Salamander Offshore Wind Farm

Offshore EIA Report

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SALAMANDER

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Intertidal Report

Salamander Offshore Wind Farm

Geophysical & Environmental Survey

North Sea UK

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Abbreviations and Definitions

BAP ....Biodiversity Action Plan
BSH ....Broad Scale Habitats
EIA ....Environmental Impact Assessment
EUNIS...European Nature Information Service
GPS ....Global Positioning System
HOCI ....Habitats of Conservation Importance
H&S ....Health & Safety
INNS ....Invasive and Non-Native Species
JNCC ....Joint Nature Conservation Committee
OI..Ocean Infinity
PMF ....Priority Marine Feature
RPD...Redox Potential Discontinuity
SACFOR..Superabundant, Abundant, Common, Frequent, Occasional, Rare
SBL..Scottish Biodiversity List
SRA ....Site Risk Assessment

1. Executive Summary

As part of the reconnaissance geophysical and environmental site investigation scope for the Salamander Offshore Wind Farm (the Project), APEM Ltd were commissioned to conduct an intertidal survey at the proposed cable corridor landfall location to provide the necessary data to feed into the Environmental Impact Assessment (EIA) process.

The survey approach used Phase I and Phase II intertidal biotope mapping techniques to obtain standardised information on the presence and extent of the broad scale habitats (BSH) and habitats of conservation importance (HOCI) within the study area, including the production of biotope maps for all intertidal hard and soft substrate habitats. The Phase II methodology included the use of 20 x 20 cm quadrat sampling on soft sediments and 50 x 50 cm quadrat sampling on hard substrata to quantify the species present and further refine the biotope definitions recorded during the Phase I survey. The fieldwork was completed by a team of two surveyors during the low spring tides on the 16th and 17th of August 2022.

A total of eight biotopes were identified within the cable corridor landfall. The majority of the survey area was divided between two biotopes: 'Talitrids on the upper shore and strand-line' (LS.LSa.St.Tal; MA5211) above 'Amphipods and *Scolelepis* spp. in littoral medium-fine sand' (LS.LSa.MoSa.AmSco; MA5233), which was present along most of the middle and lower shore of the cable corridor landfall.

The northern section of the proposed cable corridor landfall included areas of large boulders, which supported macroalgal assemblages. Where the boulders were larger and more closely grouped together, they supported fucoids in a typical zonation pattern, with '*Fucus vesiculosus* on full salinity moderately exposed to sheltered mid eulittoral rock' (LR.LLR.F.Fves.FS; MA123D1) dominant on the middle shore and '*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders' (LR.MLR.BF.Fser.Bo; MA12442) on the lower shore. The more widely spaced and smaller boulders more prone to sand-scouring were assigned to '*Ulva* spp. on freshwater-influenced and/or unstable upper eulittoral rock' (LR.FLR.Eph.Ulv; MA123G) on the upper shore; '*Porphyra purpurea* and *Ulva* spp. on sand-scoured mid or lower eulittoral rock' (LR.FLR.Eph.UlvPor; MA123H) on the upper and middle shore and '*Rhodothamniella floridula* on sand-scoured lower eulittoral rock' (LR.MLR.BF.Rho; MA1245) on the lower shore. Between the boulder habitats on the middle to lower shore the biotope '*Macoma balthica* and *Arenicola marina* in littoral muddy sand' (LS.LSa.MuSa.MacAre; MA5251) occurred either as a discrete habitat or forming a mosaic with widely spaced overlying boulders supporting *F. vesiculosus*.

The species characterising the mobile sand habitats comprising most of the proposed cable corridor landfall typically have opportunistic life history strategies, with short life histories, rapid maturation and extended reproductive periods and can withstand sediment mobilisation through a combination of robustness, mobility and ability to re-position themselves within the substratum. As such, they are tolerant of disturbed environments and can recover quickly.

No Annex I habitats, Priority Marine Features (PMF), or OSPAR threatened and/or declining species or habitats were recorded during the survey. Whilst the lower shore *Fucus serratus* on eulittoral boulders biotope correlates directly with the intertidal boulder communities habitat listed in the Scottish Biodiversity List (SBL), boulders with a limited underboulder community are not included as a priority habitat based on the original UK Biodiversity Action Plan (BAP) habitat description upon which the SBL is based. None of the boulders within the survey area exhibited features of underboulder communities, most likely due to their mobility and/or sand-scouring actions of the underlying and adjacent mobile sand habitats. As such the boulders within the survey area would not constitute SBL priority habitat. No Invasive and Non-Native Species (INNS) were observed during the survey.

2. Introduction

As part of the reconnaissance geophysical and environmental site investigation scope for the Salamander Offshore Wind Farm (the Project), an intertidal survey was required at the proposed cable corridor landfall location to provide the necessary data to feed into the Environmental Impact Assessment (EIA) process. The proposed Project site is located approximately 35 km offshore of Peterhead in the northeast of Scotland and the proposed cable corridor comes ashore close to Lunderton (Figure 1). APEM Ltd were commissioned to conduct the intertidal habitat mapping survey at the proposed landfall location. A subtidal survey which collected samples for faunal, particle size and chemical analyses to characterise the subtidal seabed was conducted by Ocean Infinity and was reported in document 104052-SBE-OI-SUR-REP-ENVSURRE-A.

Figure 1 Location of the proposed Project site.

3. Methodology

3.1 Overview of survey design

The survey approach focused on Phase I and II intertidal biotope mapping based on consideration of best practice guidance, including Davies *et al*. (2001), Wyn *et al*. (2006), JNCC (2010), Saunders *et al*. (2011), Noble-James *et al*. (2018), and Natural Resources Wales (2019). The survey design aimed to obtain standardised information on the presence and extent of the broad scale habitats (BSH) and habitats of conservation importance (HOCI) within the study area including the production of biotope maps for the intertidal shore habitats.

3.1.1 Phase I

The Phase I survey was conducted across the entire cable corridor landfall to determine the distribution and extents of biotopes, biotope complexes and lifeforms present with the aim of achieving 100% coverage of the shore within the survey corridor. Any features of conservation importance including Annex I habitats, Priority Marine Features (PMF) and notable species were delineated, and any features of nearby designated sites were also noted.

All soft and hard substrates within the proposed landing site were included during the Phase I survey.

Biotopes/habitats were assigned in the field according to JNCC's National Marine Habitat Classification for Britain and Ireland: Version 04.05 (Connor *et al*., 2004), Parry (2015) and the EUNIS classification system (EUNIS, 2022).

For each habitat/biotope surveyors recorded:

- Notes relating to the biotic assemblage including key taxa present when applicable;
- Substrate type;
- Wave exposure;
- Shore type;
- Presence of rockpools;
- Anthropogenic pressures; and
- Key features of interest, including PMF.

Photographs of each habitat or feature of interest were taken and a hand-held GPS system (accuracy 3 m or better) was carried throughout the survey to accurately plot waypoints of the features and biotopes to inform subsequent mapping.

3.1.2 Phase II

In areas of soft sediment, a series of stations were sampled from each representative biotope. At each of these stations, a 20 x 20 cm quadrat was sampled to a depth of 10 cm using a spade and screened on a sieve, with species identified in the field. Sieves with 0.5 mm and 1.0 mm mesh were taken into the field, but initial testing with the 0.5 mm mesh sieve found the mesh was too fine for most of the sediment to pass through and therefore the 1 mm mesh was used for sampling. The quadrat was then dug further to c. 30 cm depth to check for the presence of larger, burrowing species occurring deeper in the sediment.

All samples were subject to a visual inspection and observations of colour, smell, depth of Redox Potential Discontinuity (RPD) layer, texture and presence of surface features (accretions, algae, fauna, etc.) were recorded. Photographs were taken of the sediment at each sample station for future reference. The location of all samples was recorded using handheld GPS.

In hard substrate areas, a 50 x 50 cm quadrat was used to determine and quantify the biota present. Data were recorded as percentage cover or on a SACFOR (Superabundant, Abundant, Common, Frequent, Occasional or Rare) abundance scale (Connor & Hiscock, 1996), as appropriate.

The aim was to sample three such stations (either quadrats or dug out areas) in each biotope, but where only small patches of a biotope were present fewer samples were taken, whereas larger areas of one biotope had more samples.

3.2 Field team and equipment details

The survey was completed by a two-person survey team. The team was led by an APEM Marine Biolabs senior marine scientist, supported by a marine scientist.

The team carried the following equipment:

- Fujifilm Finepix XP70 and Panasonic Lumix FT30 Digital cameras
- Garmin eTrex 10 handheld GPS to mark waypoints of biotope boundaries, anthropogenic pressures etc.
- A 20 x 20 cm quadrat and spade for quantitative sampling of soft sediment biotopes
- A 50 x 50 cm quadrat for sampling of hard substrate biotopes
- 1.0 mm and 0.5 mm sieves for in-situ assessment of soft-sediment fauna.
- Taxonomic field keys

3.3 Survey timing

The intertidal survey work was timed to coincide with low spring tides to allow the maximum extent of the shore within the cable corridor landfall to be surveyed. The fieldwork was completed between the 16th and 17th of August 2022. Due to the time of low water and limitations of daylight hours, work was only possible during one low tide period per day. Details of survey timings in relation to tide times, heights and sunrise times are provided in Table 1.

Table 1 Survey timings in relation to tide times, heights and sunrise

Date	Day	Sunrise time	Low tide time	Tide Height (m)	Start time
16/08/2022	Tuesday	05:34	10:26	0.4	07:00
17/08/2022	Wednesday	05:36	11:01	0.6	07:30

3.4 Health and safety (H&S)

A Site Risk Assessment (SRA) was completed by the lead surveyor in advance of the survey. This SRA was then reviewed and assessed by APEM's H&S Manager. In addition, a daily dynamic risk assessment was carried out by the lead surveyor on site prior to the commencement of any fieldwork and during the survey as required, to identify any additional H&S concerns noted on site that were not covered in the original SRA or that arose during the day.

Primary H&S concerns were the risk of becoming trapped by incoming tides and exposure risks. All staff wore appropriate Personal Protective Equipment (PPE) for survey work, including lifejackets and waterproofs to minimise exposure risks and carried a field first aid kit and throw rope.

All staff were provided with the tidal information for the survey site, including the times of sunrise and sunset for each day, and these were carried at all times. Check-in and -out calls were made to office-based staff at previously agreed times, coinciding with expected times of starting and completing work each day.

3.5 Biosecurity

As Invasive and Non-Native Species (INNS) are considered to be a major contributor to biodiversity loss, all necessary steps were taken to prevent the spread of such species into non-affected areas. APEM staff members have extensive knowledge of INNS and routinely work in accordance with standard good practice biosecurity measures to avoid their spread. Measures to prevent the spread and introduction of INNS were adhered to on site, including:

- Cleaning of equipment, clothes and boots before carrying out any work on site;
- When on or near water, equipment was drained after use and dried as far as possible;
- Clothes and boots were dried thoroughly between survey days.

4. Results

4.1 H&S incidents

There were no incidents, near misses or other H&S issues to report under APEM's H&S procedures.

4.2 Biotopes

The intertidal cable corridor landfall comprised a section of the shore approximately 1.6 km in length, and the width from the high-water mark to the low water mark ranged from 105 m in the southern section to 225 m in the northern section, covering a total area of approximately 0.22 km². The survey area was located on an east-facing shore subject to moderate wave exposure. A total of eight biotopes were recorded in the survey area. These are summarised in Table 2 with total areas of coverage and mapped in Figure 2 (North) and Figure 3 (South).

Table 2 Biotopes recorded within the intertidal cable corridor landfall

JNCC Code	Description	EUNIS Code	Area (m²)
LR.LLR.F.Fves.FS	*Fucus vesiculosus* on full salinity moderately exposed to sheltered mid eulittoral rock	MA123D1	4,859
LR.FLR.Eph.Ulv	*Ulva* spp. on freshwater-influenced and/or unstable upper eulittoral rock	MA123G	2,490
LR.FLR.Eph.UlvPor	*Porphyra purpurea* and *Ulva* spp. on sand-scoured mid or lower eulittoral rock	MA123H	16,177
LR.MLR.BF.Fser.Bo	*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders	MA12442	7,821
LR.MLR.BF.Rho	*Rhodothamniella floridula* on sand-scoured lower eulittoral rock	MA1245	2,294
LS.LSa.St.Tal	Talitrids on the upper shore and strandline	MA5211	26,641
LS.LSa.MoSa.AmSco	Amphipods and *Scolelepis* spp. in littoral medium-fine sand	MA5233	133,732
LS.LSa.MuSa.MacAre	*Macoma balthica* and *Arenicola marina* in littoral muddy sand	MA5251	8,467
LR.LLR.F.Fves.FS/ LS.LSa.MuSa.MacAre	Mosaic of the *F. vesiculosus* and *M. balthica* biotopes overlapping with one-another	MA123D1/MA5251	11,873

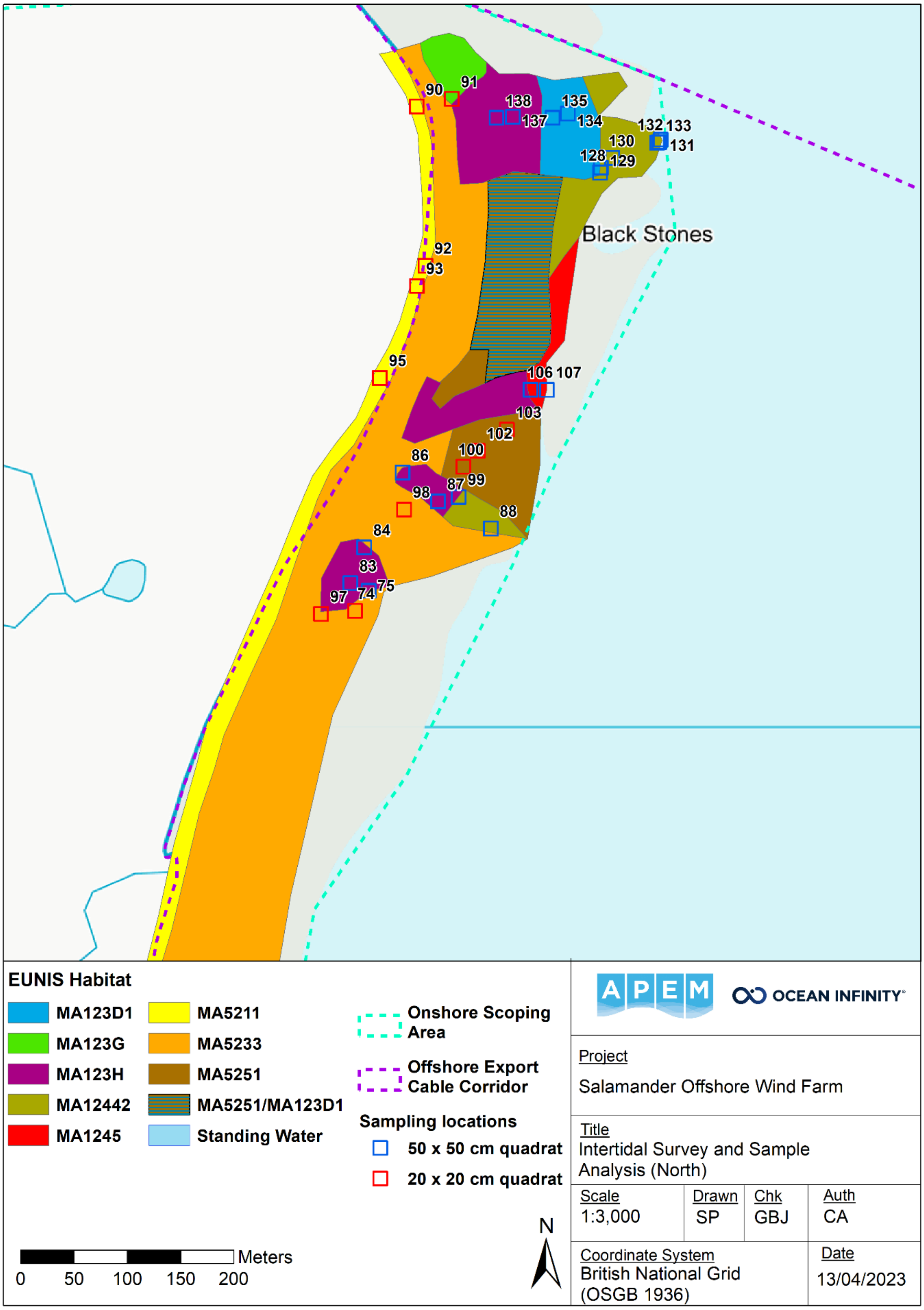

Figure 2 Biotopes recorded in the northern portion of the intertidal cable corridor landfall (Please refer to Table 2 for biotope descriptions).

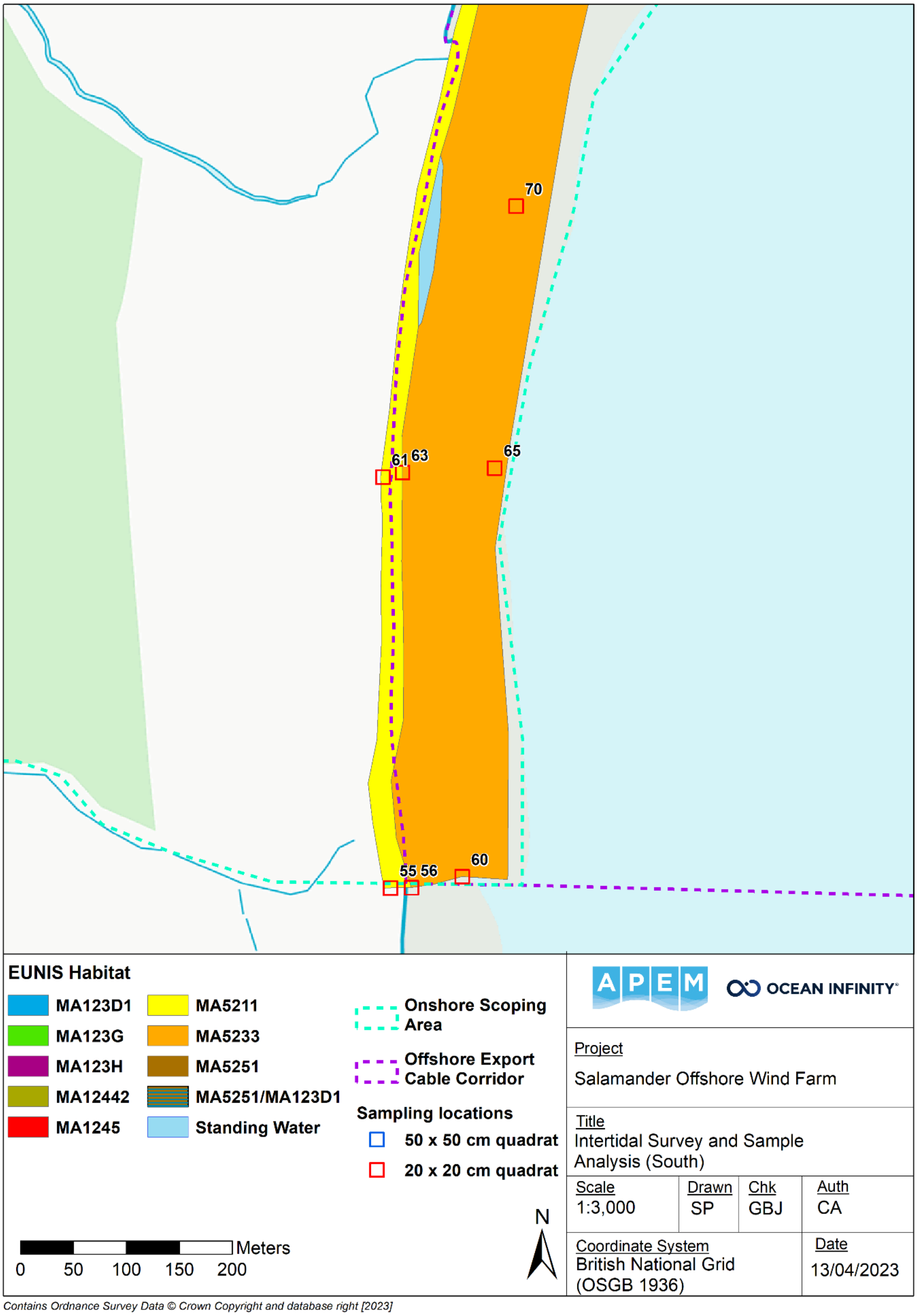

Figure 3 Biotopes recorded in the southern portion of the intertidal cable corridor landfall (Please refer to Table 2 for biotope description).

The upper shore along the entire length of the cable corridor landfall (Figure 2 and Figure 3) comprised barren sand below dune vegetation with a sparse strandline of debris and dead algae (Figure 4). Quadrat sampling in this habitat found talitirid amphipods as the only visible invertebrate fauna and it was therefore assigned to the biotope 'Talitrids on the upper shore and strand-line' (LS.LSa.St.Tal; MA5211). Within this habitat there was also evidence of anthropogenic activity in the form of shellfish creels, three of which were found on the upper shore during the survey. These may have been deposited during the stormy weather conditions in the days preceding the intertidal survey.

Figure 4 View north along the sparse strandline biotope (LS.LSa.St.Tal; MA5211) on the upper shore in the northern section of the cable corridor landfall.

Figure 5 One of the three shellfish creels found on the upper shore strandline during the survey.

The middle to lower shore across most of the cable corridor landfall consisted of clean mobile sand with low faunal abundance (Figure 6). Invertebrates recorded during quadrat sampling of this biotope included the polychaete *Scolelepis* spp., the isopod crustacean *Eurydice* spp. and the amphipod *Haustorius arenarius*, providing a good match to the standard description for the biotope 'Amphipods and *Scolelepis* spp. in littoral medium-fine sand' (LS.LSa.MoSa.AmSco; MA5233). This biotope covered the largest area of the cable corridor landfall, including much of the middle shore above the boulders in the northern section of the survey area (Figure 2) and the entire middle and lower shore of the southern portion of the cable corridor landfall, where no hard substrata were present (Figure 3).

Figure 6 View north along the middle-lower shore from quadrat 65 showing the biotope 'Amphipods and Scolelepis spp. in littoral medium-fine sand' (LS.LSa.MoSa.AmSco; MA5233).

In the southern portion of the proposed cable corridor landfall there was a large shallow pool within the LS.LSa.MoSa.AmSco biotope, high on the shore just below the strandline (Figure 7). The pool extended 165 metres along the shore and reached a maximum width of 15 metres. Sampling the water and sediment using a 1.0 mm sieve yielded no obvious fauna and this pool was therefore considered to be part of the LS.LSa.MoSa.AmSco biotope.

Figure 7 View south along the upper shore in the southern portion of the proposed cable corridor landfall showing the shallow pool within the Amphipods and Scolelepis spp. in littoral medium-fine sand (LS.LSa.MoSa.AmSco; MA5233) biotope.

The boundary between the hard and soft sediment biotopes on the middle and lower shore to the south of quadrats 74 and 97 (see Figure 8) was poorly defined, with scatterings of boulders covered with *Ulva intestinalis*, *Fucus vesiculosus* and *Fucus serratus* present on the surface of the sand (see Figure 2). These boulders were too widely spaced to be classified as a separate habitat. The southern boundary of the boulder biotope was delineated using the handheld GPS at the point where the boulders were more closely grouped and forming a distinct hard substrate biotope (Figure 8). The middle to lower shore just to the south of the boulders had numerous scattered stipes of the kelp *Laminaria digitata* (Figure 9), presumably displaced from the subtidal zone during the stormy weather in the days preceding the survey.

Figure 8 View north along the middle shore approaching the boulder habitats in the northern half of the cable corridor landfall, showing the scattering of algae-covered boulders over sand.

Figure 9 View north along the middle shore to the south of the boulder habitats in the northern half of the cable corridor landfall, showing unattached Laminaria digitata stipes.

In the northern portion of the proposed cable corridor landfall, the middle and lower shore included varying densities of large boulders supporting macroalgal assemblages. The boulders higher up the shore were more widely spaced, making them more prone to sand scour and these were dominated by the ephemeral green and red algae *Ulva* spp. and *Porphyra* spp., respectively (Figure 10). This habitat was considered to be a good match for the standard description of the biotope '*Porphyra purpurea* and *Ulva* spp. on sand-scoured mid or lower eulittoral rock' (LR.FLR.Eph.UlvPor; MA123H).

*Figure 10 Quadrat 83, sampled within the '*Porphyra purpurea *and* Ulva *spp. on sand-scoured mid or lower eulittoral rock' (LR.FLR.Eph.UlvPor; MA123H) habitat.*

The middle to lower shore sand between the boulder habitats in the northern section of the cable corridor landfall had visible lugworm (*Arenicola marina*) casts on the sediment surface at a density of between 30-50 per m², along with areas of standing water (Figure 11). Digging quadrats to try and find *A. marina* worms proved unsuccessful but did reveal an anoxic layer within 5 cm of the sediment surface (*Figure* 12). These features are all characteristic of the biotope '*Macoma balthica* and *Arenicola marina* in littoral muddy sand' (LS.LSa.MuSa.MacAre; MA5251).

Figure 11 View northeast from quadrat 100, showing Arenicola marina *casts on the sediment surface within the 'Macoma balthica and Arenicola marina in littoral muddy sand' (LS.LSa.MuSa.MacAre; MA5251) habitat.*

Figure 12 Anoxic layer visible within 5 cm of the surface of quadrat 100 in the 'Macoma balthica and Arenicola marina in littoral muddy sand' (LS.LSa.MuSa.MacAre; MA5251) habitat.

The lower shore boulders were mostly dominated by a dense covering of *Fucus serratus*, along with *Palmaria palmata* and *Ulva* spp. (Figure 13). Faunal diversity on these boulders was low, with patchy distribution of the barnacle *Semibalanus balanoides* and the limpet *Patella vulgata* on surfaces not colonised with algae (Figure 14) and the bryozoan *Electra pilosa* growing epiphytically on the *F. serratus* fronds. A single shore crab (*Carcinus maenas*) and juvenile blue mussel (*Mytilus edulis*) were recorded in quadrat 131, although other shore crabs were observed in the vicinity. This habitat was assigned to the biotope '*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders' (MA12442). However, the boulders did not exhibit features of underboulder communities that can be associated with this habitat, most likely due to the scouring activity of the underlying sand. No littorinid gastropods, anemones or sponges were recorded during the survey. There were beds of emergent *Laminaria digitata* in the shallow subtidal zone at the northernmost extent of the cable corridor landfall (Figure 15). These would most likely belong to the biotope '*Laminaria digitata* and under-boulder fauna on sublittoral fringe boulders' (IR.MIR.KR.Ldig.Bo; MB12172) but this could not be confirmed as the beds were not accessible from the intertidal zone at the lowest point of the tide.

Figure 13 Lower shore boulders with dense covering of Fucus serratus*,* Palmaria palmata *and Ulva spp. characterising the 'Fucus serratus and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders' (LR.MLR.BF.Fser.Bo; MA12442).*

Figure 14 Semibalanus balanoides *and the limpet* Patella vulgata *on lower shore boulder surface in the northern section of the cable corridor landfall.*

Figure 15 Subtidal Laminaria digitata *beds visible beyond the lowest point of the tide to the east of quadrats 131, 132 and 133.*

The lower shore in the central portion of the boulder habitat included patches of the sand-binding red algae *Rhodothamniella* spp. either beneath the *Fucus serratus* canopy or forming distinct mats interspersed with *Ulva* spp. where *F. serratus* cover was sparse (Figure 16). This was recognised as a separate biotope to the *F. serratus* dominated boulders to the north and south (see Figure 2): '*Rhodothamniella floridula* on sand-scoured lower eulittoral rock' (A1.215; MA1245). On the southern boundary of this biotope there was a large deposit of unattached algal fronds (*Figure* 17), most likely a result of the stormy conditions in the days preceding the survey.

*Figure 16 View east down shore from quadrat 106 showing the '*Rhodothamniella *floridula on sand-scoured lower eulittoral rock' (A1.215; MA1245) biotope.*

Figure 17 View south from quadrat 106 showing storm-deposited unattached algal fronds.

Between the more densely packed area of boulders at the northernmost end of the survey area and the smaller dense boulder patches further south (see Figure 2), the substrate comprised sand with *Arenicola marina* casts overlain with more sparsely distributed boulders covered with *Fucus vesiculosus* and *Ulva* spp. (Figure 18). Since neither habitat had 100% coverage this area was considered to be a mosaic of '*Fucus vesiculosus* on full salinity moderately exposed to sheltered mid eulittoral rock' (LR.LLR.F.Fves.FS; MA123D1) over '*Macoma balthica* and *Arenicola marina* in littoral muddy sand' (LS.LSa.MuSa.MacAre; MA5251).

Figure 18 Middle shore near the northern end of the survey area where sparsely distributed boulders formed a mosaic of 'Fucus vesiculosus on full salinity moderately exposed to sheltered mid eulittoral rock' (LR.LLR.F.Fves.FS; MA123D1) over 'Macoma balthica and Arenicola marina in littoral muddy sand' (LS.LSa.MuSa.MacAre; MA5251).

At the northernmost end of the survey area the more densely packed middle shore boulders supported a distinct *Fucus vesicolusus* biotope (Figure 19). These boulders were dominated by *F. vesiculosus*, along with *Ulva* spp., *Porphyra* spp. and the barnacle *Semibalanus balanoides*, forming a distinct band between the ephemeral red and green seaweeds dominant higher on the shore and the *Fucus serratus* biotope on the lower shore.

Figure 19 View north across the middle shore at the northern end of the cable corridor landfall showing the biotope Fucus vesiculosus on full salinity moderately exposed to sheltered mid eulittoral rock (A1.3131; MA123D1).

On the upper middle shore at the northernmost extent of the survey area there was an area of smaller, loose boulders and cobbles (see Figure 2). The substrate in this area appeared less stable than the larger boulders lower down the shore and therefore only supported sparse growth of *Ulva* spp. and had no visible fauna. This habitat was assigned to the biotope '*Ulva* spp. on freshwater-influenced and/or unstable upper eulittoral rock' (A1.451; MA123G).

Figure 20 View northwest across the upper middle shore at the northern end of the cable corridor landfall showing an area of smaller boulders and cobbles with sparse Ulva spp. cover assigned to the biotope Ulva spp. on freshwater-influenced and/or unstable upper eulittoral rock' (A1.451; MA123G).

4.3 Features of Conservation Importance

4.3.1 Priority Habitats

No Annex I habitats, PMF or OSPAR threatened and/or declining habitats or species were observed within the intertidal survey area.

Intertidal underboulder communities are listed on the Scottish Biodiversity List (SBL (NatureScot, 2022)), which lists plants, animals and habitats that are considered to be of principal importance for biodiversity conservation in Scotland. Intertidal underboulder communities are functional habitats and are in decline in the UK. They are also habitats for which the UK has international obligations for conservation (Council Directive 92/43/EEC).

Coastal sand dunes are also listed on the SBL. These were present above the intertidal zone and therefore were outside the scope of the current survey.

4.3.2 INNS

No INNS were observed during the survey.

5. Discussion

A total of eight biotopes were identified during the survey, although much of the survey area was characterised by clean, mobile sand with low faunal diversity. The predominant biotopes were 'Talitrids on the upper shore and strand-line' (LS.LSa.St.Tal; MA5211) above 'Amphipods and *Scolelepis* spp. in littoral medium-fine sand' (LS.LSa.MoSa.AmSco; MA5233), which comprised most of the middle and lower shore of the cable corridor landfall. The species characterising these habitats typically have opportunistic life history strategies, with short life histories, rapid maturation and extended reproductive periods and are able to withstand sediment mobility through a combination of robustness, mobility and ability to re-position themselves within the substratum. As such, they are tolerant of disturbed environments and can recover quickly.

The northern section of the proposed cable corridor landfall included areas of boulders. Where the boulders were larger and more closely grouped together, they supported fucoids in a typical zonation pattern, with *Fucus vesiculosus* dominant on the middle shore and *F. serratus* on the lower shore. The more widely spaced and smaller boulders more prone to sand-scouring supported assemblages of ephemeral red and green algae *Porphyra* and *Ulva* spp. on the upper and middle shore and the sand-binding algae *Rhodothamniella* spp. on the lower shore. Species richness remained low across all the boulder habitats, with very few algal species and low faunal abundance throughout. The absence of more mobile species such as broad-clawed porcelain crab (*Porcellana platycheles*), edible crab (*Cancer pagurus*), common starfish (*Asterias rubens*) or littorinid gastropods associated with these biotopes in the standard descriptions (Connor *et al*., 2004; EUNIS, 2022) could be partly due to the stormy weather conditions in the days preceding the survey, which may have removed them. However, the lack of sessile organisms associated with underboulder communities such as sponges, anemones and absence of more diverse red algal flora suggests that the mobility of the substratum and the effects of sand-scour from the adjacent and underlying sediment is an important factor.

Whilst the '*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders' (LR.MLR.BF.Fser.Bo; MA12442) biotope correlates directly with the Intertidal boulder communities habitat listed in the SBL, the original habitat description in the UK BAP (JNCC, 2007) upon which the SBL is based clarifies that boulders with a limited underboulder community are not included in the priority habitat, specifically excluding habitats where boulders are embedded in sediment and where boulders experience high levels of mobility and scour. None of the boulders within the survey area exhibited features of underboulder communities and as such would not constitute SBL priority habitat.

6. References

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