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Volume 7B Proposed Development (Offshore) Appendices

Appendix 4-5 Intertidal Survey Report

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Volume 7B Appendix 4-5 Intertidal Survey Report

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This document contains the following report: 'Caledonia Offshore Wind Farm Intertidal Habitat Survey' as prepared by Precision Marine Survey Limited in March 2024. For the purpose of Consent Application, the document has been retitled to: 'Volume 7B, Appendix 4-5: Intertidal Survey Report', alongside the addition of a new front cover.



Report to: GoBe Consultants Ltd

**Caledonia Offshore Wind Farm
Intertidal Habitat Survey**

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Report Title: Caledonia Offshore Wind Farm Intertidal Habitat Survey

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1. Introduction

In January 2022, as part of the ScotWind bidding round, Ocean Winds was successfully awarded an Option Agreement (granting exclusive rights) to develop an Offshore Wind Farm (OWF) within the NE4 Plan Option. It is located within the outer Moray Firth, with the southern limit of the site being approximately 38km from Banff and the north limit being 22km from Wick. A broad Offshore Export Cable Corridor (ECC) was presented in the Caledonia OWF Offshore Scoping Report, submitted to Marine Scotland in September 2022. The Offshore ECC has since been refined, with a potential landfall location identified along the Aberdeenshire coast at Stake Ness (Dallachy) to the west of Whitehills.

Precision Marine Survey Ltd (PMSL) was commissioned by GoBe Ltd to undertake a biological survey of the intertidal sediments in the vicinity of the proposed landfall options to characterise the intertidal communities, sediments and habitats within the project area. The survey aimed to utilise Phase 1 habitat mapping techniques to provide an evaluation of biotopes within the area following the UK Marine Habitat Classification (JNCC, 2022 & Connor *et al*, 2004) and highlight the occurrence and distribution of characteristic species and habitats of conservation importance. Where appropriate Phase 2 sampling in intertidal sediments using core sampling was also proposed for quantitative samples for infauna and contaminants.

1.1 Survey Area

Prior to survey the choice of landfall options was refined to a single location – Stake Ness (Dallachy) within the Cullen to Stake Ness Coast SSSI. It was proposed that three transects were utilised for phase 1 survey approximately 200m apart as shown in Figure 1.

2. Methodology

2.1 Intertidal Survey Methodology

The survey utilised a transect based Phase I intertidal habitat survey approach to identify and characterise the main biotopes and habitats present and illustrate their zonation across representative sections of intertidal habitat within the survey area. The Phase I surveys were carried out following the standardised Phase I mapping methodology as outlined in the Marine Monitoring Handbook (Davies *et al*. 2001) within procedural guidance No 3-1 (Wyn & Brazier, 2001; Wyn *et al*, 2000). Three transects were proposed for the current survey. Upon commencement of the survey it was evident that no appreciable areas of soft sediment were present at the survey transects so Phase 2 core sampling for infauna and contaminants was not undertaken.

2.1.1 Phase I Survey

Due to the nature of the foreshore which comprised of a complex mosaic of rocky platforms, angular bedrock ridges and large boulder, traversing the intertidal was quite difficult (and time consuming) so Phase I survey was primarily targeted to habitats along the transects whilst noting characteristic biotopes immediately adjacent to the transects as required. Provisional survey transects were modified slightly as required to allow safe access down the foreshore to low water. A systematic route was surveyed along the transects within the survey area to maximise tidal exposure during survey. The distribution of main habitats and biotopes were recorded from high water to mean low water as tidal conditions allowed. Boundaries between the main habitats/biotopes were recorded along each transect along with other information such as species composition, sediment type and the approximate extent of sub-features or biotopes of conservation importance. Due to timings of the low water periods and agreed access arrangements with the landowner (Seafield Estate), surveys were carried out from low water to high water at each transect. The general distribution of biotopes/habitats in adjacent areas were assessed visually and noted in survey logs as time allowed.

To assist in mapping, each transect was located in the field using a Spectra Precision MobileMapper 100 SBAS/dGPS enabled GPS logger which provides sub metre accuracy and had the survey transects and site maps/boundaries stored in memory and viewable on screen. A survey recording database was derived using PC software and input into the GPS loggers to assist in data entry which was backed up by hand written notes. A back-up GPS logger was also used on each survey to prevent possible data loss. Each transect followed the transect line down the shore (and adjusted where necessary to allow for obstructions, inaccessible terrain, areas of standing water or other obstacles) and extended to the lowest level exposed at low water for a given transect.

Within each distinct habitat, the substratum and dominant/characteristic species were identified using a rapid *in-situ* surface inspection to assess sediment type and biological features (e.g. dominant or characteristic epibiotic algal/faunal communities). At each transect, photographs of characteristic biotopes/habitats within each habitat were also taken. Photographs of the wider area, individual habitats and characteristic species (where visible) were taken at each survey transect and cross-referenced with the survey notes and GPS positions. Supplementary information was also recorded such as any indication of natural or anthropogenic impacts and the presence of Annex I and Scottish Priority Marine Feature (PMF) habitats/ species.

Upon commencement of the survey, the survey team was notified of an outbreak of avian influenza inshore from the coast and consequently any survey PPE and equipment (e.g. boots) and vehicles were decontaminated following the client avian influenza method statement. It was also requested that any dead birds noted during survey were avoided and details recorded with the landowners, client and statutory authorities notified as required. Intertidal survey was undertaken from the 4th to the 6th August 2023.

2.2 Survey Schedule & Access

All survey staff had extensive experience of using the standard Phase I mapping benthic survey methodologies. Following standard PMSL Health & Safety policy all survey staff wore appropriate PPE (lifejackets, wet weather gear and steel toe-capped safety wellingtons) and intertidal survey staff carried navigation instruments (compass/GPS), whistle, mobile phone and VHF radio. Following risk assessment prior to the survey all staff were made aware of tidal constraints within the survey area and operational windows identified. Due to timings of the low water periods (and agreed access arrangements with the landowner) the intertidal surveys at each transect were commenced prior to the morning low water with transects mapped up the shore from low to high water taking into account tidal conditions and timings of the flood tide. The survey transects were accessed from Upper Dallachy Farm following agreement with the landowner.



Figure 1. Project area and proposed survey transects.

3. Results

3.1 Phase I habitat survey

3.1.1 East Transect

At low water on bedrock and boulder habitat which extended into the shallow sublittoral, the rocky habitats were characterised by a dense kelp bed (IR.MIR.KR.Ldig) with abundant *Laminaria digitata*. Calcareous pink encrusting algae were common or abundant on the rock under the kelp along with *Mastocarpus stellatus* (abundant to common) and occasional barnacles including *Semibalanus balanoides* and limpets (*Patella* spp.). *Fucus serratus* and filamentous green algae were also recorded along with occasional red algae including *Palmaria palmata* and *Lomentaria* sp. Sponges and Bryozoa were also occasionally present. The IR.MIR.KR.Ldig biotope recorded here may potentially grade into IR.MIR.KR.Lhyp or other kelp biotopes beyond low water into infralittoral habitats.

On more elevated rock above the kelp was a rather patchy community with frequent (albeit variable) *Fucus serratus* and common (or abundant) *Semibalanus balanoides* and limpets (common) and *Littorina* spp. Frequent red algae were also recorded including *Mastocarpus stellatus*, occasional *Porphyra* sp. and *Osmundea* sp. in addition to patchy *Palmaria palmata* or *Phycodrys rubens*, *Ulva intestinalis* and *Chorda filum*. Occasional *Laminaria digitata* were also present and small clumps of *Himanthalia elongata* were also recorded on the low shore fringe of this habitat which could potentially qualify as the *Himanthalia* biotope (LR.HLR.FR.Him). This habitat continued up the shore with barnacles and limpets becoming more dominant on elevated rock (with patches of the biotope LR.HLR.MusB.Sem.FvesR or LR.HLR.MusB.Sem.Sem) whilst fucoids were more dominant on less elevated rock/boulder.

Whilst *Fucus vesiculosus* was frequently present *Fucus serratus* was generally the dominant fucoid and this habitat is probably characterised by an intermediate variant of LR.HLR.MusB.Sem.FvesR and LR.MLR.BF.Fser.R. Other green algae were also present occasionally in less elevated areas or at the edge of pools (including rare clumps of *Ascophyllum nodosum* and other algal species such as *Leathesia difformis*). This habitat was also interspersed with rockpools (LR.FLR.Rkp.FK) with *Fucus serratus* and *Laminaria digitata* common (also occasionally *Saccharina latissima*) whilst *Halidrys siliquosa*, *Corallina officinalis*, filamentous red and green algae was frequent or common along with occasional *Nucella* sp. *Littorina* spp. and anemones.



Figure 2. Low shore photographs (East transect)

Higher up the low to mid shore this habitat graded into a similar barnacle dominated biotope (with *Semibalanus balanoides* common or abundant along with frequent *Patella vulgata*) and whilst *Fucus vesiculosus* was the more common furoid there was a less diverse algal community than lower down the shore (although red filamentous algae are still occasionally present along with occasional *Osmundea* sp. or *Mastocarpus stellatus* in crevices). This habitat appears to be a variant of LR.HLR.MusB.Sem.FvesR interspersed (or transitional with) the biotope LR.MLR.BF.Fser.R in less elevated areas.



Figure 3. Mid shore photographs (East transect)

In adjacent habitats more elevated ridges of bedrock were present which were dominated by barnacles. Such habitats tended to exhibit a much-reduced algal community although patches of *Fucus vesiculosus* were recorded (particularly around rockpools) but probably not in sufficient quantities to qualify as separate distinct biotopes. As such these habitats are likely

to correspond to the biotope LR.HLR.MusB.Sem.Sem. This biotope continued through the mid shore interspersed with occasional rock pools including furoid dominated LR.FLR.Rkp.FK pools with barnacle coverage decreasing higher up the shore. In adjacent habitats to the transect, deeper gullies were often present and were characterised by Dense *Fucus serratus* and *Laminaria digitata* which correspond to the biotopes LR.MLR.BF.Fserr (or Fserr.R) or IR MLR.KR.Ldig.

Above this zone on more elevated upper mid shore bedrock platforms and ridges/boulder or cobble, a less diverse community was present. Barnacles such as *Semibalanus* were much less frequent or patchy (rare or present) whilst Limpets and *Littorina* spp. were occasionally recorded. Fucoids such as *Fucus spiralis* and *Pelvetia canaliculata* were patchily distributed throughout this section of the shore but were generally frequent to common and varied in coverage depending on elevation. More elevated ridges or bedrock tended to be dominated by *Pelvetia canaliculata* whilst less elevated bedrock near rockpools had less *Pelvetia canaliculata* whilst *Fucus spiralis* was more common along with the barnacle *Semibalanus balanoides* and the limpet *Patella vulgata*. This area of the transect appears to form a rather intermediate mosaic of LR.LLR.F.Pel and LR.LLR.F.Fspi (or perhaps LR.MLR.BF.FspiB). This habitat was also interspersed by somewhat less diverse rock pools with occasional *Fucus serratus* and *Ascophyllum nodosum* and frequent *Halidrys siliquosa* along with a variety of red/green filamentous or foliose algae (LR.FLR.Rkp.FK). Shallower pools were characterised by *Corallina officinalis* and green/red filamentous algae with *Littorina* spp., limpets or *Nucella* sp. and occasional patches of *Spirorbis* sp. on adjacent rock/cobble (LR.FLR.Rkp.Cor).

The lower section of this habitat included more *Fucus spiralis* along with barnacles, limpets and *Littorina* spp. particularly in close proximity to the larger, more diverse rockpools. Such habitats showed some resemblance to the biotope LR.MLR.BF.FspiB. Less diverse *Fucus spiralis* communities with fewer barnacles was more common recorded in this area and particularly higher up the shore which more closely resembled the biotope LR.LLR.F.Fspi. Further along the transect towards high water the algal community was increasingly characterised by *Pelvetia canaliculata* (occasional to common) whilst *Fucus spiralis* gradually reduced in coverage. Barnacles were virtually absent in these upper shore areas although occasional *Patella vulgata* were still present. The bedrock ridges and boulder, cobble or broken rock found within this upper shore habitat generally corresponded to a rather sparse or impoverished variant of LR.LLR.F.Pel.

Rockpools were widely interspersed through this habitat but were either rather barren (LR.FLR.Rkp) or characterised by a rather sparse *Fucus spiralis* and filamentous green algae community with calcareous red algae whilst *Littorina* spp. and *Patella vulgata* were also present (occasional to frequent). These rock pools are considered a rather impoverished variant of LR.FLR.Rkp.Cor. Pools higher up the shore in this zone tended to be even more impoverished with only occasional filamentous green algae (often with some sand or gravel on the base of the pool) and correspond to the biotope LR.FLR.Rkp.G. Elevated bedrock ridges adjacent to this section of the upper shore exhibited progressively less coverage by *Pelvetia canaliculata* and were characterised by lichens (LR.FLR.Lic) notably yellow lichens (LR.FLR.Lic.YG) or occasionally black lichen (LR.FLR.Lic.Ver). On the extreme upper shore, exposed bedrock and boulder were characterised primarily by yellow lichens (LR.FLR.Lic.YG)

with patches of grass appearing between the rock/boulders around (and above) Extreme High Water Springs (EHWS).





Figure 4. Upper shore photographs (East transect)

3.1.2 Central Transect

In the Central Transect on the low shore above low water, bedrock and boulder habitats were characterised by kelp, e.g. IR.MIR.KR.Ldig with notable taxa including *Laminaria digitata* which was common along with calcareous encrusting red algae on the rock along with frequent barnacles (predominantly *Semibalanus balanoides*) and limpets (*Patella vulgata*). Foliose or filamentous red and green algae were also occasionally present along with frequent *Fucus serratus*, occasional *Mastocarpus stellatus*, *Palmaria palmata* or *Phycodrys rubens* and frequent *Osmundea* sp. Denser kelp beds extended out into the shallow sublittoral and on exposed rock *Fucus serratus* was also common along with *Saccharina latissima* and *Mastocarpus stellatus*. It is likely that IR.MIR.KR.Ldig extends further offshore (possibly with other kelp biotopes; e.g. IR.LIR.K.Slat.Ldig) and may grade into *Laminaria hyperborea* communities.

More elevated or exposed rock and boulder at the low shore were characterised by abundant *Semibalanus balanoides* with the Limpet *Patella vulgata* also common along with a variety of algal species including occasional or frequent *Osmundea* sp., filamentous green algae and occasional *Himanthalia elongata* and *Porphyra* sp. *Fucus vesiculosus* was common whilst *Fucus serratus* was occasional or Frequent and this habitat likely forms a variant of the biotope LR.HLR.MusB.Sem.FvesR (or possibly LR.MLR.BF.FvesB) which grades into LR.MLR.BF.Fser.R in adjacent less elevated habitats with higher abundances of *Fucus serratus* but lack Kelp. For example, deeper gullies running down to low water alongside the transect were often dominated by abundant *Fucus serratus* and occasional *Ascophyllum nodosum* along with a variety of red or green filamentous algae and *Osmundea* sp. Quite high densities of kelp were often present in areas of the deeper low shore gullies (IR.MIR.KR.Ldig).

Larger rock pools interspersed within this LR.HLR.MusB.Sem.FvesR habitat were characterised by furoids and kelp (LR.FLR.Rkp.FK) and included frequent to common furoids, occasional *Laminaria digitata*, frequent filamentous green and red algae, *Corallina officinalis* and calcareous encrusting red algae and occasional *Mastocarpus stellatus* and *Osmundea* spp.

Further up the shore a slightly less elevated area of bedrock was present in which *Fucus serratus* became the dominant furoid and generally common or abundant (albeit with *Fucus vesiculosus* common on more elevated rock or boulder) whilst *Semibalanus balanoides* was commonly recorded and *Patella vulgata* and *Littorina* spp. were frequent to common. This habitat was probably a less diverse variant of LR.MLR.BF.Fser.R recorded elsewhere on the lower shore and within the deeper gullies running down the shore adjacent to the transect.

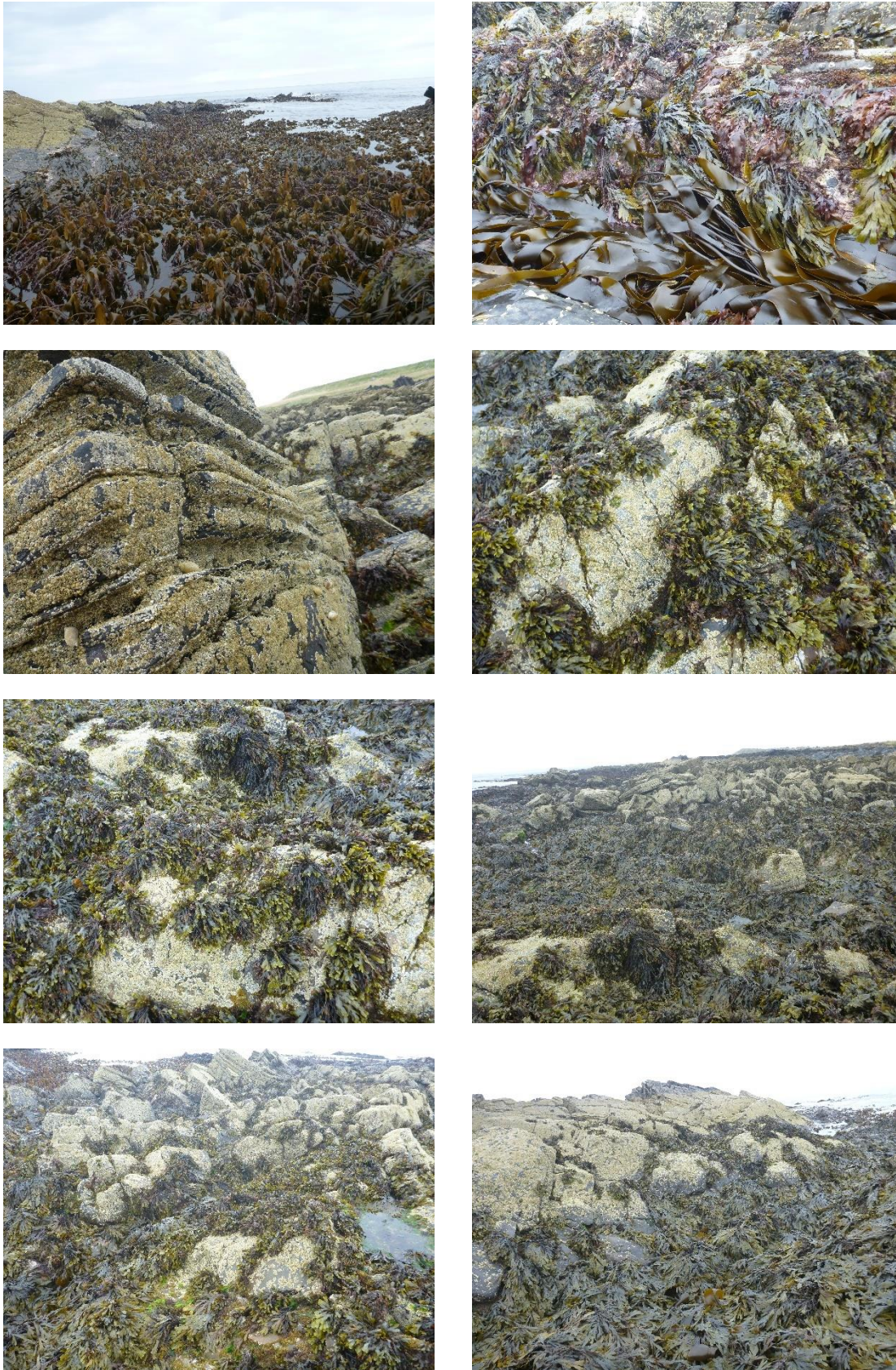


Figure 5. Lower shore photographs (Central transect)

Further up the shore and on more elevated rock/boulder a similar community was present but with more abundant barnacles and patches of *Fucus vesiculosus* and occasional *Mastocarpus stellatus* or *Osmundea* sp. *Patella vulgata* was common and frequent *Littorina* spp. were also recorded. This rather intermediate mid shore habitat of probably falls into LR.HLR.MusB.Sem.FvesR (or possibly LR.MLR.BF.FvesB). Interspersed within this habit were rockpools characterised by *Corallina officinalis* and red/green filamentous algae and *Mastocarpus stellatus*, *Osmundea* sp. and Limpets (LR.FLR.Rkp.Cor.Cor).

On the mid shore, similar exposed bedrock and boulder habitats were recorded which graded into a reduced fucoid community (with less algae overall) and characterised primarily by barnacles and limpets (LR HLR.MusB.Sem.Sem) although small clumps of *Fucus vesiculosus* or *Fucus spiralis* were occasionally recorded. This habitat was also interspersed with shallower *Corallina* dominated rockpools LR.FLR.Rkp.Cor and deeper, larger pools with fucoids such as *Fucus serratus* (occasional) and *Halidrys siliquosa* along with variety of red/green filamentous or foliose algae (LR.FLR.Rkp.FK).

Further up the shore or on more elevated areas within the LR HLR.MusB.Sem.Sem habitat rock pools tended to be more impoverished with a reduced algal community (LR.FLR.Rkp or LR.FLR.Rkp.G).





Figure 6. Mid shore photographs (Central transect)

Higher up shore on rocky ridges towards the upper shore the barnacle community gradually declined and a relatively sparse *Pelvetia canaliculata* community was present (occasional to frequent) in which barnacles were rare and *Patella vulgata* occasional to frequent. This habitat was considered a rather sparsely populated variant of LR.LLR.F.Pel (or possibly an impoverished LR.MLR.BF.PelB). Rock pools in this habitat tended to be rather impoverished examples of LR.FLR.Rkp.Cor or LR.FLR.Rkp.G with the latter more prevalent forward the upper shore and characterised primarily by *Ulva intestinalis* and other filamentous green algae (e.g. *Cladophora* spp.). Cobbles or small boulder adjacent to rock pools in this area occasionally had higher numbers of *Spirorbis* spp. tubes and occasional *Spirobranchus* spp. tubes.

This habitat continued to the upper shore until it was replaced by upper shore bedrock ridges and boulder colonised by yellow, or in some areas black lichen (LR.FLR.Lic.YG and LR.FLR.Lic.Ver) interspersed with occasional barren rock pools (LR.FLR.Rkp). Above this habitat on the extreme upper shore (and extending above EHWS) was a band of barren shingle/cobble and broken rocks (LS.LCS.BarSh) with occasional cobble or rock with yellow lichen.

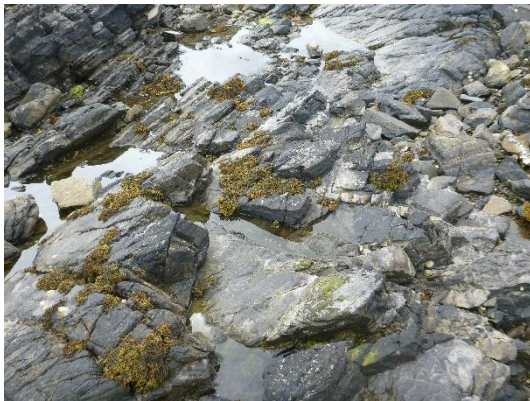


Figure 7. Upper shore photographs (Central transect)

3.1.3 West Transect

At low water on the West transect, the lower end of the transect was predominantly submerged, perhaps due to strong onshore winds. Dense kelp beds were visible in the water or on elevated fringing rocks which appeared to include *Laminaria digitata* (and occasionally *Saccharina latissima*). The seabed in very shallow water close to the shore was characterised by exposed bedrock, cobble and some gravel/stones with occasional *Fucus serratus*, *Chorda filum*, filamentous green algae including *Ulva intestinalis* and red filamentous or foliose algae. A single exposed boulder in the water was covered in *Saccharina latissima* and encrusting pink algae along with *Mastocarpus stellatus*, *Corallina officinalis* and occasional limpets and barnacles. It is likely that the submerged end of the transect includes similar kelp biotopes to the other survey areas to the east (e.g. IR.MIR.KR.Ldig) but may include other kelp or fucoid biotopes. Immediately adjacent to low water was a narrow band (1-2m wide) of cobble and pebbles/gravel (LS.LCS) overlaying rock which fronted elevated bedrock and boulder. This narrow band of coarse sediment was relatively barren aside from small patch of *Ulva intestinalis* and *Chorda filum*. Elevated bedrock and boulder at low water was heavily colonised by barnacles including *Semibalanus balanoides* (abundant or common) and *Patella vulgata* (common). This habitat corresponds to the biotope LR.HLR.MusB.Sem.Sem which extends further up the shore. At the base of the bedrock adjacent to the cobble and gravel was a very narrow band of algal taxa including *Ulva intestinalis* (common) with occasional *Mastocarpus stellatus*, red filamentous algae, *Corallina officinalis* and *Fucus serratus*. A few small patches of *Himanthalia elongata* and *Chorda filum* were also present.

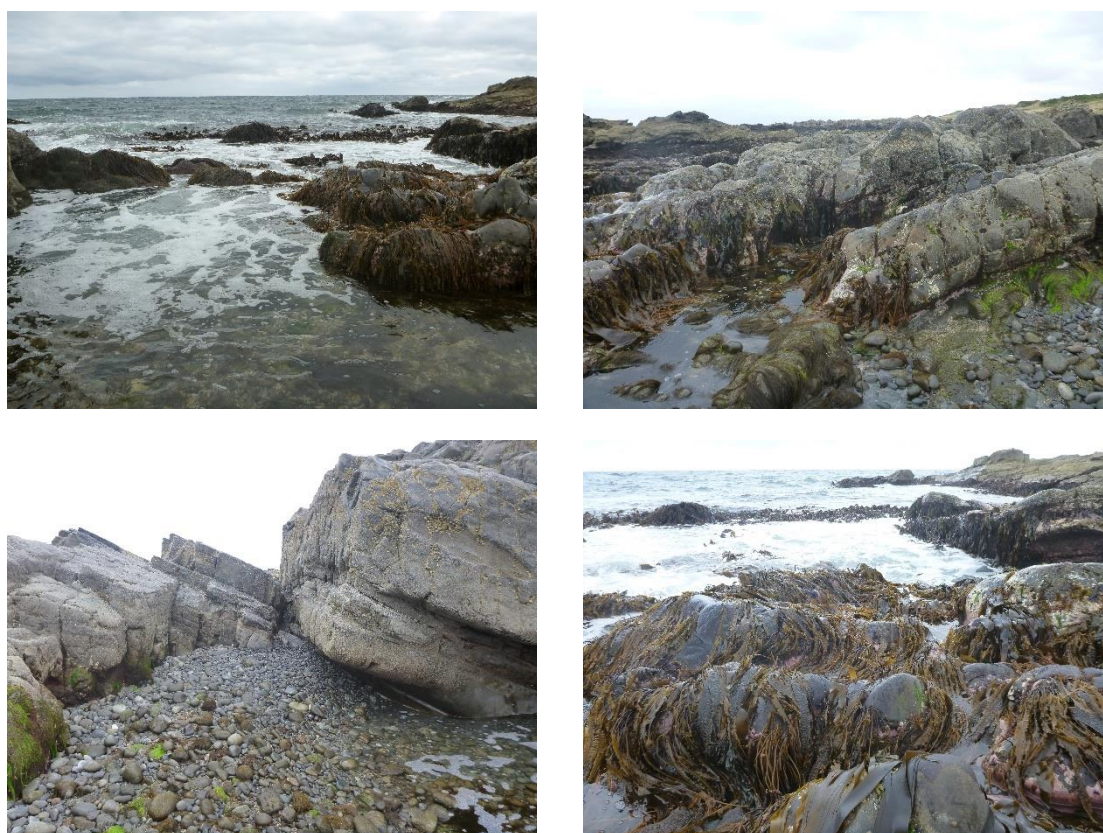


Figure 8. Low shore photographs (West transect)

On the main elevated bedrock and boulder ridges on the low shore a rather variable barnacle and limpet dominated community was present which extended up to the mid shore, often interspersed with rockpools. This habitat was populated by common to abundant barnacles (*Semibalanus balanoides*) and *Patella vulgata* (frequent to common) along with *Littorina* spp. Occasional small clumps of stunted fucoids were sporadically present e.g. *Fucus vesiculosus* (or on more elevated areas *Fucus spiralis*) whilst in crevices *Corallina officinalis* or red/green filamentous algae were sometimes present rare to occasional. This habitat was considered to be the biotope LR.HLR.MusB.Sem.Sem but may include impoverished or transitional variants of LR.HLR.MusB.Sem.FvesR.

Rockpools in this area included kelp and *Halidrys siliquosa* along with filamentous/foliose green and red algae and *Ulva intestinalis* (LR.FLR.Rkp.FK). The barnacle/limpet dominated habitats continued up through the mid shore across bedrock slabs and boulder with abundant *Semibalanus balanoides*, frequent (or common) *Patella vulgata* and occasional *Littorina* spp. Occasionally, sparse or patchy clumps of *Fucus vesiculosus* (or more rarely *Fucus serratus*) were recorded in this area usually in less elevated habitats or near rock pools. Rock pools in this section of the foreshore were characterised by *Ulva intestinalis* and occasional *Corallina officinalis* and red/green filamentous algae and *Actinia* sp. (LR.FKR.Rkp.Cor).

On the mid to upper shore angular bedrock ridges and boulder habitats were characterised by a more impoverished/transitional variants of LR.HLR.MusB.Sem.Sem in which barnacles and limpets were occasional to frequent along with occasional *Littorina* spp. Any fucoids present were very patchy and generally very sparse whilst at the upper shore end of this habitat the tops or more elevated bedrock ridges occasionally included small sparse clumps of *Pelvetia canaliculata*.

This area was interspersed with rockpools (LR.FKR.Rkp.Cor and LR.FKR.Rkp.FK) characterised by calcareous pink algae, *Corallina officinalis*, occasional *Fucus serratus*, *Halidrys siliquosa*, green and red filamentous algae and frequent barnacles, limpets. and *Littorina* spp. Flatter areas of bedrock often had crevices with standing water and shallow pools colonised solely by calcareous encrusting algae and occasionally *Corallina officinalis*.



Figure 9. Mid shore photographs (West transect)

On the upper shore, angular bedrock ridges and platforms were characterised by a rather patchy and often sparse *Pelvetia canaliculata* community (occasional to frequent) with occasional patches of *Fucus spiralis* and *Patella vulgata* also present whilst barnacles were sparse or absent. This habitat has been classified as a rather impoverished variant of LR.LLR.F.Pel (possibly interspersed with small areas of LR.LLR.F.Fspi). Rockpools in this habitat tended to be characterised by abundant filamentous green algae including *Ulva intestinalis* and others e.g. *Cladophora* spp. (LR.FKR.Rkp.G) and exposed rock with filamentous green algae and *Ulva intestinalis* adjacent to pools could include small scale examples of biotope LR.FLR.Eph.Ent. This habitat extends to the top of the shore and whilst *Pelvetia canaliculata* was often frequent (or sometimes common) it was very patchy and decreased in abundance up the shore towards high water.

Toward the upper end of this sparse LR.LLR.F.Pel biotope more elevated bedrock ridges adjacent to the transect start to be colonised by yellow lichen (LR.FLR.Lic.YG). At the very top of the shore was a band of boulders and exposed bedrock characterised solely lichens - primarily yellow lichen (LR.FLR.Lic.YG) but occasionally black lichens were also present (LR.FLR.Lic.Ver). Above this area around (and above) EHWS was a band of barren cobbles, stones and slates with boulder with no obvious fauna/flora (LS.LCS.Sh.BarSh).





Figure 10. Upper shore photographs (West transect)

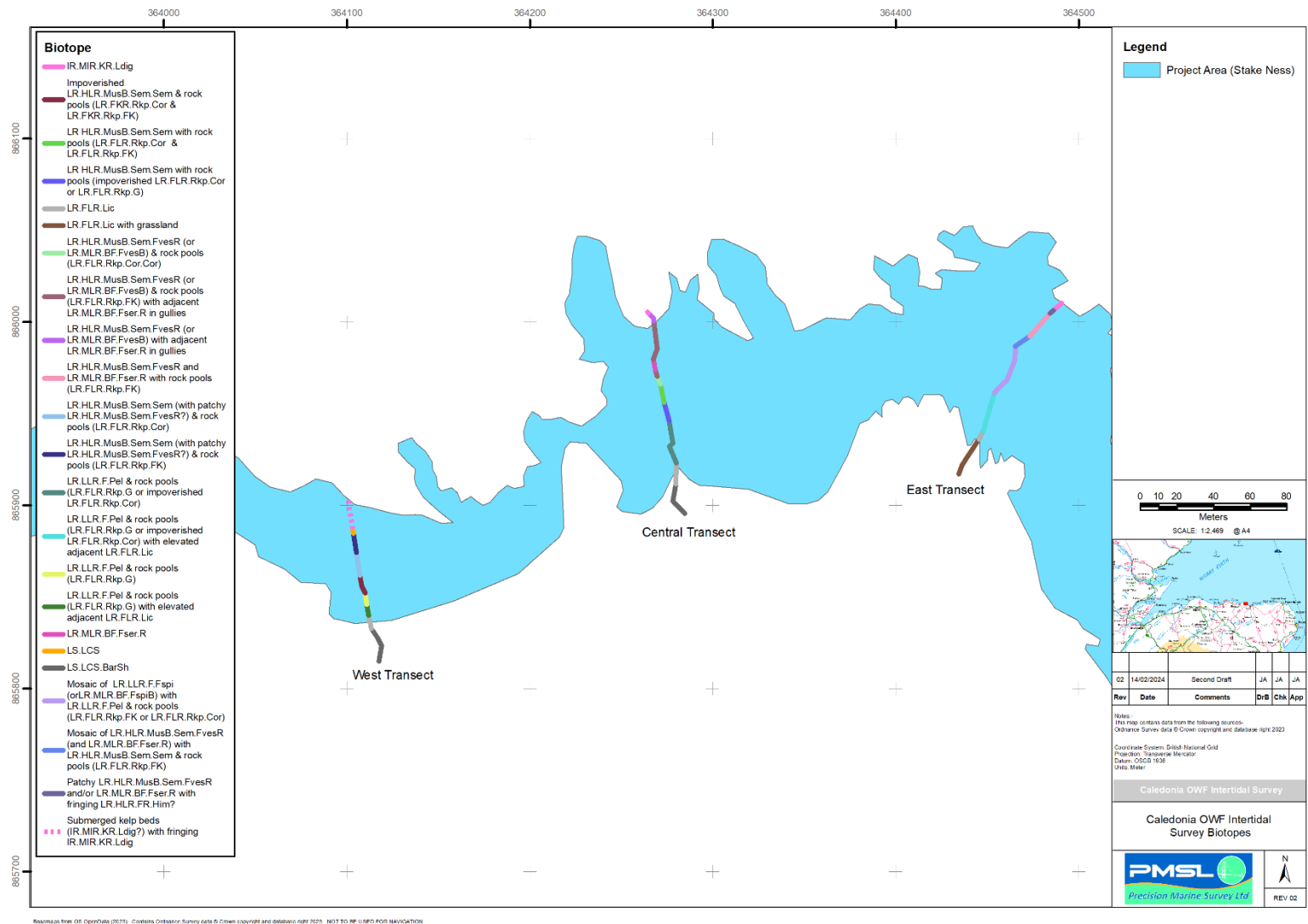


Figure 11. Biotope distribution at survey transects.

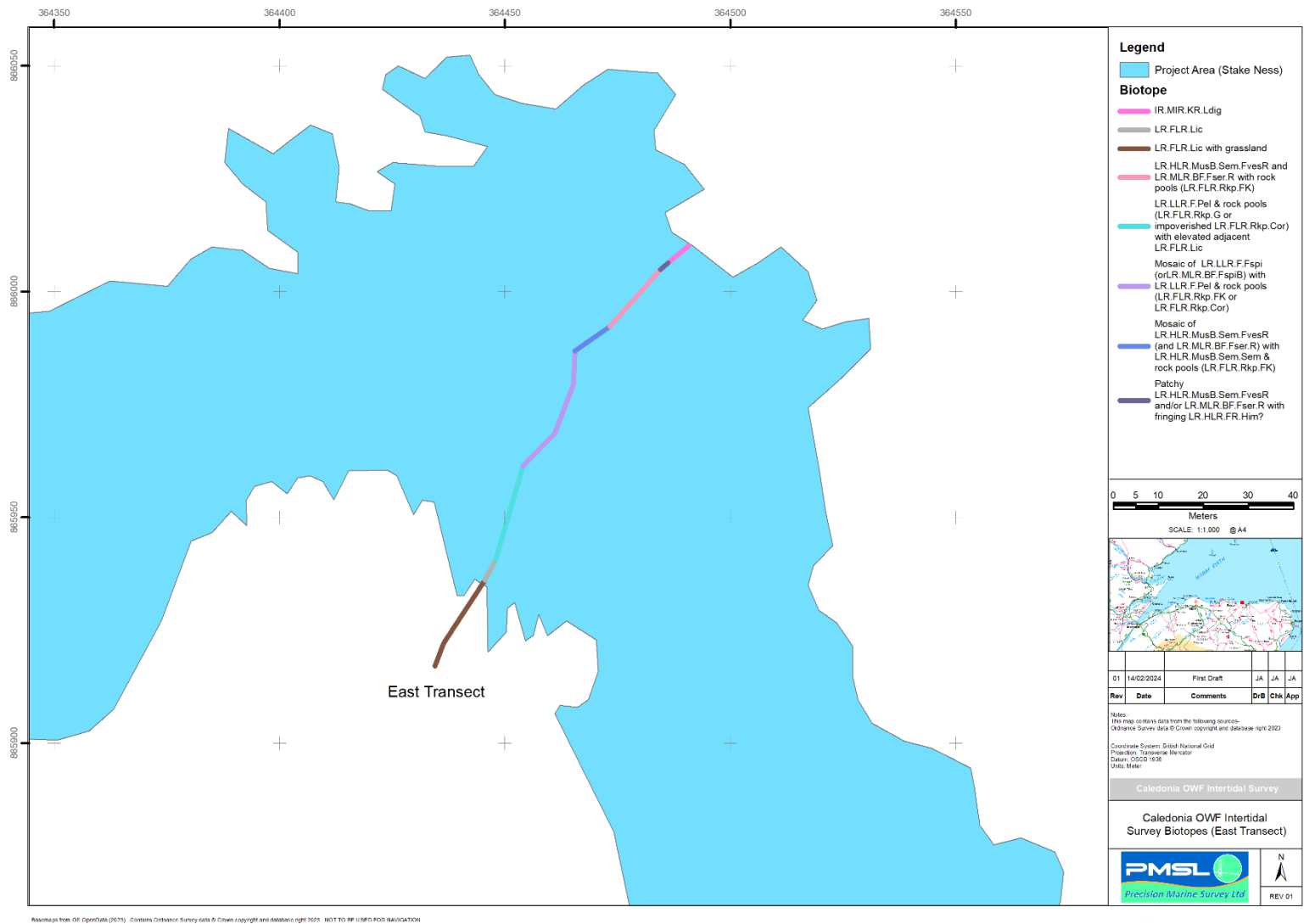


Figure 12. Biotope distribution at the East transect.

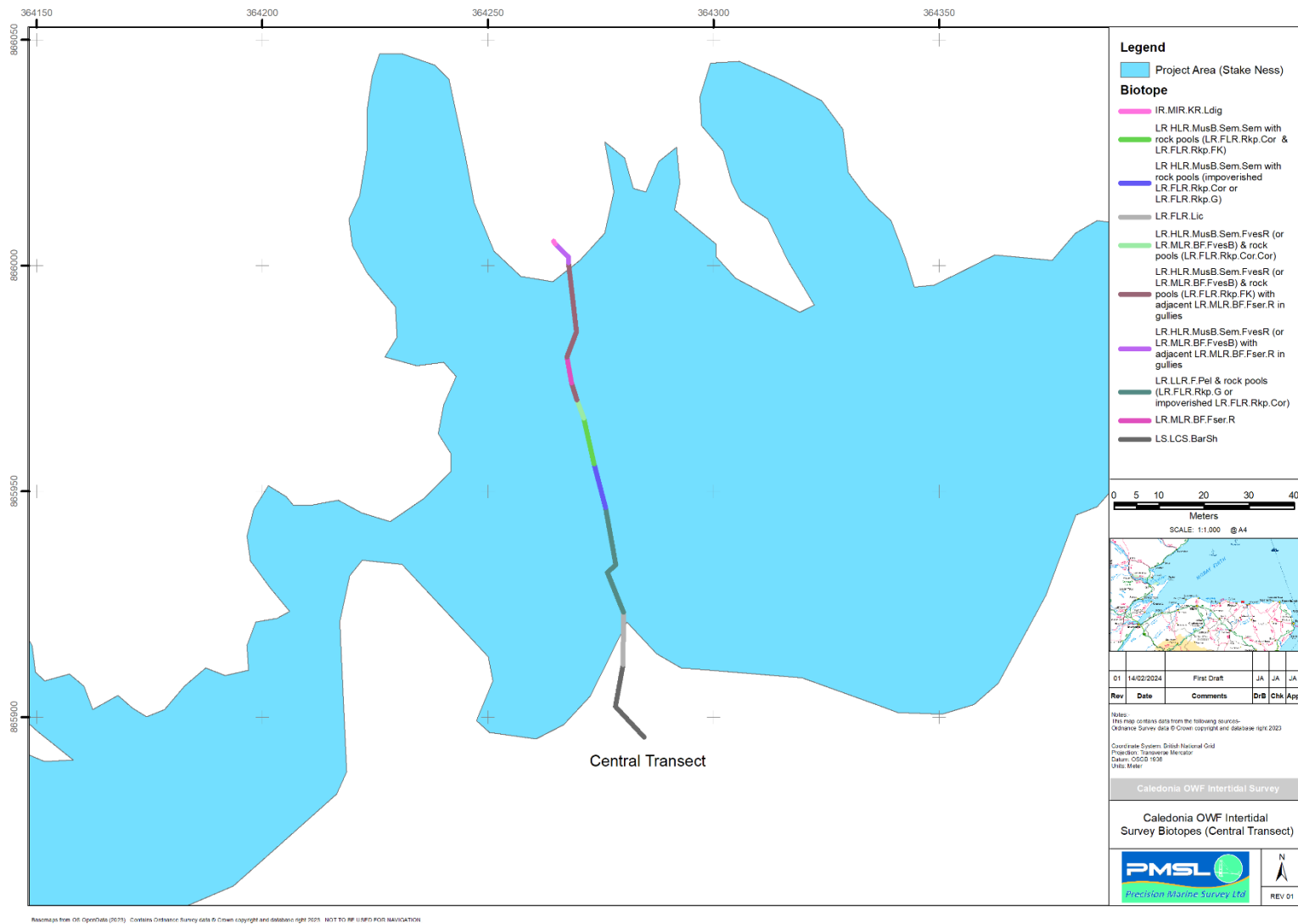


Figure 13. Biotope distribution at the Central transect.

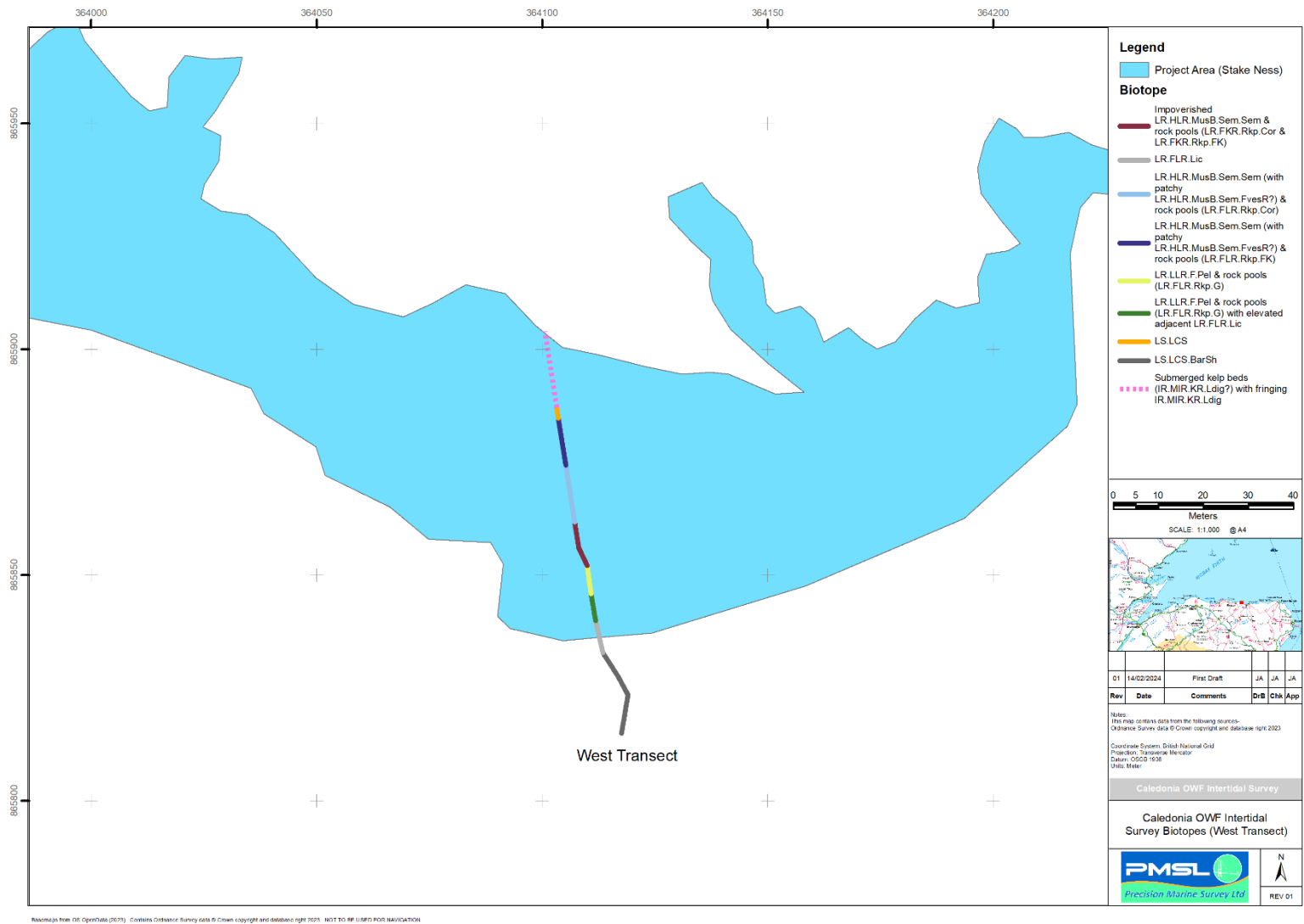


Figure 14. Biotope distribution at the West transect.

4. Conclusions

The rocky habitats in the vicinity of the Stake Ness landfall location are characterised by a structurally complex combination of bedrock, boulder and angular bedrock ridges and gullies. This rather complex topography is reflected in the biological communities present along the survey transects which includes a variety of predominantly furoid or barnacle dominated communities. These habitats were often characterised by intermediate or transitional examples of rocky shore communities and sometimes formed mosaics comprising of several biotopes (often with rapid changes to biotopes in habitats immediately adjacent to the transects) which reflects the rapid changes in elevation/topography and exposure within the survey area. Despite the inherent complexity of the observed rocky shore communities, a broadly similar range of biotopes was recorded across all three transects. The extreme low shore was typically characterised by kelp biotopes such as IR.MIR.KR.Ldig whilst low to mid shore habitats included a range of furoid and/or barnacle dominated biotopes such as LR.HLR.MusB.Sem.Sem, LR.HLR.MusB.Sem.FvesR (or possibly LR.MLR.BF.FvesB) and LR.MLR.BF.Fser.R with such habitats often interspersed with rock pools (typically LR.FLR.Rkp.Cor and LR.FLR.Rkp.FK).

On the mid to upper shore more impoverished barnacle communities were often present grading into rather sparse or intermediate mosaics of communities associated with the algae *Pelvetia canaliculata* or *Fucus spiralis* (e.g. LR.LLR.F.Pel or LR.LLR.F.Fspi) often with more impoverished rock pools populated by filamentous green algae (LR.FLR.Rkp.G). The upper extreme upper shore tended characterised by lichens predominantly LR.FLR.Lic.YG or occasionally LR.FLR.Lic.Ver with a band of barren rock and stones/cobble (LS.LCS.Sh.BarSh) often present at (or above) high water. The West transect tended to be the least diverse in terms of the range of biotopes and algal communities present although in general terms all three transects exhibited a broadly similar gradation of littoral rocky shore communities which are typical for moderately exposed rocky shores and characteristic of this section of the coastline.

5. References

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