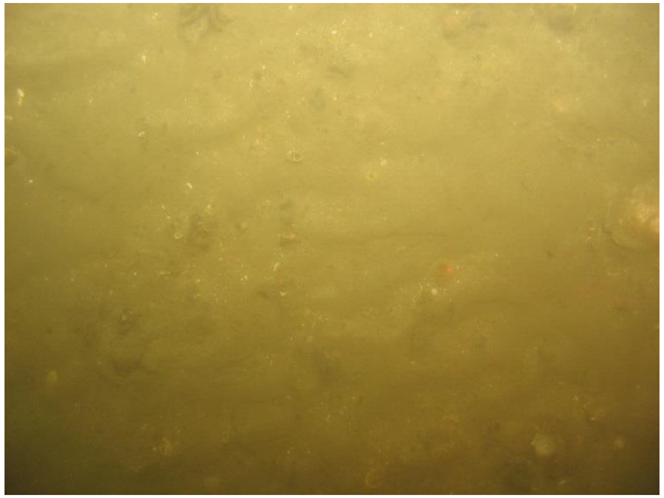
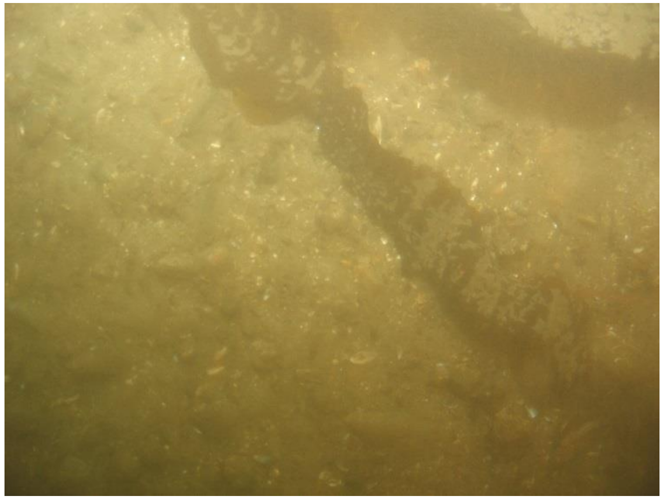
Note:
The last row of the table indicates the grouping SIMPROF factor (5%) applied during the analysis

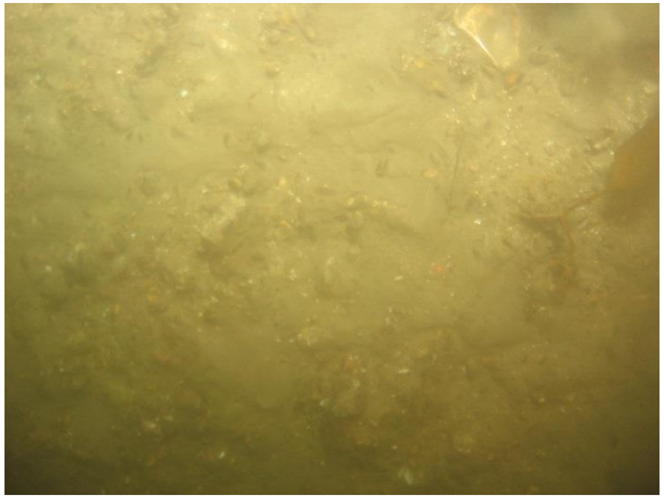
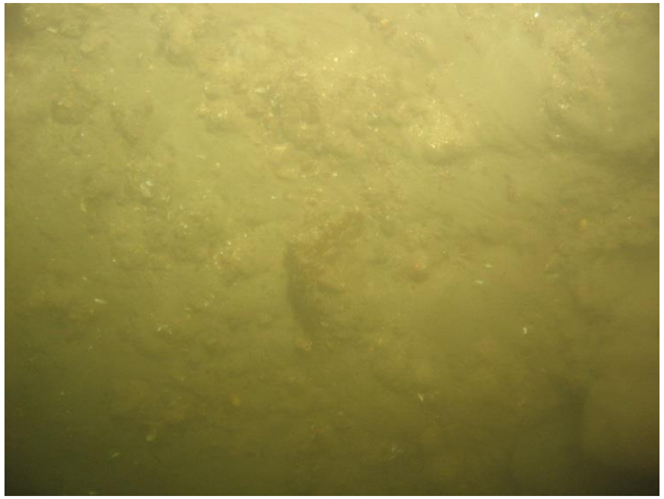
E. RESULTS

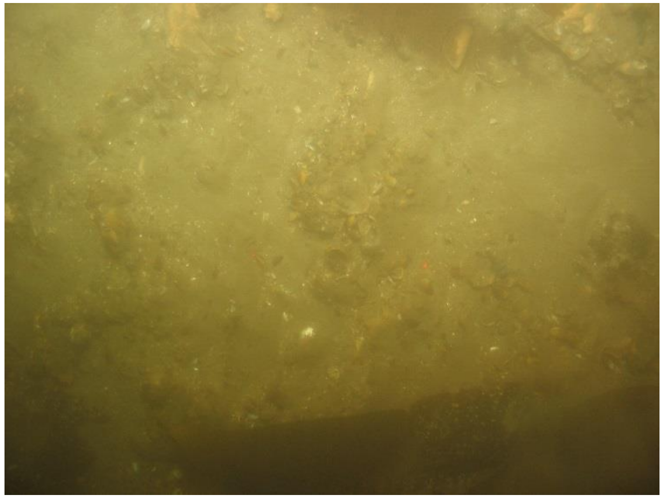
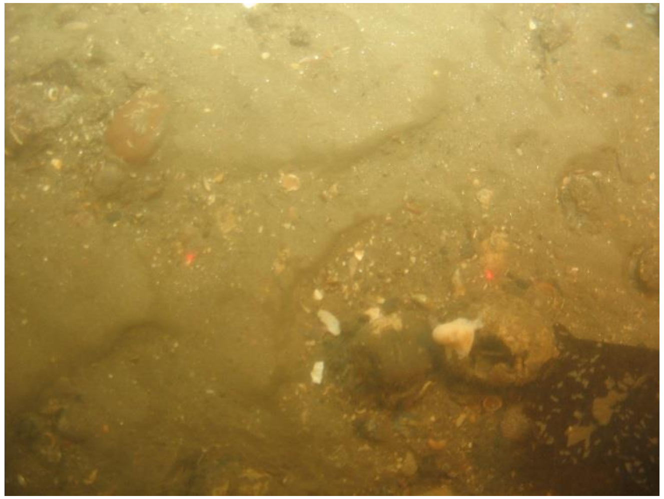
E.1 VIDEO DATA ANALYSIS

Site	General Description	Detailed Sediment Notes	Conspicuous Species	Estimated Abundance	Representative Image
TR1	Muddy sand with pebbles and cobbles	Coarse mixed sediment of gravelly muddy sand with pebbles, cobbles and shells. Very poor visibility due to suspended sediment.	Kelp (*Laminaria* sp.) *Asterias rubens* Hydroid/Bryozoan turf *Spirobranchus* sp. Gastropoda Hexacorallia *Alcyonium digitatum* *Echinus esculentus* *Ophiura albida* Corallinacea ?Bivalvia Paguridae Ophiuroidea *Callionymus* sp. *Metridium dianthus* Decapoda *Urticina* sp.	O O O P P P P R R P P P R R O O O	 

Site	General Description	Detailed Sediment Notes	Conspicuous Species	Estimated Abundance	Representative Image
TR2	Muddy sand	Muddy sand with scattered pebbles. End of transect becomes muddy sand with pebbles and cobbles and small to medium sized boulders. Suspended sediment causes poor visibility and sand resettling on kelp.	Kelp (*Laminaria* sp.) Gastropoda *Asterias rubens* Hydroid/Bryozoan turf *Spirobranchus* sp. *Carcinus maenas* *Pagurus bernhardus* Paguridae	A R R P P R R R	 

Site	General Description	Detailed Sediment Notes	Conspicuous Species	Estimated Abundance	Representative Image
TR3	Gravelly muddy sand with pebbles and cobbles	Coarse mixed sediment of gravelly muddy sand with pebbles, cobbles and shells and the appearance of hard ground with a veneer of sand in places. Very poor visibility due to suspended sediment.	Kelp (*Laminaria* sp.) *Asterias rubens* Hydroid/Bryozoan turf *Spirobranchus* sp. Sagartiidae *Alcyonium digitatum* *Ophiura albida* Corallinacea	F R P P R P R P	 

Site	General Description	Detailed Sediment Notes	Conspicuous Species	Estimated Abundance	Representative Image
TR4	Gravelly muddy sand with pebbles and cobbles	Coarse mixed sediment of gravelly muddy sand with pebbles, cobbles and shells and with the appearance of hard ground with a veneer of sand in places. Patch of rippled sand observed. Very poor visibility due to suspended sediment.	Kelp (*Laminaria* sp.) *Asterias rubens* Hydroid/Bryozoan turf *Spirobranchus* sp. *Alcyonium digitatum* Corallinacea Paguridae Ascidiacea *Mytilus edulis*	P R O P P P P R O	 

<table>
<tr><th>Site</th><th>General Description</th><th>Detailed Sediment Notes</th><th>Conspicuous Species</th><th>Estimated Abundance</th><th>Representative Image</th></tr>
<tr><td>TR5</td><td>Gravelly muddy sand with pebbles and cobbles</td><td>Coarse mixed sediment of gravelly muddy sand with pebbles, cobbles and shells and with the appearance of hard ground with a veneer of sand in places. Very poor visibility due to suspended sediment.</td><td>Kelp (Laminaria sp.)
Asterias rubens
Hydroid/Bryozoan turf
Spirobranchus sp.
Gastropoda (?Buccinum sp.)
Gastropoda
Alcyonium digitatum
Ophiura albida
Corallinacea
Metridium dianthus
Rodophycota
Pleuronectes platessa
Mytilus edulis</td><td>F
O
O
P
R
R
P
R
P
R
P
O
O</td><td>
</td></tr>
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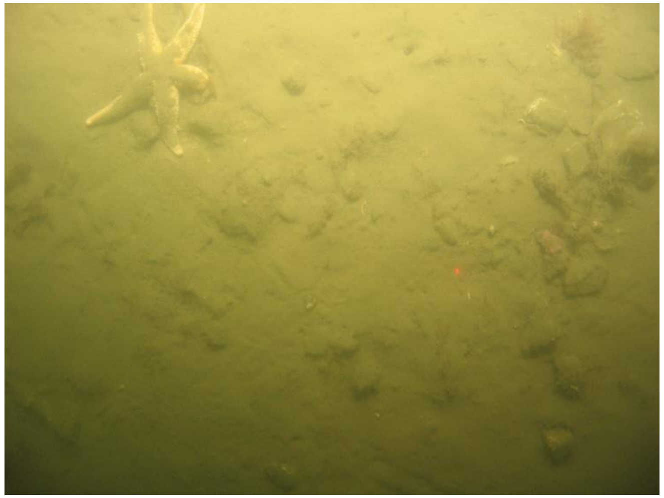
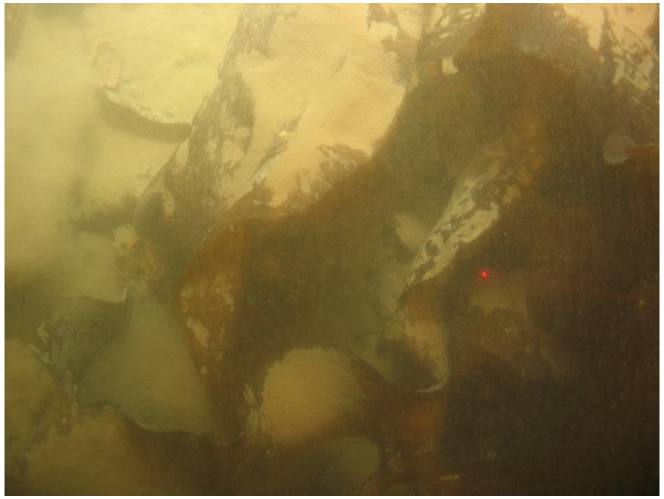
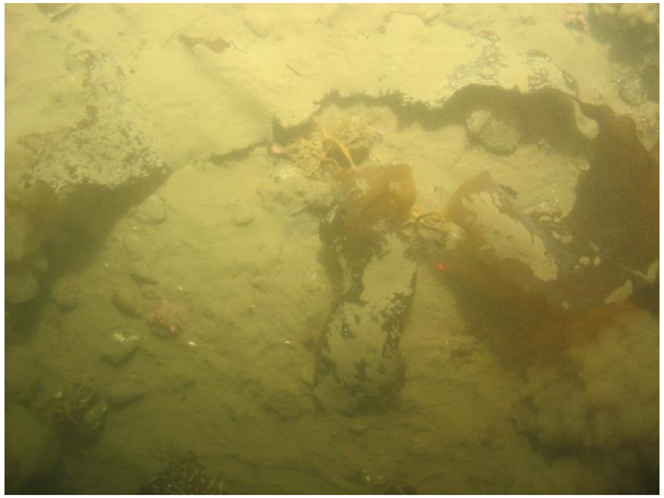
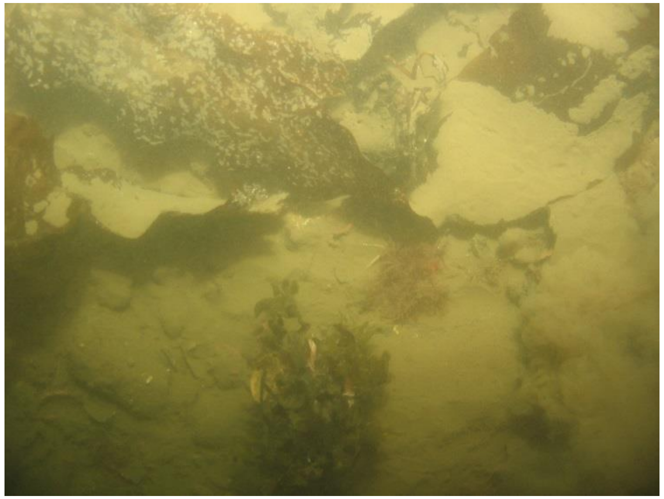
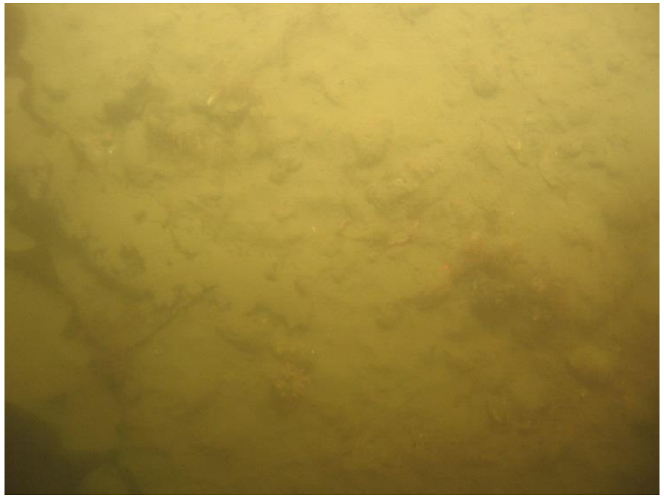
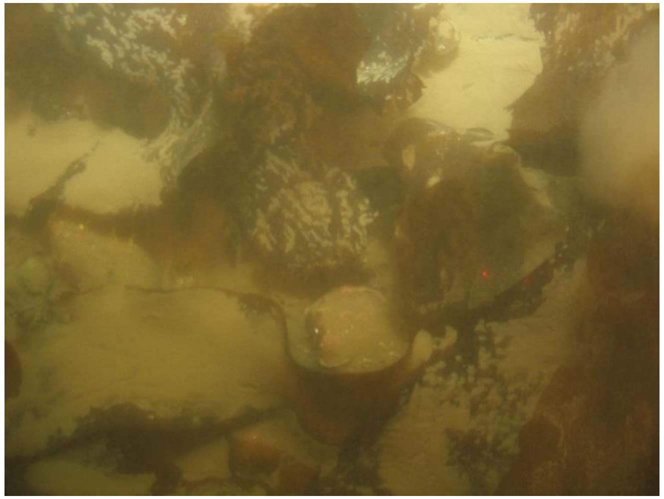
Site	General Description	Detailed Sediment Notes	Conspicuous Species	Estimated Abundance	Representative Image
TR6	Gravelly muddy sand with pebbles and cobbles	Coarse mixed sediment of gravelly, muddy sand with pebbles, cobbles and shells, and with the appearance of hard ground in places. Thicker veneer of rippled sand visible in one area. Very poor visibility due to suspended sediment, with sand resettling on kelp and sedentary fauna.	Kelp (*Laminaria* sp.) *Lithothamnion* sp. *Asterias rubens* Hydroid/Bryozoan turf	P P R F	 

Site	General Description	Detailed Sediment Notes	Conspicuous Species	Estimated Abundance	Representative Image
TR7	Pebbly gravelly muddy sand	Coarse mixed sediment of pebbly, gravelly, shelly muddy sand. Very poor visibility due to suspended sediment, with sand resettling on kelp and sedentary fauna. The last section of the video (2:30 mins) was dark and the analysis of this section is only based on stills taken	Kelp (*Laminaria* sp.) *Lithothamnion* sp. *Asterias rubens* Hydroid/Bryozoan turf *Pagurus bernhardus* Sagartiidae Paguridae *Spirobranchus* sp. Rhodophyta Majidae	C P R F R P P P P O	 

Site	General Description	Detailed Sediment Notes	Conspicuous Species	Estimated Abundance	Representative Image
TR8	Gravelly muddy sand	Boulders apparent at the start of the transect. Becomes gravelly shelly muddy sand with scattered pebbles. Suspended sediment causes very poor visibility and sand resettling on kelp and sedentary fauna.	Kelp (*Laminaria* sp.) *Lithothamnion* sp. Hydroid/Bryozoan turf Rhodophyta Gastropoda Sagartiidae	A P R P P P	 

Site	General Description	Detailed Sediment Notes	Conspicuous Species	Estimated Abundance	Representative Image
TR9	Gravelly muddy sand	Pebbly gravelly muddy sand. Suspended sediment causes very poor visibility and sand resettling on kelp and sedentary fauna.	Kelp (*Laminaria* sp.) *Lithothamnion* sp. *Asterias rubens* Hydroid/Bryozoan turf *Dendrodoa grossularia* *Spirobranchus sp.*	F P R R P P	 

E.2 MACROBENTHIC DATA ANALYSIS WITH JUVENILES

Univariate Analysis

Univariate analysis was undertaken with a view to assessing faunal richness and diversity, together with evenness and dominance, the latter highlighting areas of numerically dominant taxa.

The total number of taxa ranged from 65 (Sample ST07) to 129 (Sample ST04), with an average of 99 ± 23 taxa across the survey area (Table F3.1). No overall pattern in the distribution of the number of taxa across the survey area was noted. Faunal abundances were between 492 individuals (Sample ST07) and 2 038 individuals (Sample ST01), with an average of 1 494 ±486 individuals across the survey area (Table F3.1).

Values of diversity were on average high ($H' \log_2 = 4.57$), with eight samples (89 %) showing high diversity ($H' \log_2 > 4$) and one sample (11 % - ST01) showing good diversity ($4 \leq H' \log_2 \leq 3$) (Table F3.1, Dauvin et al., 2012).

Values of evenness were between 0.52 (Sample ST01) and 0.77 (Sample ST05) with an average of 0.69 ± 0.07 across the survey area (Table F3.1). The lowest evenness value (J' = 0.52) in sample ST01 was associated with a numerical dominance of Nematoda and the polychaete *Phyllodoce mucosa*, which, with 966 and 288 individuals, accounted, respectively, for 52 % and 14 % of the faunal abundance at this station. This was further confirmed by the highest dominance value ($\lambda = 0.25$) obtained at this station. For all other samples values of evenness were similar, as well as values of dominance which were close to $\lambda = 0$, indicating similar communities occurring at most sampling sites.

Table F3.1: Macrofaunal Community Statistics

Station	Numbers		Diversity Indices		Evenness
	Taxa [S]	Individuals [N]	Simpsons [d]	Shannon-Weiner [H' Log_2]	Pielou [J']
ST01	81	2038	10.5	3.29	0.5194
ST02	79	989	11.31	4.15	0.6584
ST03	119	1368	16.34	4.83	0.6998
ST04	129	1763	17.12	5.13	0.7312
ST05	122	1529	16.5	5.37	0.7751
ST06	113	1675	15.09	4.96	0.7276
ST07	65	492	10.33	4.23	0.7024
ST08	89	1923	11.64	4.48	0.6919
ST09	92	1671	12.26	4.66	0.7144
Summary Statistics					
Minimum	**65**	**492**	**10.33**	**3.29**	**0.5194**
Mean	**99**	**1494**	**13.45**	**4.57**	**0.6911**
Maximum	**129**	**2038**	**17.12**	**5.37**	**0.7751**
SD	**23**	**486**	**2.77**	**0.62**	**0.0718**

Multivariate Analysis

Prior to multivariate analysis, the enumerated faunal dataset was transformed. A fourth root transformation provided the best assessment of the enumerated faunal community, down-weighting the numerically dominant species (> 1000 individuals) which represented under 1 % of the fauna, giving the right weight to the abundant taxa (> 100 individuals), which comprised 11 % of the fauna, as well as to species with intermediate abundance (> 10 individuals), which represented 31 % of the fauna, and the underlying community (≤ 10 individuals), which represented 57 % of the fauna.

Community structure of the enumerated fauna within the survey area was assessed employing the hierarchical clustering analysis, with the SIMPROF test set to a significance level of 5 %. The dendrogram shows three main groups of stations (Figure F3.1) and the description of the groups is presented in Table F3.2. Figure F3.2 presents the MDS which is an ordination technique, which arranges the samples on a two-dimensional plot, so that their relative distances from each other reflect their faunal similarities. The stress coefficient of 0.07 resulting from their procedure indicates that the plot is a 'good' representation of the multi-dimensional relationship between samples (Clarke and Warwick, 2001).

Group a comprised a single sample (ST07), with characterising taxa including Nematoda, the polychaetes *S. armiger* and *S. lamarcki*, the ascidian *D. grossularia* and bivalves belonging to the family Mytilidae juv.

Group b comprised two samples (ST08 and ST09), with characterising taxa including the ascidian *D. grossularia*, the polychaetes *P. inornata* and *S. armiger*, Nematoda and bivalves belonging to the family Mytilidae juv.

Group c comprised four samples (ST03, ST04, ST05 and ST06), with characterising taxa including Nematoda, bivalves belonging to the family Mytilidae juv and the genus *Abra* juv and the polychaetes *P. inornata* and *S. armiger*.

Group d comprised two samples (ST01 and ST02), with characterising taxa including NEMATODA, the polychaetes *S. lamarcki* and *S. armiger*, bivalves belonging to the family Mytilidae juv and NEMERTEA.

The SIMPER analysis also highlighted the differences between groups in terms of species composition and their average abundances. The top five species contributing to this difference are presented in Table F3.3.

The taxa composition for all groups was similar, as shown by the low dissimilarity percentage which varied between 38.20 % between Groups c and b to 52.06 % between Groups c and a. The differences between the groups were mainly related to the average abundance of the characterising species. Differences in species composition were also noted.

Groups d and c differed in the abundance of peracarid *Tanaopsis graciloides* and the polychaete *Mediomastus fragilis* (higher in Group c) and the presence of the polychaetes *Ampharete lindstroemi* agg and *Aricidea* (*Aricidea*) *minuta* and the bivalve *Nucula nucleus* in Group c only.

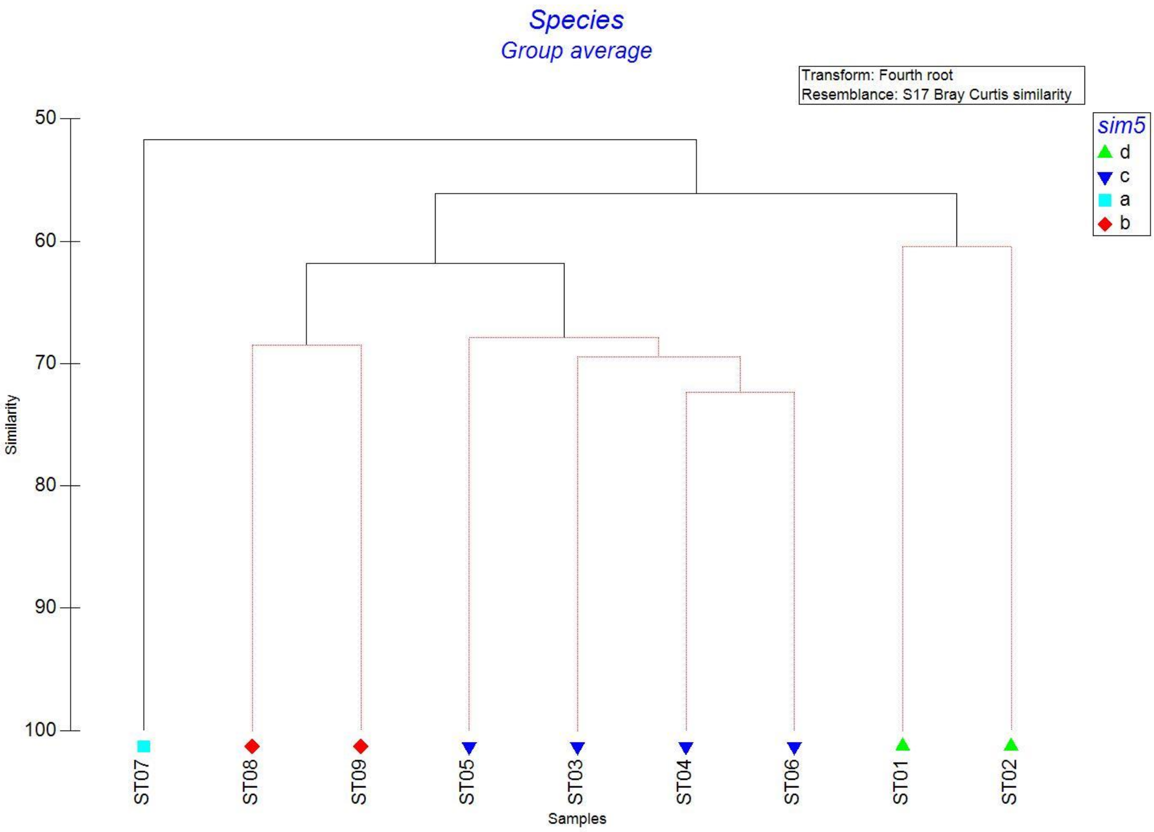


Figure F3.1: Dendrogram of Bray-Curtis similarity index of enumerated fauna from grab samples

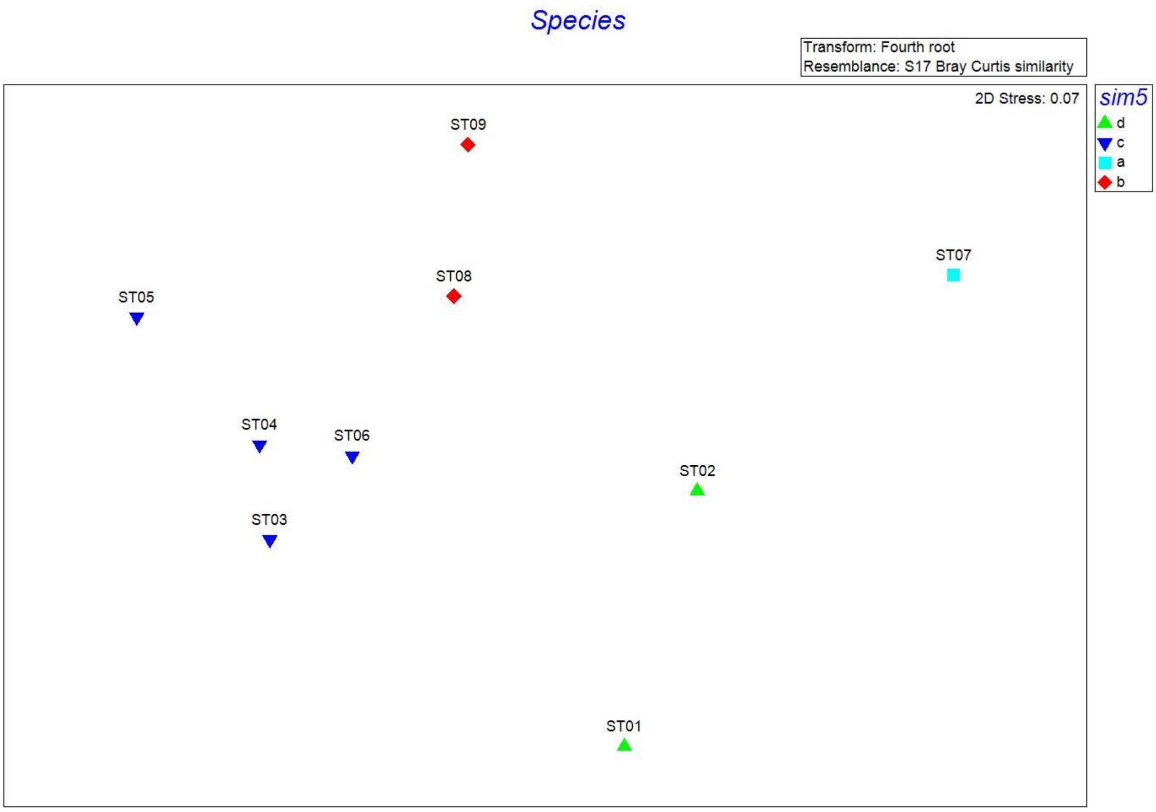


Figure F3.2: MDS plot of Bray-Curtis similarity index of enumerated fauna from grab samples

Table F3.2: Summary Attributes of the Faunal Group Derived from Multivariate Analysis of Enumerated Fauna from Grab samples

Group	Samples	Characterising Features	Species	Mean Abundance	Occurrence [% samples]
a Average similarity: NA	ST07	S = 65 N = 492 Depth [m]= 5.4	NEMATODA *Scoloplos (Scoloplos) armiger* *Spirobranchus lamarcki* *Dendrodoa grossularia* Mytilidae juv	143 53 48 32 30	29 11 10 7 6
b Average similarity: 68.5 %	ST08, ST09	S = 91 ± 2 N = 1797 ± 178 Depth [m]= 4.1 ± 0.6	*Dendrodoa grossularia* *Pholoe inornata* NEMATODA *Scoloplos (Scoloplos) armiger* Mytilidae juv	3.98 3.65 3.86 3.56 3.01	3.74 3.66 3.45 3.38 2.68
c Average similarity: 69.2 %	ST03, ST04, ST05, ST06	S = 121 ± 7 N = 1584 ± 173 Depth [m]= 6.8 ± 1.6	NEMATODA Mytilidae juv *Pholoe inornata* *Abra* juv *Scoloplos* (*Scoloplos*) *armiger*	3.66 3.29 3.39 3.04 2.81	2.52 2.5 2.48 2.27 2.15
d Average similarity: 60.5 %	ST01, ST02	S: 80 ± 1 N: 1514 ± 742 Depth [m]: 6.4 ± 1.0	NEMATODA *Spirobranchus lamarck*i Mytilidae juv NEMERTEA *Scoloplos* (*Scoloplos*) *armiger*	4.86 3.12 3.05 2.81 2.85	5.81 4.28 4.14 3.9 3.83

Notes:
S = number of species
N = number of individuals
Abundance refers to untransformed data and is expressed as mean value within the multivariate group; frequency refers to the % of samples within the multivariate group

Groups d and a differed in the abundance of the polychaete *Phyllodoce mucosa*, higher in Group d and the presence of Ascidiacea juv. and the bivalve Anomiidae juv. taxa as well as the presence of the gastropod *Rissoa parva* and the polychaete *P. baltica* in Group D only. Similarly was observed between Groups c and a for which also the presence of the order Ostracoda and the polychaete family Nephtydae juv. in Group c only contributed to the dissimilarity of this group.

Groups d and b differed in the abundance of the peracarid *Tanaopsis graciloides*, the sea squirt *D. grossularia* and the oligochete *Tubificoides amplivasatus*, which was higher in Group b. Other taxa contributing to the disiimilarity were the gastropod *R. parva*, only recorded within Group d, and the bivalve *Lucinoma borealis* juv., only recorded in Group b.

Groups c and b differed in the abundance of the sea squirt *D. grossularia* (higher in Group b) and the abundance of the order Ostracoda (higher in Group c). Other taxa contributing to the dissimilarity of these groups included the amphipod *Pariambus typicus* and the polychaetes *Aricidea* (*Aricidea*) *minuta* and *Sabellaria spinulosa*, all recorded within Group c only.

Groups a and b differed in the abundance of the polychaete *P. inornata*. The families Anomiidae juv. and Nephtydae juv. were only recorded within Group b, as well as the gastropod *Onoba semicostata*, whilst the polychaete *Chaetozone setosa* was only recorded at station ST07 (Group A).

The main taxa characterising the differences between groups are presented in Figure F.3.3.

Table F3.3 Output of SIMPER Analysis Indicating Differences Between Groups

Taxa	Av. Abund	Av. Abund	Av. Diss	Diss/SD	Contrib%	Cum.%
Groups d and c			Average Dissimilarity = 44.05			
Species	Group d	Group c				
Tanaopsis graciloides	0.81	2.87	0.68	2.11	1.55	1.55
Ampharete lindstroemi agg	0	1.83	0.61	8.38	1.39	2.94
Aricidea (Aricidea) minuta	0	1.64	0.55	10.21	1.26	4.2
Mediomastus fragilis	0.75	2.31	0.53	1.85	1.2	5.4
Nucula nucleus	0	1.54	0.52	13.6	1.17	6.57
Groups d and a			Average Dissimilarity = 44.44			
	Group d	Group a				
ASCIDIACEA juv	2.03	0	0.99	53.11	2.23	2.23
Anomiidae juv	2.01	0	0.99	3.24	2.22	4.45
Rissoa parva	1.83	0	0.88	2.78	1.99	6.44
Pholoe baltica	1.57	0	0.77	5.49	1.73	8.17
Phyllodoce mucosa	2.56	1.41	0.74	0.98	1.68	9.84
Groups c and a			Average Dissimilarity = 52.06			
	Group c	Group a				
Pholoe baltica	2.31	0	0.87	11.25	1.66	1.66
Anomiidae juv	2.18	0	0.81	2.78	1.56	3.22
OSTRACODA	2.1	0	0.78	5.95	1.5	4.72
Nephtyidae juv	1.92	0	0.71	4.75	1.37	6.1
Pholoe inornata	3.39	1.5	0.71	4.21	1.36	7.46
Groups d and b			Average Dissimilarity = 43.64			
	Group d	Group b				
Tanaopsis graciloides	0.81	2.98	0.82	1.82	1.88	1.88
Rissoa parva	1.83	0	0.69	3.33	1.58	3.46
Dendrodoa grossularia	2.28	3.98	0.65	5.21	1.48	4.94
Lucinoma borealis juv	0	1.66	0.63	6.27	1.44	6.38
Tubificoides amplivasatus	1	2.65	0.63	5.53	1.44	7.82
Groups c and b			Average Dissimilarity = 38.20			
	Group c	Group b				
Dendrodoa grossularia	2.05	3.98	0.59	2.17	1.56	1.56
Aricidea (Aricidea) minuta	1.64	0	0.51	10.68	1.33	2.88
OSTRACODA	2.1	0.66	0.44	1.84	1.15	4.03
Pariambus typicus	1.41	0	0.43	5.74	1.13	5.17
Sabellaria spinulosa	1.4	0	0.43	3.03	1.12	6.29
Groups a and b			Average Dissimilarity = 44.76			
	Group a	Group b				
Pholoe inornata	1.5	3.65	0.93	43.23	2.07	2.07
Anomiidae juv	0	1.92	0.82	3.38	1.84	3.91
Nephtyidae juv	0	1.82	0.78	61.12	1.75	5.66
Chaetozone setosa	1.68	0	0.72	61.12	1.62	7.28
Onoba semicostata	0	1.65	0.71	138.04	1.59	8.87

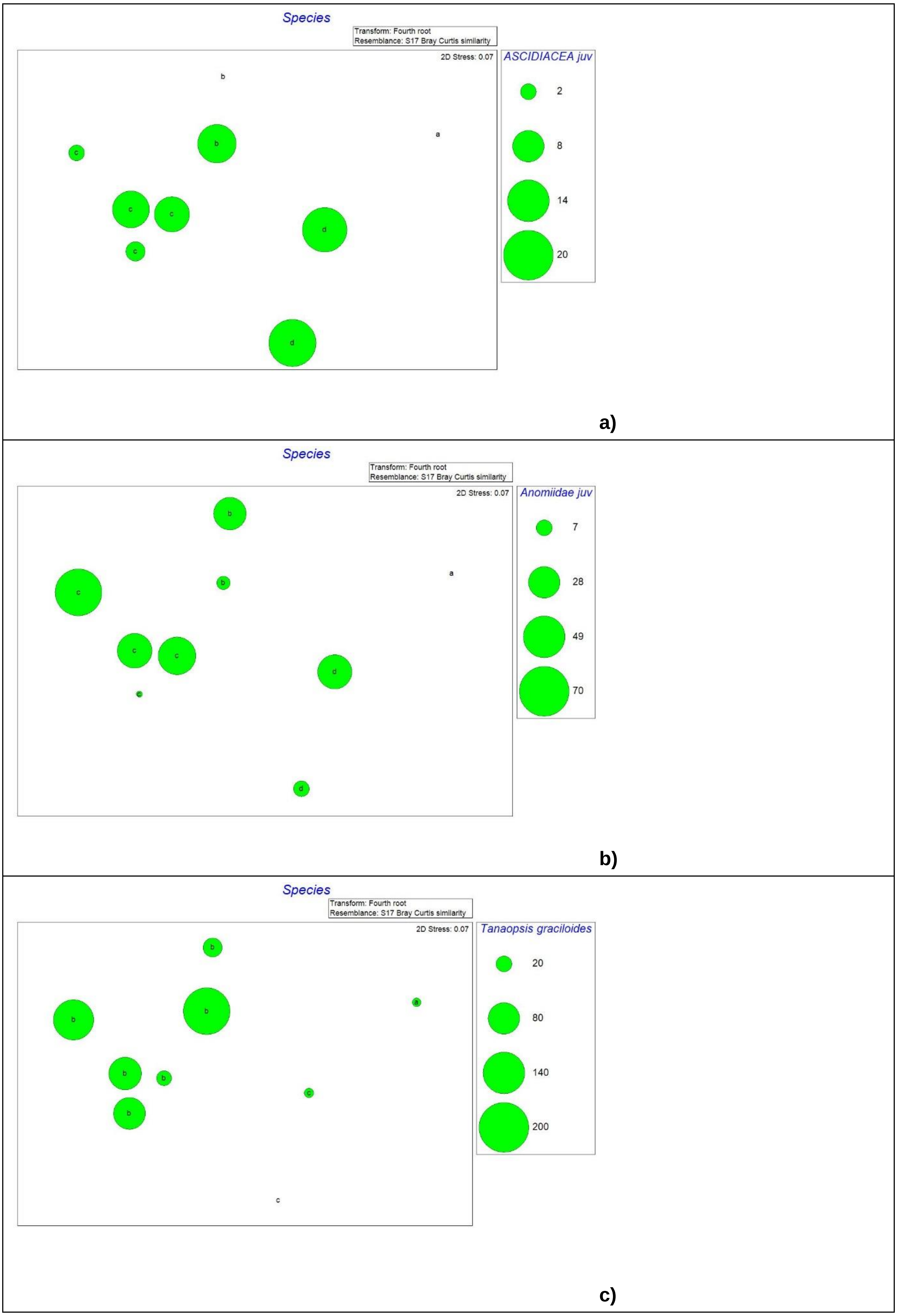


Figure F3.3: Species mainly contributing to the differences between groups identified by the cluster analysis, overlaid with their relative abundance

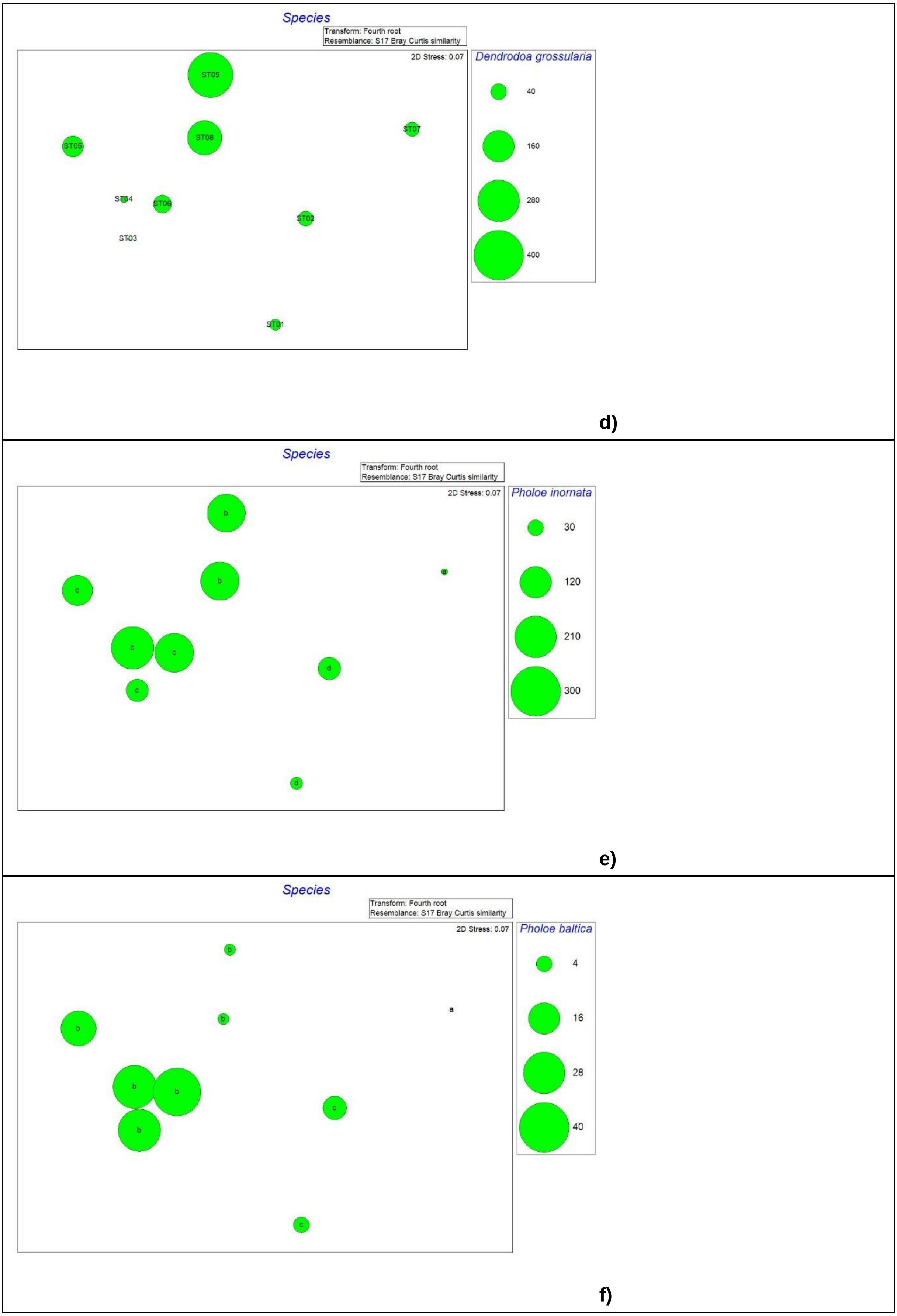
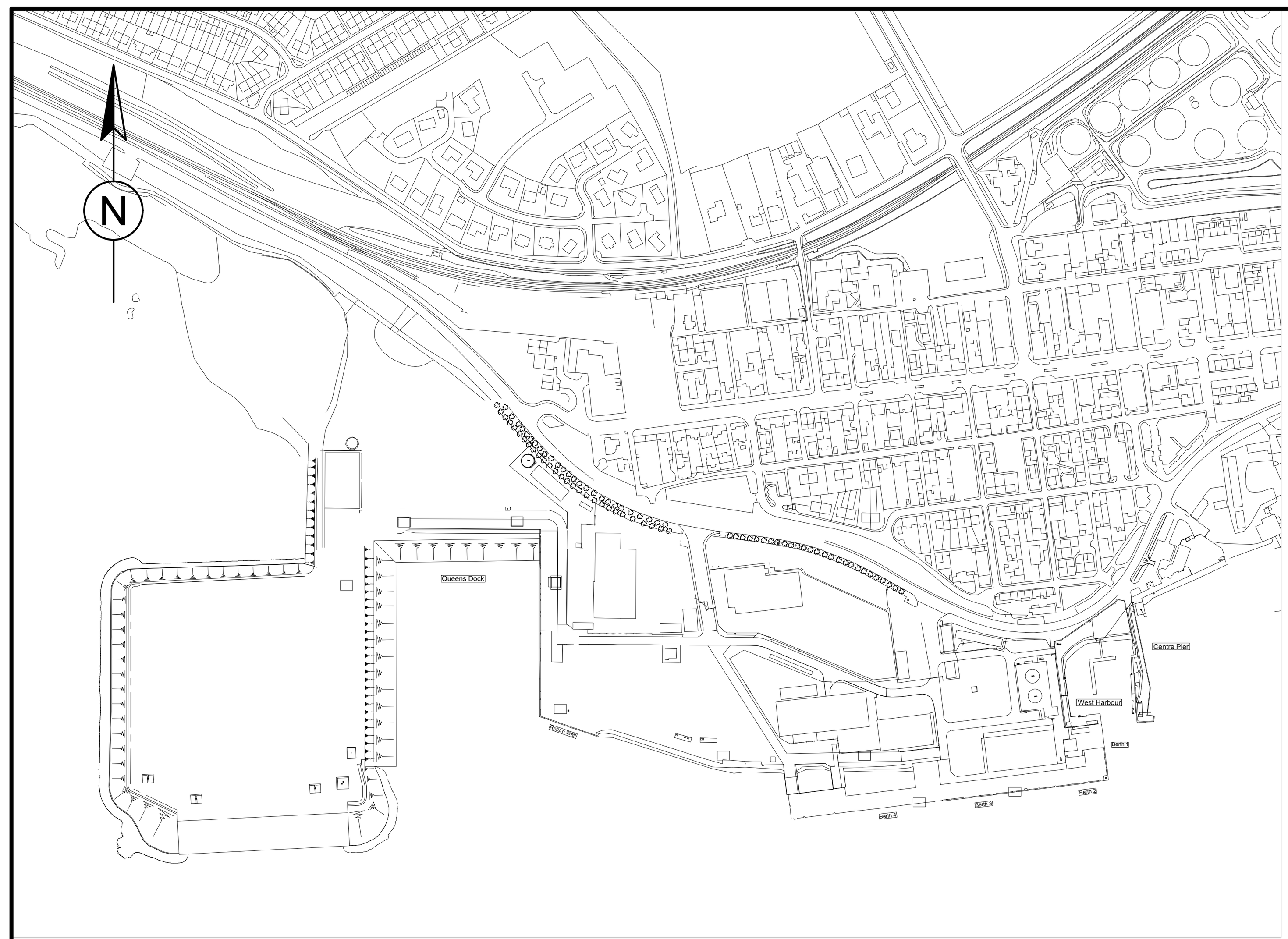


Figure F3.3: Species mainly contributing to the differences between groups identified by the cluster analysis, overlaid with their relative abundance continued

Drawings

DO NOT SCALE



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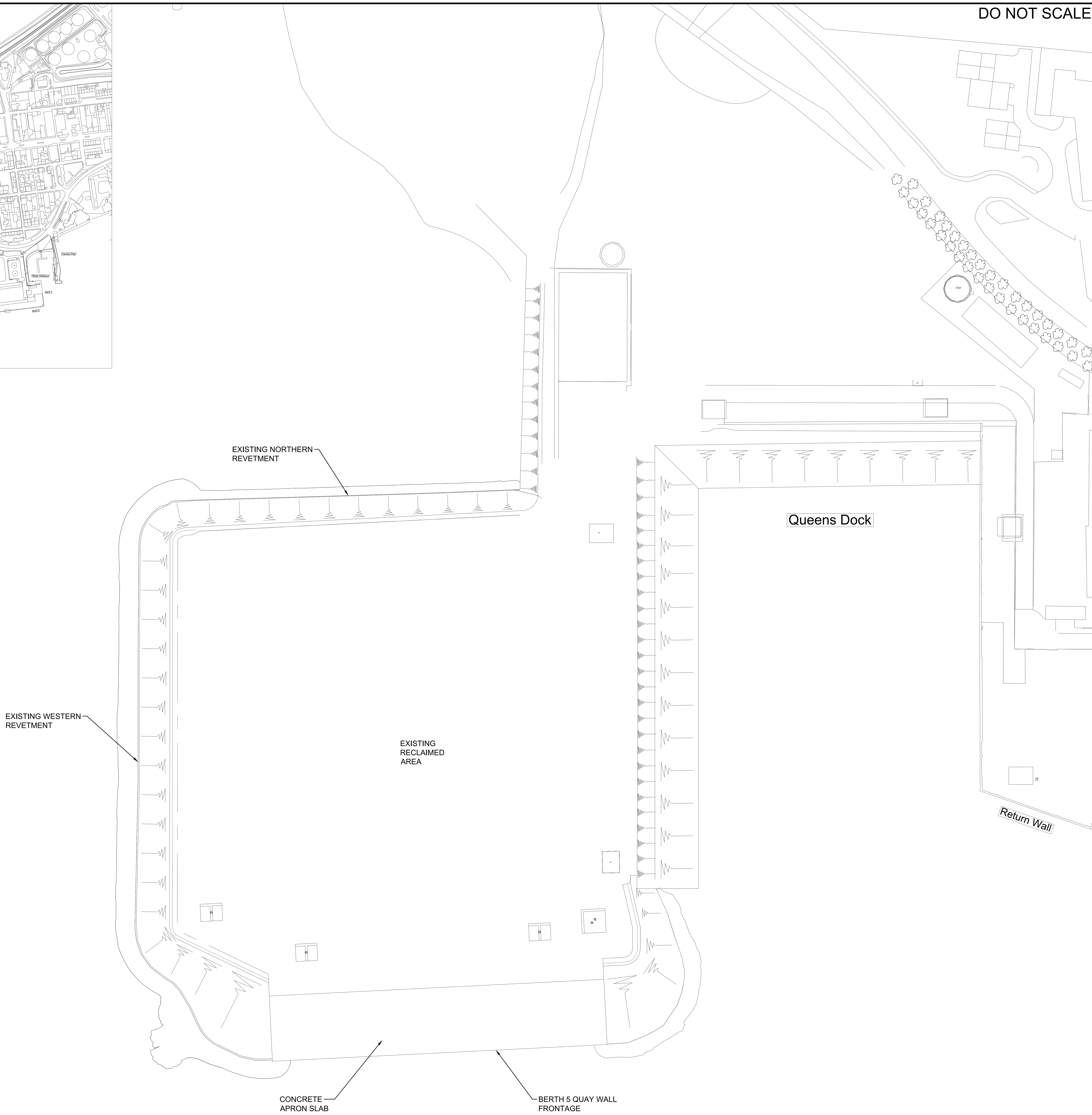

PLAN
SCALE 1: 1000

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION
N/A

MAINTENANCE/CLEANING
N/A

DECOMMISSIONING/DEMOLITION
N/A

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

NOTES:

1. THE CONTENTS OF THIS DRAWING ARE FOR INFORMATION PURPOSES ONLY AND SUBJECT TO CHANGE.

FOR INFORMATION PURPOSES ONLY

Rev.	Date	Description	By	Chk'd	App'd
P0.1	01.05.18	FOR INFORMATION	BJH	PJT	PJT

Drawing Status: WORK IN PROGRESS
Suitability: S0

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www.atkinsglobal.com

Client: PORT OF CROMARTY FIRTH

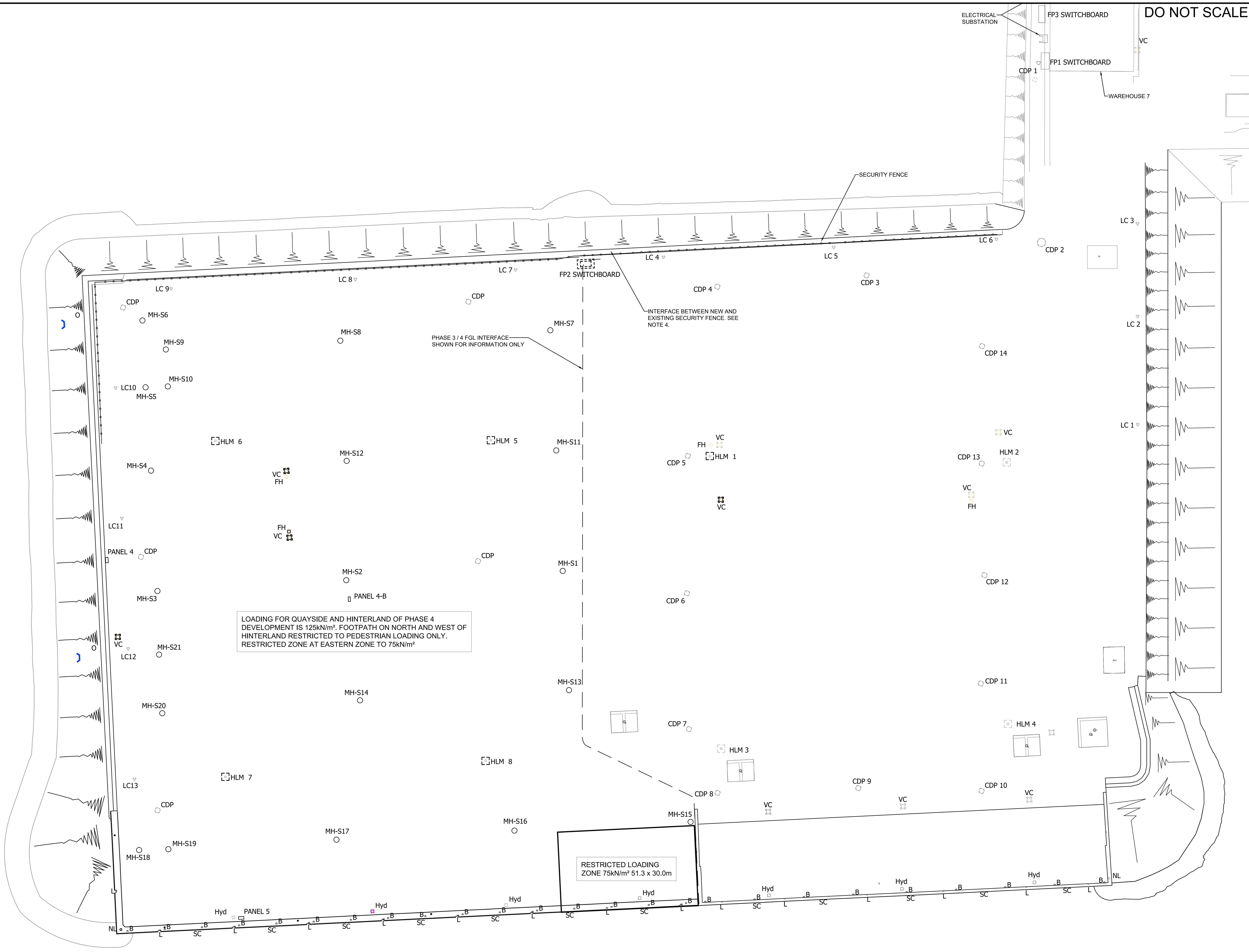
Project Title: INVERGORDON SERVICE BASE PHASE 4 DEVELOPMENT

Drawing Title: EXISTING SITE LAYOUT

Scale	Designed	Drawn	Checked	Authorised
AS SHOWN	-	BJH	PJT	PJT
Original Size: A1	Date: -	Date: 01/05/18	Date: 01/05/18	Date: 01/05/18

Drawing Number: 5121683-ATK-PH4-ZZ-DR-C-0011
Revision: P0.1

Drawing file: P:\GBEMC\WGE\Projects\Trans\20180523 Invergordon Phase 4 Detailed Design\7 WIP\7.0 CAD_BIM\1 WIP\CDR\5121683-ATK-PH4-ZZ-DR-C-0011.dwg



DO NOT SCALE

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

REFERENCE TO BE MADE TO DRA AND SERIES 120 ONWARDS.
REFER TO HANDOVER FILE, DRA, DBS AND SERIES 100 ONWARDS.

MAINTENANCE/CLEANING

REFERENCE TO BE MADE TO DRA AND SERIES 120 ONWARDS.
REFERENCE SPECIFIC LOADINGS OF 125kN/m² AND 75kN/m²
REFER TO HANDOVER FILE, DRA, DBS AND SERIES 100 ONWARDS.

DECOMMISSIONING/DEMOLITION

REFERENCE TO BE MADE TO DRA AND SERIES 120 ONWARDS.
REFER TO HANDOVER FILE, DRA, DBS AND SERIES 100 ONWARDS.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

NOTES:

1. NOT USED.
2. NOT USED.
3. NOT USED.
4. PERIMETER FENCE MATCHED WITH EXISTING PHASE 3 NORTHERN BOUNDARY. FENCE COMPRISED 2400x60x60 SHS POSTS AT 3.0m CENTRES. POSTS FOUNDED IN 600mm DEEP, 300mm DIA POCKET AND ENCASED IN STANDARDISED PRESCRIBED CONCRETE MIX ST4. PANELS FORMED FROM 6mm HORIZONTAL WIRES AT 200mm CENTRES AND 5mm VERTICAL WIRES AT 50mm CENTRES. PANELS HAVE 3 SHALLOW PROFILES PER PANEL AND 6No. CLAMPS PER POST. FENCE COMPONENTS ARE POLYESTER POWDER COATED GALVANISED WIRE TO RAL 6005. ALL FIXINGS ARE TAMPER PROOF.
5. PHASE 4 TO BE LOADED AS PER DBS SECTION 3 ONLY. 125kN/m² CAPACITY ON BOTH QUAYSIDE AND HINTERLAND WITH REDUCED 75kN/m² CAPACITY THROUGHOUT THE EASTERN ZONE OF THE QUAY. REFER TO DRAWING 5121683-ATK-PH4-ZZ-DR-Z-0005 P0.3 LOADING PLAN IN APPENDIX B OF THE DBS.
6. REFER TO PHASE 3 H&S FILE FOR PHASE 3 LOADING PLAN.
7. PEDESTRIAN LOADING ON PERIMETER FOOTPATH ON NORTH AND WEST HINTERLAND.
8. ALL ELECTRICAL AND WATER TANK INFORMATION SHOWN ON OTHER DRAWINGS.
9. ELEVATIONS OF REVETMENTS AND QUAY WALL SHOWN ON DRAWING 5163655-ATK-PH4-ZZ-DR-C-0201.
10. AT THE LOCATION OF HIGH LIGHT MAST ON PHASE 4, THE FOUNDATION ONLY FOR HIGH LIGHT MAST INSTALLED AT POSITION 5 AND 8, WITH ELECTRICAL DUCTS INSTALLED AT ALL POSITIONS.
11. AS BUILT DRAWING (REV Z4) WAS PREPARED BY ATKINS LIMITED ON THE BASIS OF INFORMATION PROVIDED BY ROADBRIDGE UK LIMITED.

KEY:

- VC - VALVE CHAMBER
- HYD - WATER HYDRANT
- CDP - CABLE DRAW PIT
- HLM - HIGH LIGHT MAST SEE NOTE 10
- LC - LIGHTING COLUMNS
- NL - NAVIGATION LIGHT
- FH - FIRE HYDRANT
- LADDER (L)
- SAFETY CHAIN (SC)
- BOLLARD (B)
- OUTFALL (O)
- MH - MANHOLE

Rev.	Date	Description	By	Chk'd	App'd
Z5	28/06/22	AS BUILT PREPARED BY PoCF	DM	GMC	GMC
Z4	16/02/22	AS BUILT PREPARED BY ATKINS	SA	PJT	SKC
Z3	17/11/21	AS BUILT PREPARED BY ATKINS	SKM	PJT	JH
Z2	21/10/21	AS BUILT PREPARED BY ATKINS	VK	PJT	JH
Z1	07/04/21	AS BUILT PREPARED BY ATKINS	BJH	PJT	JH

Drawing Status: AS BUILT
Suitability: AB

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Client: PORT OF CROMARTY FIRTH

Project Title: INVERGORDON SERVICE BASE PHASE 4 DEVELOPMENT

Drawing Title: GENERAL ARRANGEMENT

Scale	Designed	Drawn	Checked	Authorised
N.T.S	PJT	SKM	SKC	JO
Original Size: A1	Date: 29/06/18	Date: 29/06/18	Date: 29/06/18	Date: 29/06/18

Drawing Number: 5163655-ATK-PH4-ZZ-DR-C-0200
Revision: Z 5

NOTES:

1. THIS PROPOSED DEVELOPMENT GENERAL ARRANGEMENT IS BASED ON THE DRAWING DW-UK-BLU-22-0009 REVISION 3, SHEET 1 OF 2, AS RECEIVED ON 14/12/22 AS ISSUED BY DEVELOPER THE INFORMATION FROM WHICH HAS BEEN ADAPTED TO SHOW PHASE 5 DEVELOPMENT AREA.
2. LEAPMOOR LLP HAS UNDERTAKEN NO DESIGN WORKS AND LAYOUT IS AS PROVIDED BY DEVELOPER.

KEY:

- PHASE 2
- PHASE 3
- PHASE 4
- PRIORITY USE OF BERTH
- CLIENT PROPOSED DEVELOPMENT AREA

Rev.	Date	Description	By	Chk'd	App'd
C	14/12/22	UPDATED PER REV 3 OF DEVELOPER DRAWING	DM	GMC	GMC
B	24/11/22	DESIGN REFINEMENTS	DM	GMC	GMC
A	11/11/22	FOR COMMENT	DM	GMC	GMC

Drawing Status: FOR INFORMATION

Suitability: INFO

LEAPMOOR

Client: PORT OF CROMARTY FIRTH

Project: INVERGORDON SERVICE BASE PHASE 5 DEVELOPMENT

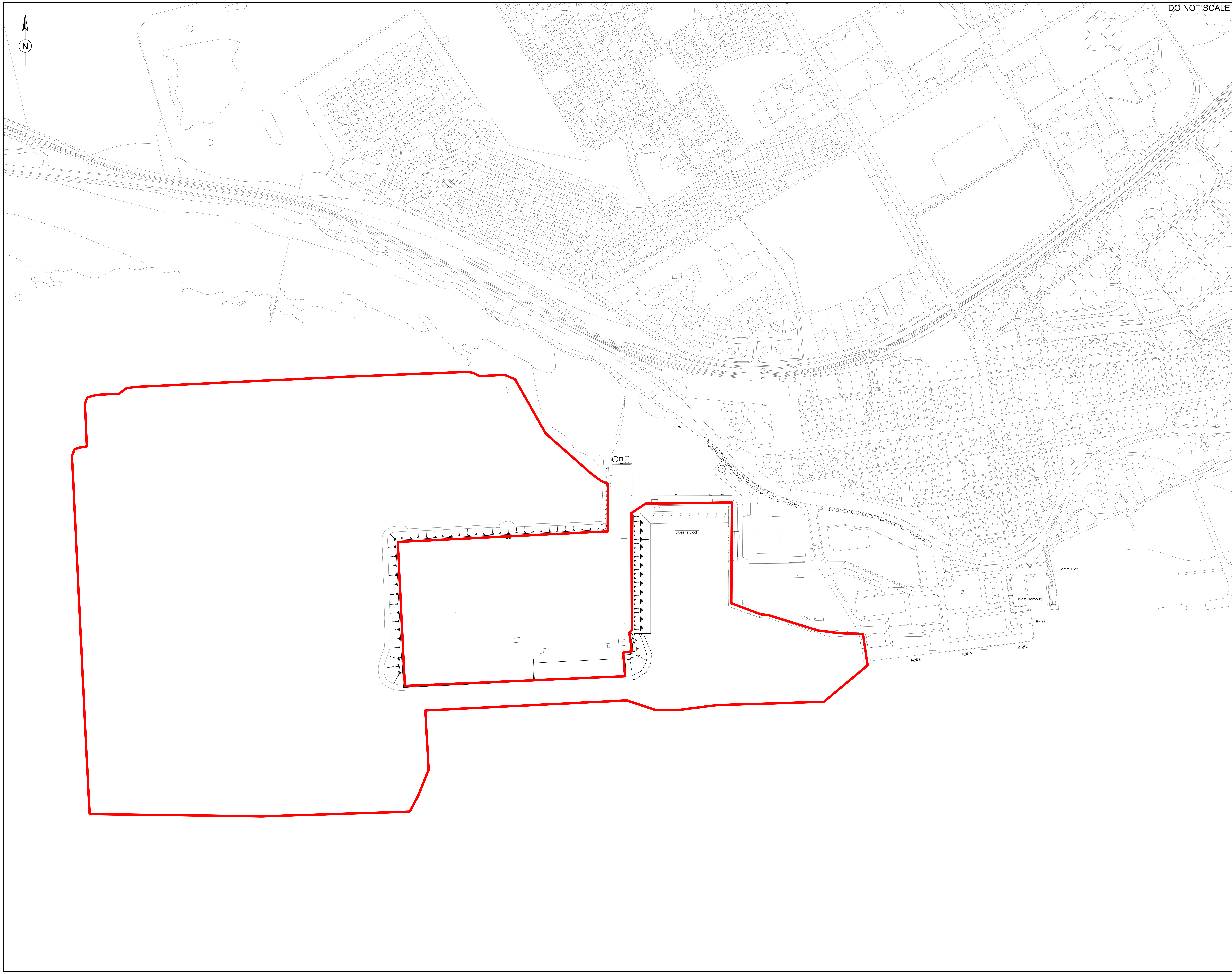
Title: PROPOSED DEVELOPEMENT GENERAL ARRANGEMENT

Scale	Designed	Drawn	Checked	Authorised
1:2000 @ A0	GMcC	DM	GMcC	GMcC
Original Size: A0	Date: 11/11/22	Date: 11/11/22	Date: 11/11/22	Date: 11/11/22

Drawing Number: 1024-PH5-015

Revision: C

DO NOT SCALE



NOTES:

1. RED LINE BOUNDARY >5m FROM MAXIMUM PLANNED DEVELOPMENT EXTENTS.
2. THIS DRAWING IS BASED ON INFORMATION TAKEN FROM LEAPMOOR DRAWINGS 1024-PH5-006, 009, 015, 016, 017, 018, 019 & 031 AND PARTNER DRAWINGS DW-UK-BLU-22-0009 REV 1, REV 2 & REV 3.

KEY:

CONSENTING RED LINE BOUNDARY

Rev.	Date	Description	By	Chk'd	App'd
G	11/01/23	BOUNDARY UPDATED TO EXCLUDE EXISTING SITE	DM	GMC	GMC
F	15/12/22	SCALE SHOWN AT 1:4000	DM	GMC	GMC
E	15/12/22	RED LINE BOUNDARY UPDATED PER NEW DESIGN	DM	GMC	GMC
D	08/12/22	SCALE SHOWN AT 1:4000	DM	GMC	GMC
C	08/12/22	SCALE CHANGED TO 1:2000	DM	GMC	GMC
B	22/11/22	INCLUDES LAYOUT	DM	GMC	GMC
A	22/11/22	FOR COMMENT	DM	GMC	GMC

Drawing Status: FOR INFORMATION

Suitability: INFO

Do not scale this drawing.
NOT TO BE USED FOR CONSTRUCTION.

LEAPMOOR

Client: PORT OF CROMARTY FIRTH

Project: INVERGORDON SERVICE BASE PHASE 5 DEVELOPMENT

Title: CONSENTING RED LINE BOUNDARY

Scale	Designed	Drawn	Checked	Authorised
1:2000	GMcC	DM	GMcC	GMcC
Original Size	Date	Date	Date	Date
A0	22/11/22	22/11/22	22/11/22	22/11/22

Drawing Number: 1024-PH5-032

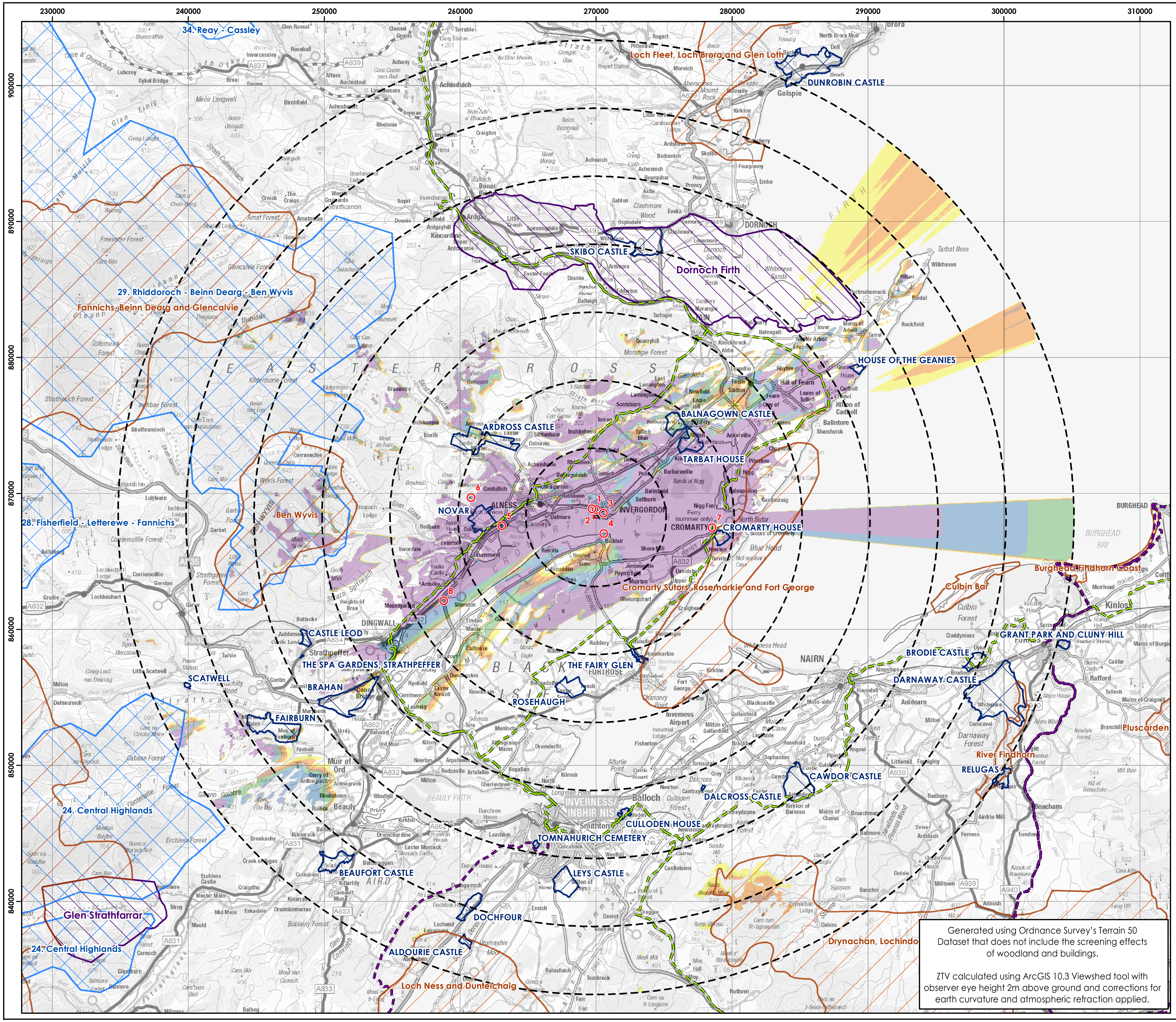
Revision: G

[Redacted]

Invergordon Port Phase 4

PORT OF CROMARTY FIRTH

Figure 30.16.7
Bare Ground Zone of Theoretical Visibility
Rig and Offshore Renewables Scenarios
with Landscape Designations



Generated using Ordnance Survey's Terrain 50 Dataset that does not include the screening effects of woodland and buildings.

ZTV calculated using ArcGIS 10.3 Viewshed tool with observer eye height 2m above ground and corrections for earth curvature and atmospheric refraction applied.

Key

- Constructed Phase 3 expansion area
- Proposed Phase 4 expansion area
- 5km buffers to 35km
- Landscape Viewpoint
  1: B817, Invergordon
  2: King George Street, Invergordon
  3: Invergordon High Street
  4: Near Balblair
  5: A9 - Skiach
  6: Fryish Monument
  7: Cromarty Beach
  8: A9 - A862

Landscape Designation

- Council Landscape Designation
- Wild Land Area
- National Scenic Area
- Garden or Designed Landscape
- Long distance path
- Sustrans cycle route

Zone of Theoretical Visibility

Visibility of reclaimed land site

- 20m above reclaimed land visible
- 40m above reclaimed land visible
- 60m above reclaimed land visible
- 80m above reclaimed land visible
- 100m above reclaimed land visible
- 120m above reclaimed land visible

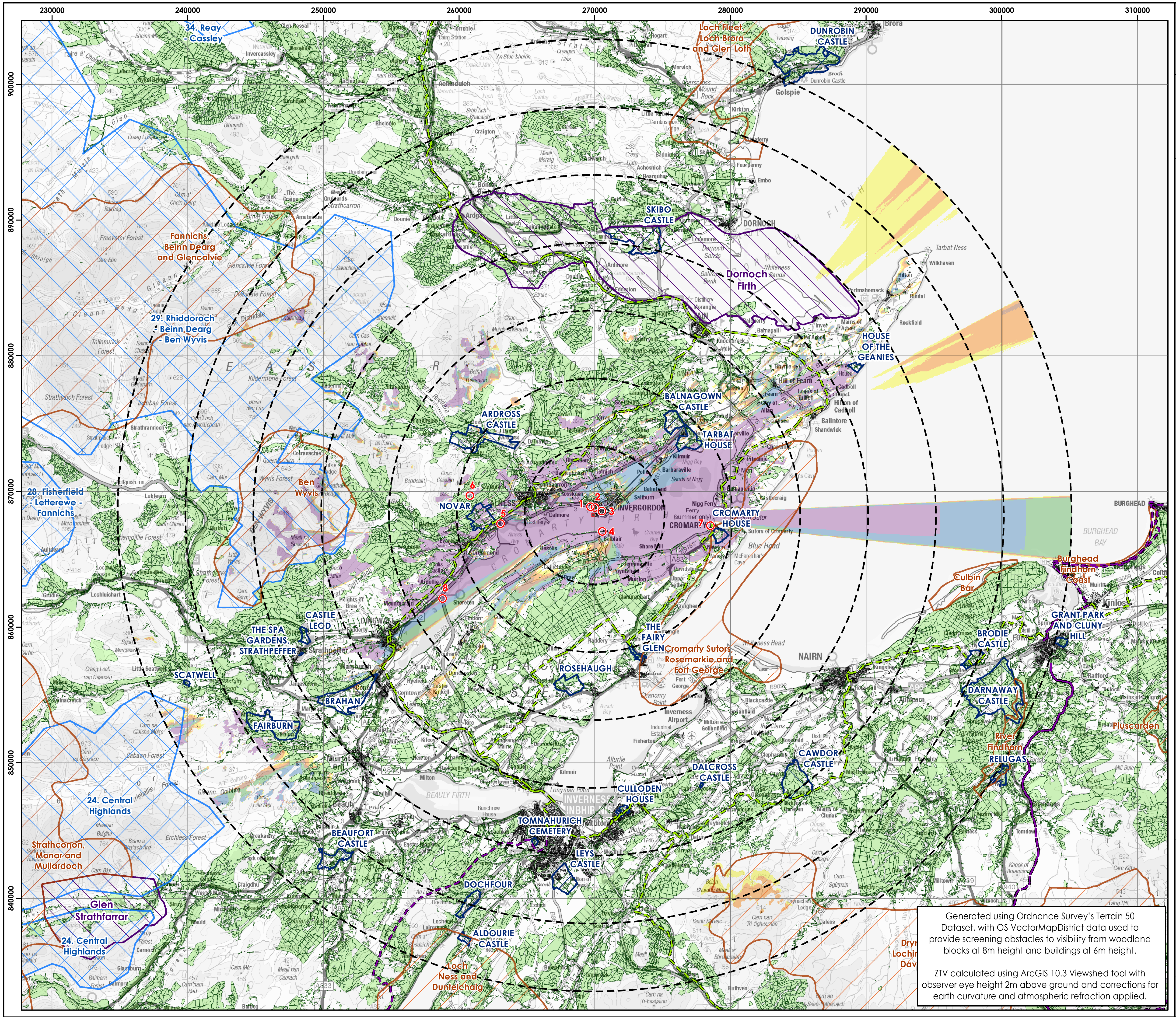
atmos CONSULTING

0 2.5 5 10
Kilometres

N

Scale @ A3:
1:260,000

26/04/2018 19401/ZV/011e
Drawn by: TH Checked by: AA Approved by: TH



Invergordon Port Phase 4

PORT OF CROMARTY FIRTH

Figure 30.16.8
Screened Zone of Theoretical Visibility
Rig and Offshore Renewables Scenarios
with Landscape Designations

Key

- Constructed Phase 3 expansion area
- Proposed Phase 4 expansion area
- 5km buffers to 35km
- Landscape Viewpoint
  - 1: B817, Invergordon
  - 2: King George Street, Invergordon
  - 3: Invergordon High Street
  - 4: Near Balblair
  - 5: A9 - Skiach
  - 6: Fryish Monument
  - 7: Cromarty Beach
  - 8: A9 - A862

Landscape Designation

- Council Landscape Designation
- Wild Land Area
- National Scenic Area
- Garden or Designed Landscape
- Long distance path
- Sustrans cycle route

Zone of Theoretical Visibility

Visibility of reclaimed land site

- 20m above reclaimed land visible
- 40m above reclaimed land visible
- 60m above reclaimed land visible
- 80m above reclaimed land visible
- 100m above reclaimed land visible
- 110m above reclaimed land visible
- Building
- Woodland

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0 2.5 5 10
Kilometres

N

Scale @ A3: 1:260,000

26/04/2018 19401/ZV/012e
Drawn by: TH Checked by: AA Approved by: TH