Shetland Tidal Array
European Protected Species & Basking Shark Risk Assessment

Version 0.3

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0.1	13/08/2021	First version, produced to support application for a new EPS licence.
0.2	17/08/2021	Second version, updated to include cable corridor and export cable positions.
0.3	08/12/2022	Updated to extend proposed end date of the licence to 30 April 2023.

Notice

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1 Introduction

This document supports Nova Innovation's application for a licence to disturb marine species that are subject to strict protection ("European Protected Species" – EPS), as described in Annex IV to Council Directive 92/43/EEC at Bluemull Sound, Cullivoe, Yell, Shetland.

On 3rd August 2020 the Scottish Ministers granted a licence to Nova Innovation to disturb marine species at the Shetland Tidal Array in Bluemull Sound under Regulation 44(2)(e) of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). The licence (reference MS EPS 04/2020/0) was granted for the purpose of permitting the disturbance of Harbour Porpoise (*Phocoena phocoena*), Risso's dolphin (*Grampus griseus*), Killer Whale (*Orca orcinus*), Minke whale (*Balaenoptera acutorostrata*) and Humpback whale (*Megaptera novaeangliae*), as a result of the following activities:

- the installation of three additional 100kW tidal turbines and associated infrastructure including the subsequent relocation of these turbines and associated infrastructure.

Licence MS EPS 04/2020/0 expires on **1 October 2021**. While the activities for which the licence was issued have commenced, they have not been completed. Nova is therefore applying for a new EPS licence to cover the ongoing activities in Bluemull Sound, as set out in this report and accompanying licence application form.

2 The proposed activities

The Shetland Tidal Array currently comprises four 100 kW tidal turbines (T1 to T4), located in Bluemull Sound, Shetland[1]. The proposed activities will involve the addition of two further 100 kW turbines and associated infrastructure within the Shetland Tidal Array, and the relocation of turbines within the array. These activities are also subject to a marine licence issued by Marine Scotland Licensing Operations Team (MSLOT) on behalf of the Scottish Ministers (Licence Number: MS-00009110).

Full technical details of the proposed activities are provided in the project Construction Method Statement[2] approved by MSLOT on behalf of the Scottish Ministers on 10 June 2020, in accordance with condition 3.2.2.3 of marine licence MS-00009110. The CMS is provided in Annex I. The proposed activities will comprise the following key operations:

1. Installation of turbines 5 and 6 substructures and nacelles.
2. Installation of turbines 5 and 6 export cable.
3. Installation of a subsea hub and jumper cables to be used in conjunction with turbines 5 and 6.
4. Reconfiguration of turbines 4 to 6 within the array.

It is anticipated that all these operations will take place in 2022 to early 2023. However, the final detailed schedule has not been confirmed, and will depend on several factors including manufacturing and component fabrication, vessel availability and any ongoing Covid-related restrictions. In accordance with condition 3.2.4.6 of marine licence MS-00009110, Nova will notify MSLOT at least one month prior to commencement of any works.

[1] Note that at the time of writing, the nacelle of T2 is not in-situ in Bluemull Sound, having been removed for maintenance in February 2021. The turbine substructure and cable remain in-situ.

[2] Construction Method Statement Shetland Tidal Array (as extended) V2.0, issued 24/04/2020.

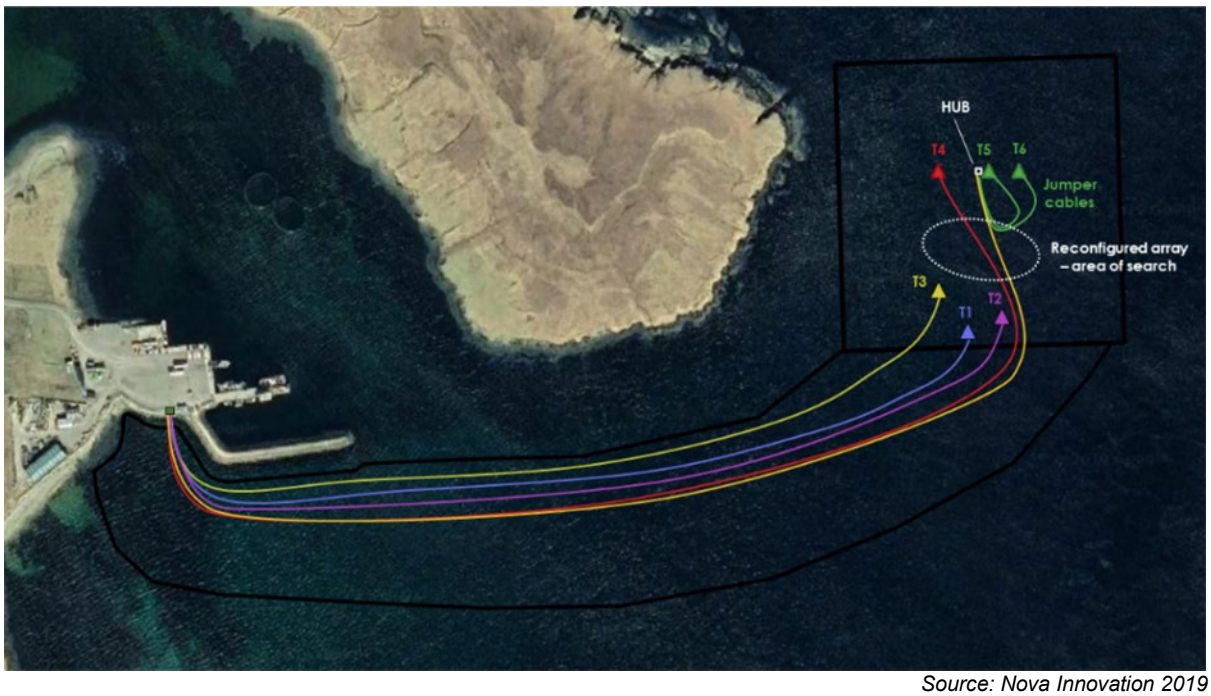
To ensure that any project activities which may disturb marine species are lawful and appropriately licensed, precautionary commencement and completion dates for the activities have been identified that are contiguous with licence MS EPS 04/2020/0. The proposed commencement date for the activities is **2 October 2021** while the proposed completion date is **30 April 2023**.

3 Location of proposed activities

The Shetland Tidal Array is located in Bluemull Sound, Shetland between the islands of Unst and Yell. The site is located near the Ness of Cullivoe, a narrow 1 km long headland to the north-east of Yell, as indicated in Figure 3-1.

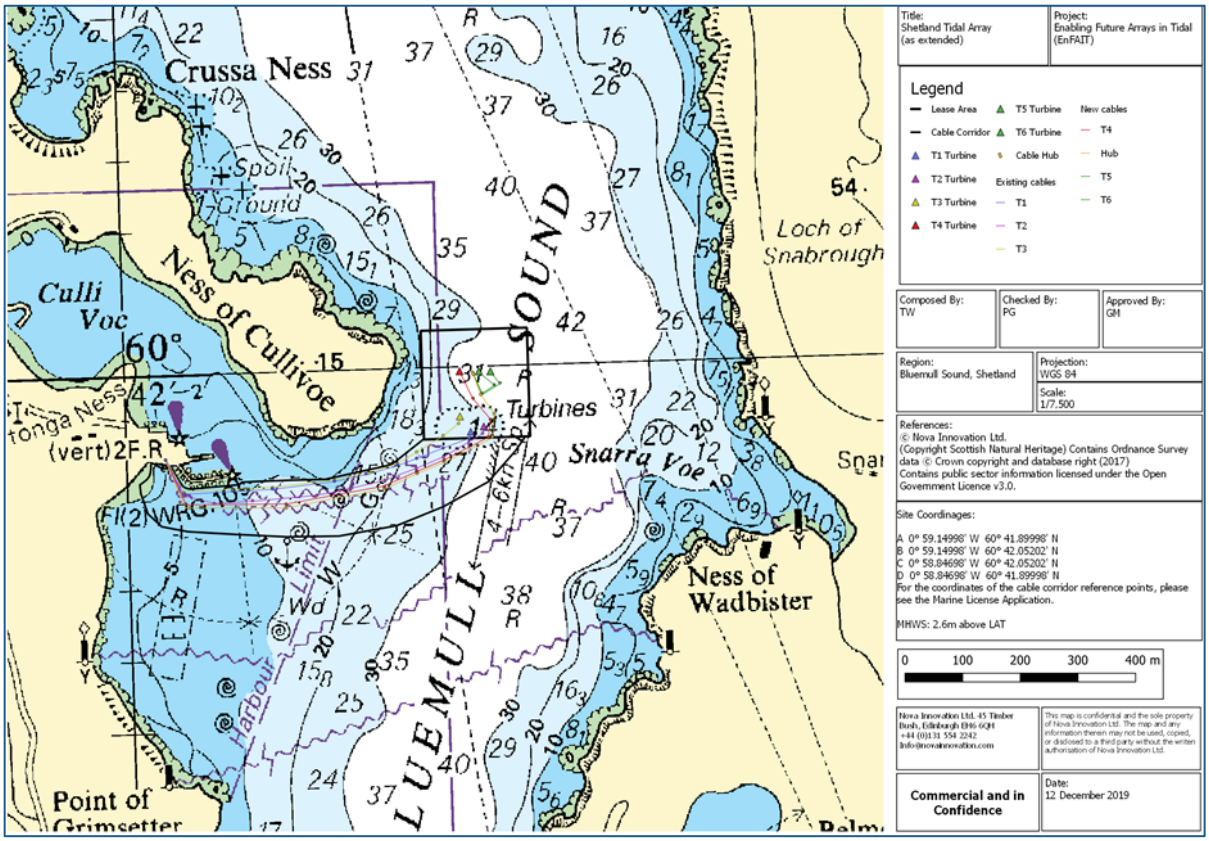
Figure 3-1 Map showing the location of the Shetland Tidal Array in Bluemull Sound, Shetland.

Figures 3-2 and 3-3 show the location of subsea infrastructure associated with the Shetland Tidal Array. Turbines 1-4 have been already deployed, while turbines 5 and 6 (and the associated subsea hub and cables) will be deployed in the period covered by this licence application, as described in the preceding section.



Source: Nova Innovation 2019

Figure 3-2 Shetland Tidal Array layout (satellite view).



Source: Nova Innovation 2019

Figure 3-3 Shetland Tidal Array layout (Admiralty chart).

All turbines and the subsea hub are (or will be) located within the area bounded by the following points:

- 60° 41.900' N 000° 59.150' W
- 60° 41.900' N 000° 58.847' W
- 60° 42.052' N 000° 58.847' W
- 60° 42.052' N 000° 59.150' W

All export cables are (or will be) located within a cable corridor bounded by the following points:

- 60° 41.769' N 000° 59.401' W
- 60° 41.776' N 000° 59.701' W
- 60° 41.781' N 000° 59.831' W
- 60° 41.808' N 000° 59.943' W
- 60° 41.878' N 000° 59.926' W
- 60° 41.858' N 000° 59.857' W
- 60° 41.841' N 000° 59.799' W
- 60° 41.849' N 000° 59.435' W
- 60° 41.866' N 000° 59.245' W
- 60° 41.900' N 000° 58.847' W

The cable landing point is located at:

- 60° 41.883' N 000° 59.933' W

Table 3-1 provides coordinates (decimal degree latitude and longitude) for turbines and export cables in the Shetland Tidal Array. Coordinates for turbines 1 to 4 and export cables are as deployed, while coordinates for turbines 5 and 6 are as planned, as set out in Construction Method Statement (provided in Annex I).

Table 3-1 Shetland Tidal Array turbine positions and export cable route (decimal degrees latitude and longitude). Coordinates for turbines 1 to 4 and export cables are as deployed. Coordinates for turbines 5 and 6, subsea hub and export cable are as planned.

Shetland Tidal Array offshore component	Latitude	Longitude
Turbine 1 and export cable		
Turbine 1 (as deployed)	60° 41.909' N	000° 59.016' W
Turbine 1 export cable waypoint 1	60° 41.900' N	000° 59.021' W
Turbine 1 export cable waypoint 2	60° 41.887' N	000° 59.096' W
Turbine 1 export cable waypoint 3	60° 41.874' N	000° 59.173' W
Turbine 1 export cable waypoint 4	60° 41.865' N	000° 59.228' W
Turbine 1 export cable waypoint 5	60° 41.855' N	000° 59.318' W
Turbine 1 export cable waypoint 6	60° 41.846' N	000° 59.409' W
Turbine 1 export cable waypoint 7	60° 41.837' N	000° 59.587' W
Turbine 1 export cable waypoint 8	60° 41.836' N	000° 59.700' W
Turbine 1 export cable waypoint 9	60° 41.834' N	000° 59.838' W
Turbine 2 and export cable		
Turbine 2 (as deployed)	60° 41.917' N	000° 58.978' W
Turbine 2 export cable waypoint 1	60° 41.906' N	000° 58.982' W
Turbine 2 export cable waypoint 2	60° 41.875' N	000° 59.095' W
Turbine 2 export cable waypoint 3	60° 41.860' N	000° 59.174' W
Turbine 2 export cable waypoint 4	60° 41.845' N	000° 59.266' W
Turbine 2 export cable waypoint 5	60° 41.833' N	000° 59.394' W
Turbine 2 export cable waypoint 6	60° 41.825' N	000° 59.464' W
Turbine 2 export cable waypoint 7	60° 41.822' N	000° 59.444' W
Turbine 2 export cable waypoint 8	60° 41.820' N	000° 59.753' W
Turbine 2 export cable waypoint 9	60° 41.823' N	000° 59.851' W
Turbine 3 and export cable		
Turbine 3 (as deployed)	60° 41.926' N	000° 59.048' W
Turbine 3 export cable waypoint 1	60° 41.921' N	000° 59.050' W
Turbine 3 export cable waypoint 2	60° 41.905' N	000° 59.095' W
Turbine 3 export cable waypoint 3	60° 41.882' N	000° 59.172' W
Turbine 3 export cable waypoint 4	60° 41.867' N	000° 59.228' W
Turbine 3 export cable waypoint 5	60° 41.855' N	000° 59.311' W
Turbine 3 export cable waypoint 6	60° 41.848' N	000° 59.409' W
Turbine 3 export cable waypoint 7	60° 41.839' N	000° 59.586' W
Turbine 3 export cable waypoint 8	60° 41.838' N	000° 59.699' W
Turbine 3 export cable waypoint 9	60° 41.836' N	000° 59.838' W
Turbine 4 and export cable		
Turbine 4 (as deployed)	60° 41.838' N	000° 59.699' W
Turbine 4 export cable waypoint 1	60° 41.994' N	000° 59.032' W
Turbine 4 export cable waypoint 2	60° 41.961' N	000° 58.988' W
Turbine 4 export cable waypoint 3	60° 41.937' N	000° 58.934' W
Turbine 4 export cable waypoint 4	60° 41.890' N	000° 58.950' W
Turbine 4 export cable waypoint 5	60° 41.834' N	000° 59.049' W
Turbine 4 export cable waypoint 6	60° 41.809' N	000° 59.170' W
Turbine 4 export cable waypoint 7	60° 41.792' N	000° 59.401' W

Shetland Tidal Array offshore component	Latitude	Longitude
Turbine 4 export cable waypoint 8	60° 41.799' N	000° 59.759' W
Turbine 4 export cable waypoint 9	60° 41.835' N	000° 59.848' W
Turbines 5 & 6, subsea hub and export cable		
Turbine 5 (planned position)	60° 41.993 N	000° 58.988' W
Turbine 6 (planned position)	60° 41.993 N	000° 58.955' W
Turbine 5/6 hub	60° 41.990' N	000° 58.999' W
Turbine 5/6 export cable waypoint 1	60° 41.960' N	000° 58.984' W
Turbine 5/6 export cable waypoint 2	60° 41.933' N	000° 58.948' W
Turbine 5/6 export cable waypoint 3	60° 41.901' N	000° 58.955' W
Turbine 5/6 export cable waypoint 4	60° 41.868' N	000° 59.095' W
Turbine 5/6 export cable waypoint 5	60° 41.853' N	000° 59.173' W
Turbine 5/6 export cable waypoint 6	60° 41.833' N	000° 59.267' W
Turbine 5/6 export cable waypoint 7	60° 41.810' N	000° 59.549' W
Turbine 5/6 export cable waypoint 8	60° 41.814' N	000° 59.824' W
Landfall of all export cables	60° 41.882' N	000° 59.888' W

4 Activities likely to cause disturbance

In advice provided to MSLOT in March 2018 (provided in Annex II), which remains relevant to the current risk assessment and licence application, Scottish Natural Heritage (SNH, now NatureScot) advised that **installation works (including cable and turbine installation and relocation and associated vessel activities) associated with the Shetland Tidal Array (extended) may cause a disturbance to marine EPS** and therefore would require an EPS licence to avoid an offence under the Conservation (Natural Habitats) Regulations 1994 (as amended). SNH further advised that the operation of the turbines would not cause a disturbance to EPS and that this activity would therefore not require a licence.

The turbines are fixed to the seabed using a gravity foundation, so no offshore piling or drilling is required at any point during the project. Significant levels of underwater noise will not be generated by the activities. On this basis, and the advice of SNH, the activities likely to cause disturbance to marine species are the presence of vessels and infrastructure during the following key operations:

1. Installation of turbines 5 and 6 substructures and nacelles.
2. Installation of turbines 5 and 6 export cables.
3. Installation of a subsea hub, to be used in conjunction with turbines 5 and 6.
4. Reconfiguration of turbines 4 to 6 within the array.

Vessels and infrastructure may also be present on site from time-to-time, associated with routine or non-routine maintenance.

Nova has gained experience through multiple deployments, retrievals, maintenance and decommissioning operations at the Shetland Tidal Array. A consequence of this experience is that any potential disturbance as a result of the activities detailed above will be minimized through quick and efficient operations. All offshore works associated with turbine deployments in Shetland now take less than 6 days to complete. The installation of the turbine nacelle can be completed in a single slack water period. The activities will be carried out in separate operations between October 2020 and April 2023, limiting the extent of any single period of offshore works.

5 Species likely to be disturbed

All species of cetaceans (dolphin, porpoise and whale), as described in Annex IV to Council Directive 92/43/EEC could potentially occur within Bluemull Sound and might therefore potentially be at risk of disturbance as a result of the proposed activities.

Land-based vantage point surveys carried out continuously since November 2010 have gathered data on the spatio-temporal distribution of birds and mammals in Bluemull Sound. During these surveys, the following five species of EPS have been recorded:

- Harbour porpoise, *Phocoena phocoena*
- Killer whale, *Orca orcinus*
- Risso's dolphin, *Grampus griseus*
- Humpback whale, *Megaptera novaeangliae*
- Minke whale, *Balaenoptera acutorostrata*

A single record of basking shark, *Cetorhinus maximus*, has also been recorded in vantage point surveys.

In advice to MSLOT in March 2018 (provided in Annex II), SNH advised that, since there had only been one basking shark observation in Bluemull Sound since Nova's monitoring began in 2010, a basking shark licence to address potential disturbance during installation or operational collision risk would not be required. There have subsequently been no further records of the species in Bluemull Sound, so SNH's advice that the Shetland Tidal Array will not have a negative impact on the conservation status of basking sharks and a licence to address potential disturbance will not be required remains valid.

Based on Nova's monitoring data for Bluemull Sound spanning almost a decade, and the advice of SNH, five marine species of EPS may be disturbed as result of the proposed activities. These are Harbour porpoise, Killer whale, Risso's dolphin, Humpback whale and Minke whale. The next section considers the numbers of animals of each of these species likely to be disturbed as a result of the proposed activities.

6 Numbers of animals likely to be disturbed

Table 6-1 details a range of metrics which provide a semi-quantitative indication of the numbers of animals of the five EPS likely to be disturbed as a result of the proposed activities. These metrics have been calculated using data gathered during the vantage point surveys carried out in Bluemull Sound between November 2010 and March 2020[3] and subsea video monitoring around turbines[4].

Table 6-1 Metrics providing a semi-quantitative indication of the numbers of animals of the five EPS likely to be disturbed as a result of the proposed activities.

Species	Metrics for numbers of animals likely to be disturbed
Harbour porpoise, *Phocoena phocoena*	- 736 animals recorded in 1040 hours of survey effort spanning 10 years. - Recorded in 5.6% of scans (175 scans out of 3120). - When present in Bluemull Sound, occurs in small family groups of average size 4.2 individuals. - Average standardised count of 0.38 animals per scan/km^2 in Bluemull Sound. - Occurs in Bluemull Sound throughout the year.

[3] Nova Innovation (2021). Shetland Tidal Array Monitoring Report: Vantage point surveys. EnFAIT-0347.

[4] Nova Innovation (2021). Shetland Tidal Array Monitoring Report: Subsea video monitoring. EnFAIT-0364.

	- Species not observed around turbines in subsea video footage.
Killer whale, *Orca orcinus*	- 10 animals recorded in 1040 hours of survey effort spanning 10 years. - Recorded in 0.03% of scans (1 scan out of 3120). - Single record comprises a pod of 10 animals in January 2017[5]. - Species not observed around turbines in subsea video footage.
Risso's dolphin, *Grampus griseus*	- 25 animals recorded in 1040 hours of survey effort spanning 10 years. - Recorded in 0.06% of scans (2 scans out of 3120). - Records comprise one pod of 5 animals in August 2015 and one pod of 20 animals in March 2016. - Species not observed around turbines in subsea video footage.
Humpback whale, *Megaptera novaeangliae*	- 2 animals recorded in 1040 hours of survey effort spanning 10 years. - Recorded in 0.03% of scans (1 scan out of 3120). - Record comprises a mother and calf in February 2016. - Species not observed around turbines in subsea video footage.
Minke whale, *Balaenoptera acutorostrata*	- 4 animals recorded in 1040 hours of survey effort spanning 10 years. - Species recorded in 0.1% of scans (3 scans out of 3120). - Records comprise 1 animal in November 2010, 1 animal in November 2017 and 1 further animal in November 2017. - Species not observed around turbines in subsea video footage.

Nova's vantage point surveys have demonstrated that the presence and numbers of individuals of the EPS likely to be disturbed as a result of the proposed activities in Bluemull Sound is highly stochastic and difficult to predict with so few sightings. Occurrence of all species is extremely rare, with the exception of harbour porpoise, which occurs in low numbers year-round (individuals or groups of less than 5 animals).

Based on Nova's long-term environmental monitoring data, key life history characteristics of the species, and the nature of the activities, including scale, duration and methodologies that will be used, the numbers of individuals likely to be disturbed is estimated to be very to extremely low for all species. The activities likely to disturb species will be very time-limited, carried out quickly efficiently over a few days, and during separate operations between October 2021 and April 2023 (further detailed in Section 4 and 7).

Population estimates for the five EPS based on the relevant UK Marine Mammal Management Units (MU) (where available) are provided in Table 6-2. Whilst almost all marine mammal species found in UK waters are part of a much larger biological population whose range extends beyond UK waters into the waters of other States and/or the High Seas, the Management Units provide a pragmatic approach to contextualise predicted impacts of various activities.

Table 6-2 Population estimates (based on UK Marine Mammal Management Units) for the five cetacean species likely to be disturbed as a result of the proposed activities.

Species	Management Unit (MU)	Abundance of animals in MU (CV)	95% MU confidence interval	Abundance of animals in UK portion of MU (CV)	95% confidence interval for UK portion of MU
Harbour porpoise	North Sea*	227,298 (0.13)	176,360-292,948	110,433 (0.16)	80,866-150,811
Killer whale	No Management Unit for UK waters				
Risso's dolphin	UK waters	No population estimates available			

[5] A pod of 8 to 10 killer whale was also recorded in Bluemull Sound in July 2021. Data have not yet been fully analysed, but animals were not observed in the subsea video footage captured on that day.

Humpback whale	No Management Unit for UK waters				
Minke whale	Celtic & Greater North Seas	23,528 (0.27)	13,989-39,572	12,295 (0.28)	7,176-21,066

* Likely interchange of animals in North Sea MU with the 'West Scotland' MU.

As stated above, uncertainty and variation in the presence and numbers of the above species in Bluemull Sound and wider uncertainty about the geographical extent and population demographics of many of the species, the number of individuals likely to be affected by the proposed activities is uncertain but estimated to be very to extremely low. SNH stated in their advice to MSLOT in March 2018 (Annex II), that it is **unlikely that there will be any significant disturbance, and the project will not be detrimental to the maintenance of the populations of relevant cetacean species at a favourable conservation status in their natural range**.

7 Mitigation measures

The following measures will reduce the risk of disturbance to EPS as a result of the proposed activities:

1. The proposed activities, comprising installation of two further turbines, export cables and a subsea hub, and reconfiguration of turbines 4 to 6 within the Shetland Tidal Array, will be carried out over an extended period in separate operations between October 2020 and April 2023. This limits the extent of any single period of offshore works and the potential for any sustained source of disturbance.

2. The proposed activities will be temporary and short-term in nature, minimizing the frequency and length of any periods of disturbance.

3. Nova's turbines are relatively small and modular, comprising substructures, nacelles and export cables which are deployed in separate operations, using small vessels. During maintenance operations, only the nacelle is removed, with the substructure remaining in place on the seabed.

4. Nova has gained experience through multiple turbine deployments, retrievals, maintenance and decommissioning operations at the Shetland Tidal Array. A consequence of this experience is that any potential disturbance will be minimized through quick and efficient operations. All offshore works associated with turbine deployments in Shetland now take less than 6 days to complete. The installation of turbine nacelles can be completed in a single slack water period.

5. The fifth and sixth turbines within the Shetland Tidal Array will be the M100D, Nova's next generation direct drive turbine. Operation of the fourth turbine (also the M100D) since it was installed in the Shetland Tidal Array in August 2020 has demonstrated that the M100D is highly reliable, extending the period between maintenance from 1 to 2 years[6], reducing the need for offshore operations.

6. The vessels that will be used for the proposed activities are significantly smaller and less intrusive than those used in the offshore oil and gas and offshore wind industries and favoured by several tidal energy developers for example deploying at EMEC. In addition, Bluemull Sound is an active channel for shipping and the Project site is located next to a

[6] Compared to Nova's geared turbine, the M100.

busy port. Any additional noise and vessel disturbance as a result of the proposed activities is therefore unlikely to surpass normal background levels.

7. Turbines are fixed to the seabed using a gravity foundation, so no piling or rock-drilling is required. This greatly reducing the potential for disturbance by limiting the sources of anthropogenic noise and allowing more rapid deployment of devices. Use of drilling or piling to secure devices to the seabed was considered. However, employing gravity foundations, secured to the seabed by weight alone, minimises the risk of disturbing protected species.

8. Deployment of a small array of small-scale turbines minimises the potential for disturbance. Larger devices and a larger array (more devices) were considered as options for the extended STA.

9. Use of larger deployment vessels, such as the dynamically positioned (DP) vessels typically used in the offshore oil and gas and offshore wind industries and favoured by several tidal energy developers deploying at EMEC was considered. Utilising such vessels reduces some project risks since these vessels can operate in a wide variety of tidal flow, sea state and weather conditions. However, Nova's small-scale turbines allow the use of smaller multicat vessels. These are frequently used in the waters around Shetland, for example by the fish farming industry. Using smaller vessels minimises the likelihood of disturbance to protected species.

10. The Scottish Marine Wildlife Watching Code will be adhered to at all times. Copies of the Code will be kept on site at Cullivoe, on-board all vessels engaged in works and included in site briefings for all staff and contractors working on site.

11. Environmental monitoring of the Shetland Tidal Array, including the use of land-based focal watch surveys and subsea video will continue. This will further build the knowledge base on the spatio-temporal distribution of marine EPS and the findings reported to MS-LOT.

These mitigation measures are deemed by Nova to be adequate and appropriate to reduce the risk of disturbance to EPS to levels that meet the third "EPS test"; namely that the proposed activities will not be detrimental to the Favourable Conservation Status of the EPS concerned. In support of this conclusion, SNH stated in advice to MSLOT in March 2018 (Annex II), that it is **unlikely that there will be any significant disturbance, and the project will not be detrimental to the maintenance of the populations of relevant cetacean species at a favourable conservation status in their natural range**. This advice related to the Shetland Tidal Array (as extended), so considered the proposed activities detailed in this risk assessment and associated EPS licence application.

In addition, in advice to MSLOT in March 2018 (provided in Annex III), Whale and Dolphin Conservation (WDC) stated that the lack of pile-driving means that their concerns are reduced for the Shetland Tidal Array (as extended).

8 Consideration of designated sites

With the exception of harbour porpoise and minke whale, there are no designated sites in the UK for any of the species of EPS identified in this report. The nearest designated site for harbour porpoise is the Inner Hebrides and the Minches Special Area of Conservation on the west coast of Scotland, while the Southern Trench MPA, designated in 2020 for minke whale is located off the Aberdeenshire coast.

The proposed activities are within Bluemull and Colegrave Sounds proposed Special Protection Area (pSPA) for which the qualifying feature is breeding red-throated diver (*Gavia stellata*). The proposed activity is also within the foraging range of the harbour seal (*Phoca vitulina*) feature of the Yell Sound Coast SAC and Yell Sound Coast SSSI.

Other designated sites considered in an Environmental Assessment produced by Nova Innovation in support of the Marine Licence application for the Project (provided in Annex IV) include: Hermaness, Saxa Ford and Valla Field SPA and Hermaness SSSI; Saxa Vord SSSI and Valla Field SSSI; Fetlar SPA; Foula SPA; Mousa SPA; Noss SPA; Otterswick and Graveland SPA; Fair Isle SPA; Sule Skerry and Sule Stack SPA; North Rona and Suia Sgeir SPA and St Kilda SPA.

A full consideration of the potential effects of the proposal on all these designated sites is detailed within the following two documents, provided in support of this EPS Risk Assessment and application:

- Environmental Assessment Report produced in support of Nova Innovation's applications for a Marine Licence and Shetland Islands Council Works Licence (Annex IV).
- Marine Scotland's assessment of the project's implications for the Special Areas of Conservation (SAC) and Special Protection Areas (SPA) and proposed Special Protection Areas (pSPA) in view of the sites' Conservation Objectives, or "Appropriate Assessment" (Annex V)

Consultations were conducted with stakeholders as part of the marine licensing process. Responses relevant to this EPS Risk Assessment are enclosed with this application:

- Scottish Natural Heritage (Annex II)
- Whale and Dolphin Conservation Society (Annex III)

9 Satisfactory alternatives

Tidal turbines transform the kinetic energy of the tides in the marine environment into electricity. As a Scottish company, Nova Innovation considered a range of locations in Scotland when identifying the preferred site for developing what eventually became the Shetland Tidal Array. Key factors influencing the site identification process were the available tidal energy resource, access to a grid connection, availability of local infrastructure and supply chain, and hard constraints (including environmental). Early dialogue with Scottish Natural Heritage in the site identification process identified Bluemull Sound as an area of lower environmental sensitivity since, at the time, it was not located within any Natura 2000 sites (SPAs or SACs, including possible or candidate sites).

The deployment of the Shetland Tidal Array incorporating a greater number of larger turbines was considered. There are economies of scale involved in building larger turbines and deploying more of them; hence the huge arrays of giant, multi-MW turbines being deployed in offshore wind farms. Many marine energy developers are developing MW-scale machines and multi-MW projects for precisely this reason. However, Nova Innovation has adopted a different approach: deploying a small array of small-scale turbines minimises the associated environmental, engineering and financial risks.

Ongoing activity at the Shetland Tidal Array, including the proposed activities detailed within this risk assessment and associated EPS licence application are constrained to take place within the area bounded by the seabed lease issued to Nova Innovation by The Crown Estate (now Crown Estate Scotland). As such, there are no suitable alternative locations for the proposed activities.

The proposed activities comprising installation of two further turbines, export cables and a subsea hub, and reconfiguration of turbines 4 to 6 within the Shetland Tidal Array, will be carried out over an extended period in separate operations between October 2020 and April 2023. This limits the extent of any single period of offshore works and the potential for any sustained source of disturbance. Carrying out the activities within a shorter, more compressed, timeframe was considered, but would likely risk posing any EPS present at the site to more significant levels of disturbance. Further, Nova's environmental monitoring in Bluemull Sound has demonstrated that the presence of EPS in Bluemull Sound is highly stochastic, with no clear seasonal patterns. In particular, the most frequently occurring EPS, harbour porpoise, occurs in low numbers year-round, so there are no times of the year in which operations could be targeted to avoid the risk of disturbance.

Nova considered using larger deployment vessels, such as the dynamically positioned (DP) vessels typically used in the offshore oil and gas and offshore wind industries and favoured by several tidal energy developers deploying at EMEC. Utilising larger DP vessels reduces some project risks since these vessels can operate in a wide variety of tidal flow, sea state and weather conditions. However, Nova's small-scale, modular turbines allow us to use smaller multicat vessels. These are frequently used in the waters around Shetland, for example by the fish farming industry. Using smaller vessels minimises the likelihood of disturbance to protected species.

Nova also considered using drilling or piling to secure turbines to the seabed. Such techniques are commonly used in the offshore wind industry and by other marine energy developers but can result high inputs of anthropogenic noise to the marine environment which can lead to disturbance to marine species. By employing gravity foundations, secured to the seabed by weight alone, we minimise the risk of disturbing species including EPS.

10 Case for Imperative Reasons of Overriding Public Interest

The Climate Change Act 2019 commits Scotland to net-zero emissions of all greenhouse gases by 2045. In 2020 the Scottish Government published an update to Scotland's 2018-2032 Climate Change Plan[7] setting out the pathway to achieving this target. This report highlighted government's continued support for the Scottish tidal energy sector and its role in achieving net zero, while also creating high quality jobs, contributing to the green recovery from the Covid-19 pandemic. The Scottish Government continues to champion the tidal energy sector, supporting the research, development, and demonstration that will maintain Scotland's competitive advantage and potentially deliver significant domestic and export-led economic benefit. Recent Scottish Government investment of £2million in Nova Innovation and its turbine technology has further strengthened this commitment to support the Scottish tidal energy sector[8], for which the Shetland Tidal Array is a flagship project.

As the world's first offshore tidal energy array, Nova Innovation's Shetland Tidal Array project has been, and will continue to be, a landmark project in demonstrating the commercial and ecological viability of tidal power. All offshore work involves a degree of risk, and it will not be possible to exploit Scotland's vast marine energy resources without some risk of disturbance to marine protected species. However, the proposed approach of deploying and monitoring small-scale projects which grown incrementally, in line with the knowledge base, allows this risk to be minimised and controlled.

[7] Scottish Government (2020). Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update.

[8] Awarded by Scottish Enterprise see Two million VOLT sparks Scottish tidal energy scale up (novainnovation.com)

The proposed activities will enable Nova to build on the success of the operating 400 kW Shetland Tidal Array and further progress the development of learning and the knowledge base on key engineering and environmental aspects of tidal energy. This will continue to build and strengthen the evidence base to de-risk future larger-scale tidal energy projects. It will also enable the further development and dissemination of good practice in engineering, and environmental assessment and management, delivering wider benefits to the whole marine renewable energy sector.

Expansion of the project from four to six turbines, with integrated environmental monitoring will improve the knowledge base on the effects of tidal turbines in array conditions available for future tidal energy projects and fill key gaps identified by the Offshore Renewable Energy Joint Industry Programme for Offshore Energy.

Annexes

Annex I: Shetland Tidal Array (as extended) Construction Method Statement

Annex II: Scottish Natural Heritage consultation response to Nova Innovation's Marine Licence application, 2 March 2018

Annex III: Whale and Dolphin Conservation consultation response to Nova Innovation's Marine Licence application, 16 March 2018

Annex IV: Shetland Tidal Array (as extended) Environmental Assessment Report

Annex V: MS-LOT Appropriate Assessment for the Shetland Tidal Array (as extended)

Nova Innovation Ltd

Construction Method Statement

Shetland Tidal Array (as extended)

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1.0-1.4	20/12/2019	First issues, revised based on MS-LOT feedback.	To discharge pre-commencement of works licence conditions
2.0	24/04/2020	Revised based on consultee feedback (SNH/MCA).	

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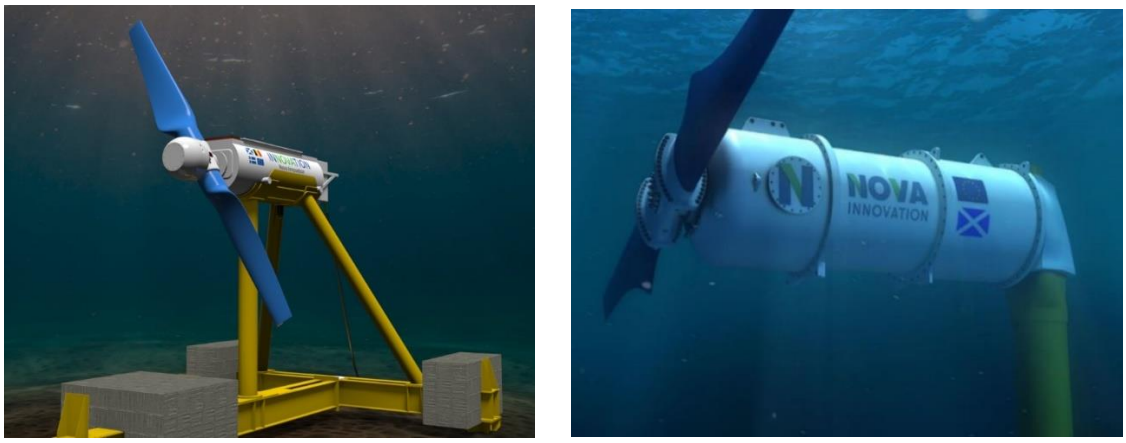
1 Introduction

Nova Innovation has produced this Construction Method Statement to describe the methods and techniques that will be employed to install, operate, reconfigure and decommission the 600 kW array of Nova M100 tidal turbines, including cables and offshore infrastructure, in the Bluemull Sound near Cullivoe in Shetland.

An existing offshore tidal array of three M100 turbines (T1, T2 and T3), known as the Shetland Tidal Array, will be expanded with the addition of three new M100D direct drive turbines (T4, T5 and T6), taking the total to six bottom-mounted, gravity-anchored, non-yawing horizontal axis turbines of 100 kW capacity. Each of the six tidal turbines comprises a cylindrical nacelle unit, rotor and tripod gravity base to secure it to the seabed. The design of the newest three turbines has evolved (see Figure 1 and details in 2.2). Associated infrastructure includes a subsea cable hub, inter-array cabling and export cables connecting the array to Cullivoe Pier.

Figure 1: Nova Innovation M100 turbine models: original M100 (left) and updated M100D (right)



Source: Copyright © Nova Innovation 2019

Each turbine has a rotor diameter of 8.5 m, and a hub height of 8.9 m, making the total height from the bottom of feet to the tip of the blades less than 14 m. The devices will operate in a maximum sustained tidal speed of 2.6 m/s and are located at depths that ensure that during operation all parts of the turbine are at least 15 m below lowest astronomical tide, to allow ample draught clearance for shipping.

As part of the research work associated with the EU Horizon 2020 project, Enabling Future Arrays in Tidal (EnFAIT), Nova will monitor the operation of the expanded tidal array for around a year to evaluate an optimised array layout using Array Interaction Modelling. The three newest turbines (T4, T5 and T6) will then be repositioned to maximise learning and power production from the array.

This work will be carried out under, and in accordance with, the conditions of:

- Shetland Islands Council (SIC) Works Licence 2018/021/WL, issued under the Zetland County Council Act 1974
- Marine Scotland Marine Licence 06642/18/0, issued under the Marine (Scotland) Act 2020, part 4

Nova Innovation maintains a Marine License Conditions Status Register for the Shetland Tidal Array, which is regularly shared with the Marine Scotland Licensing Operations Team (MS-LOT) and Shetland Islands Council (SIC), to ensure that all relevant consent conditions are being complied with. Table 1 below lists the consent plans and other relevant documentation.

Table 1: Reference Documentation

Documentation	Doc. No.	Notes
CES Lease	n/a	
SIC Works License	2018/021/WL	
MS-LOT Marine Licence	06642/18/0 (replaces ML 04859 15 1)	
Nova Innovation STA Licence Conditions Status Register	n/a – refer license number	Comprehensive register of all conditions and compliance status for Marine Licence and Works Licence
STA Project Environmental Monitoring Plan (PEMP)	EnFAIT-0362	
STA Vantage Point Monitoring Report	EnFAIT-0363	
STA Subsea Video Footage Report	EnFAIT-0364	
STA Cable Plan	EnFAIT-0234	
Emergency Response & Cooperation Plan (ERCOP)	EnFAIT-0365	

Source: Copyright © Nova Innovation 2020

2 The Construction Works

2.1 Location

The Shetland Tidal Array is located in Bluemull Sound, near Cullivoe Harbour, within the area bounded by joining the following points:

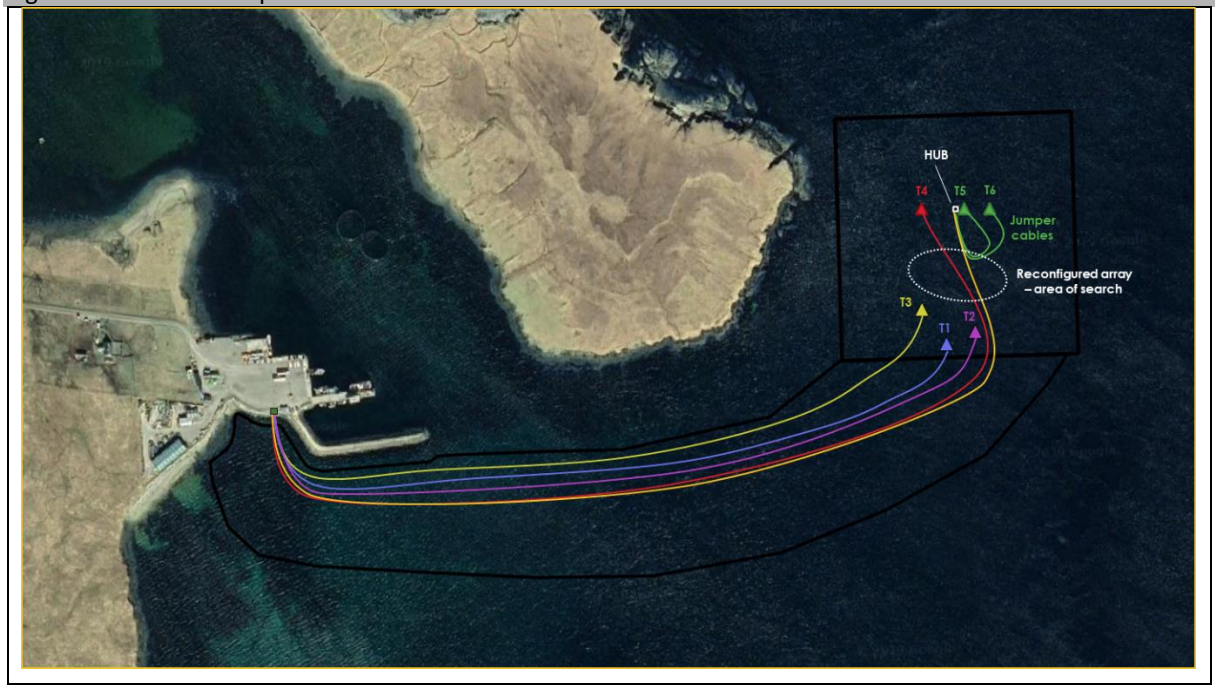
60° 41.900’ N 000° 59.150’ W	60° 41.900’ N 000° 58.847’ W
60° 42.052’ N 000° 58.847’ W	60° 42.052’ N 000° 59.150’ W

Cable landing point:

60° 41.883’ N 000° 59.933’ W

Bluemull Sound is situated between the Shetland Islands of Yell and Unst. At the time of writing, three M100 (geared) turbines (T1, T2 and T3) are deployed just east of the Ness of Cullivoe. Figure 2 shows the planned array layout once the three new M100D (direct drive) turbines have been installed: T4, T5 and T6. The area of search that will be considered for a subsequent reconfiguration of the array is also shown.

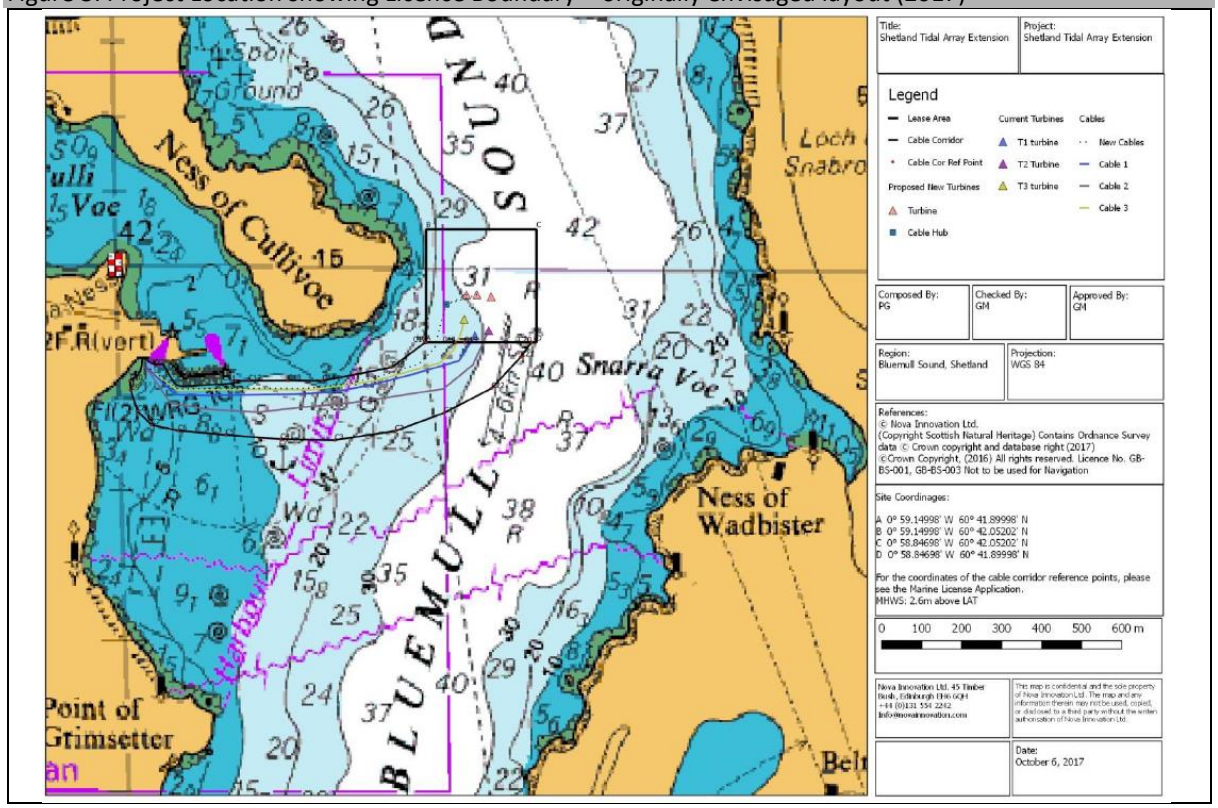
Figure 2: STA build-out plan



Source: Nova Innovation 2014

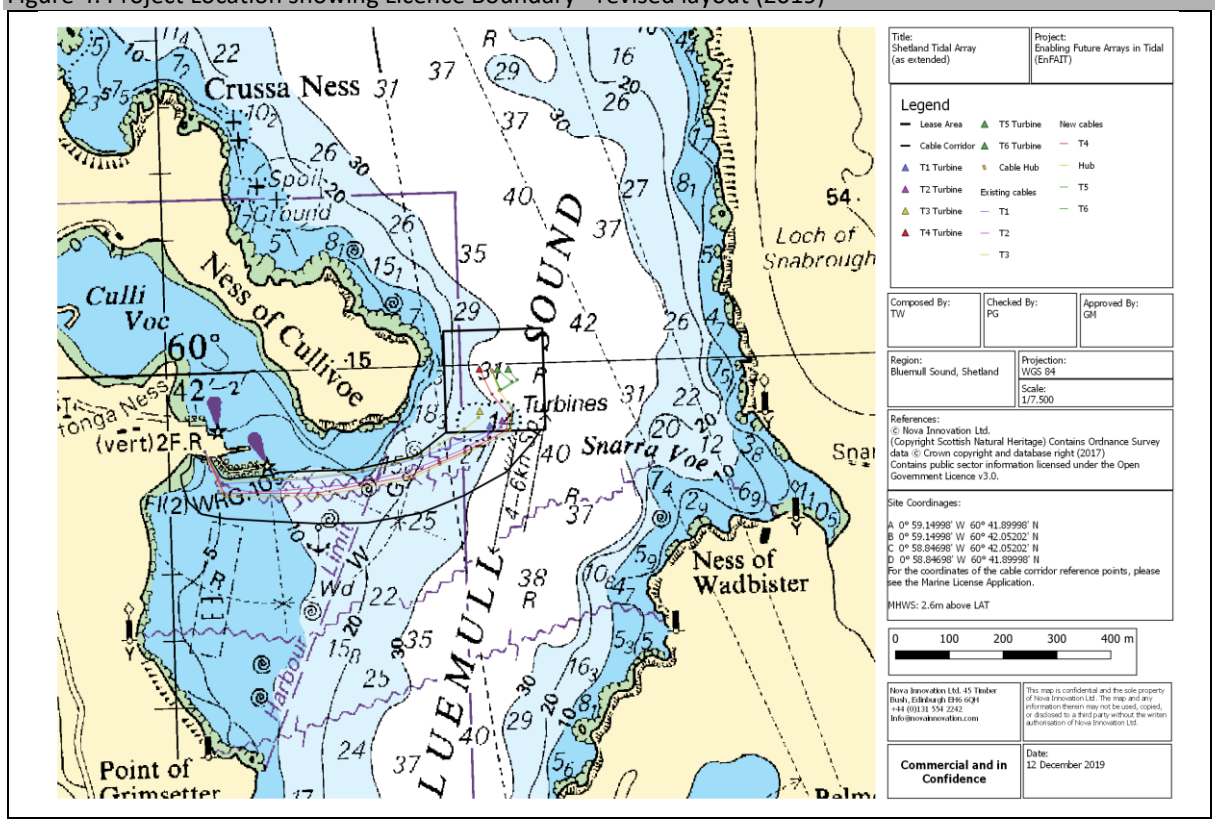
The existing turbines each have their own export cable to shore. In 2017, it was envisaged that the three new turbines would be connected to shore via a subsea hub with a single export cable led to the north of the existing three cables (Figure 3). This has now been revised so that T4 will be installed with its own export cable, and T5 and T6 will be connected via jumper cables to a subsea hub, with its own export cable (Figure 4). See Section 2.2 for details.

Figure 3: Project Location showing Licence Boundary – originally envisaged layout (2017)



Source: Nova Innovation 2014

Figure 4: Project Location showing Licence Boundary - revised layout (2019)

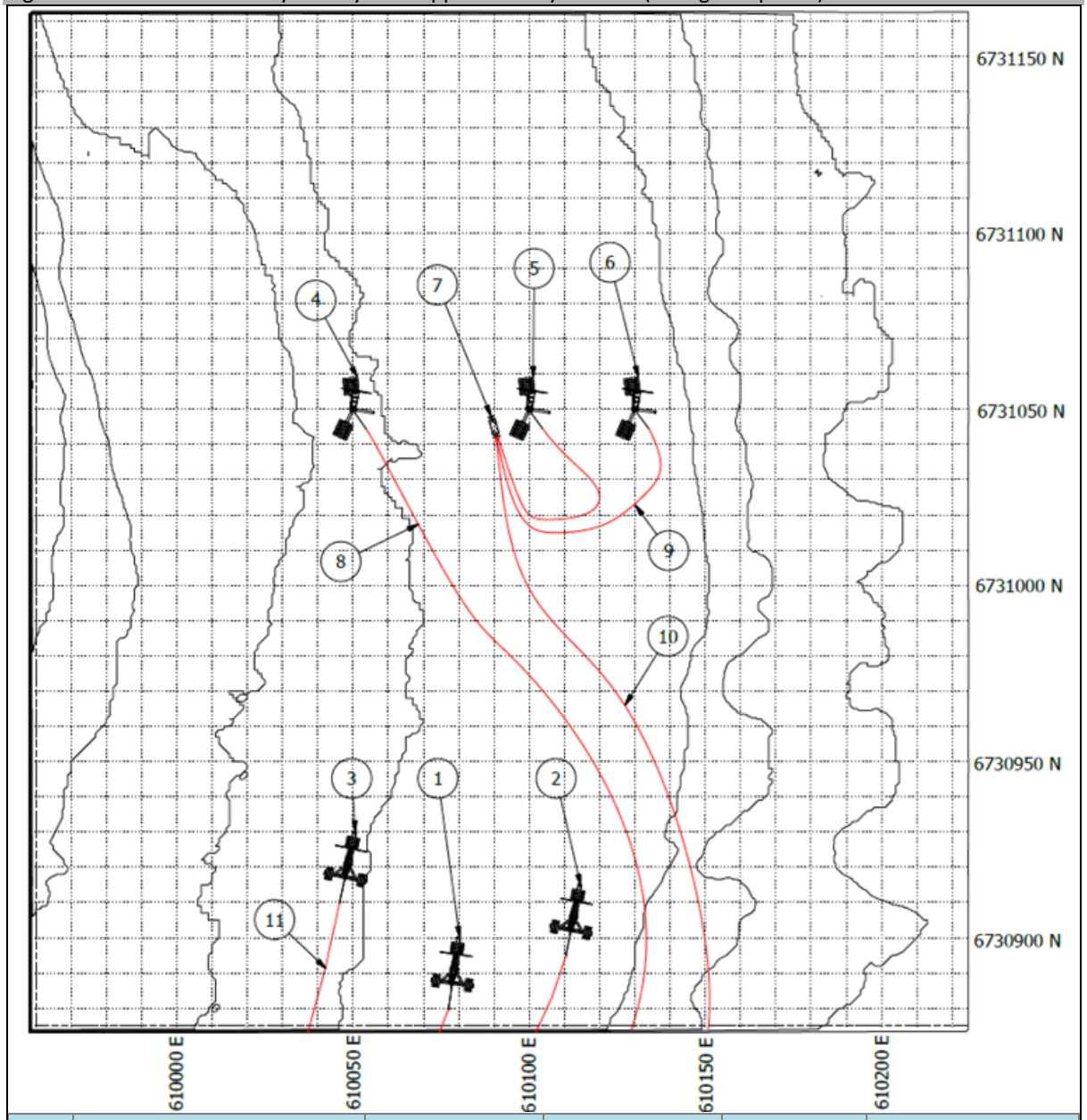


Source: Nova Innovation 2019

2.2 Array layout and headings

Figure 5 shows a more detailed view of the array.

Figure 5: Shetland Tidal Array site layout – approximately to scale (10m grid squares)



Ref	Item	UTM30 (N)	UTM30 (E)	Heading	Notes
1	M100 T1 TURBINE	6730893	610079	008	AS-BUILT
2	M100 T2 TURBINE	6730908	610113	011	AS-BUILT
3	M100 T3 TURBINE	6730923	610049	012	AS-BUILT
4	M100D T4 TURBINE	6731050	610050	010	PHASE 1 (2020)
5	M100D T5 TURBINE	6731050	610100	009	PHASE 2 (2020/21)
6	M100D T6 TURBINE	6731050	610130	008	PHASE 2 (2020/21)
7	SUBSEA CABLE HUB	6731045	610090	-	PHASE 2 (2020/21)
8	T4 EXPORT CABLE	-	-	-	PHASE 1 (2020)
9	T5/6 JUMPER CABLE	-	-	-	PHASE 2 (2020/21)
10	T5/6 EXPORT CABLE	-	-	-	PHASE 2 (2020/21)
11	M100 EXPORT CABLES	-	-	-	AS-BUILT

Source: Copyright © Nova Innovation 2020

2.3 Turbine coordinates (Lat/Long)

Table 2: Turbine coordinates

	UTM V30 N/E		WGS84 GPS Lat/Long (decimal)	
	Northing	**Easting**	**Latitude**	**Longitude**
T1 Turbine	6730893	610079	60.69848	-0.98360
T2 Turbine	6730908	610113	60.69861	-0.98297
T3 Turbine	6730923	610049	60.69876	-0.98413
T4 Turbine	6731050	610050	60.69990	-0.98404
T5 Turbine	6731050	610100	60.69988	-0.98313
T6 Turbine	6731050	610130	60.69988	-0.98258
T5/6 Hub	6731045	610090	60.69984	- 0.98331

Source: Copyright © Nova Innovation 2020

2.4 Cable route coordinates

Table 3: Subsea cable routes

	UTM V30		WGS84 GPS Lat/Long (decimal)	
	Northing	**Easting**	**Latitude**	**Longitude**
T1 Cable				
Turbine T1	6730893	610079	60.69848	- 0.98360
WP01	6730876	610075	60.69833	- 0.98369
WP02	6730851	610007	60.69812	- 0.98494
WP03	6730824	609939	60.69790	- 0.98621
WP04	6730806	609889	60.69775	- 0.98713
WP05	6730784	609807	60.69758	- 0.98864
WP06	6730765	609725	60.69743	- 0.99015
WP07	6730745	609564	60.69729	- 0.99311
WP08	6730739	609461	60.69727	- 0.99500
WP09	6730731	609335	60.69723	- 0.99730
SHORE	6730819	609287	60.69803	- 0.99814
T2 Cable				
Turbine T2	6730908	610113	60.69861	- 0.98297
WP01	6730889	610110	60.69844	- 0.98304
WP02	6730828	610009	60.69792	- 0.98492
WP03	6730798	609938	60.69767	- 0.98624
WP04	6730767	609856	60.69741	- 0.98776
WP05	6730741	609740	60.69721	- 0.98990
WP06	6730726	609677	60.69709	- 0.99106
WP07	6730714	609513	60.69703	- 0.99407
WP08	6730707	609414	60.69700	- 0.99589
WP09	6730710	609325	60.69705	- 0.99751
SHORE	6730819	609287	60.69803	- 0.99814

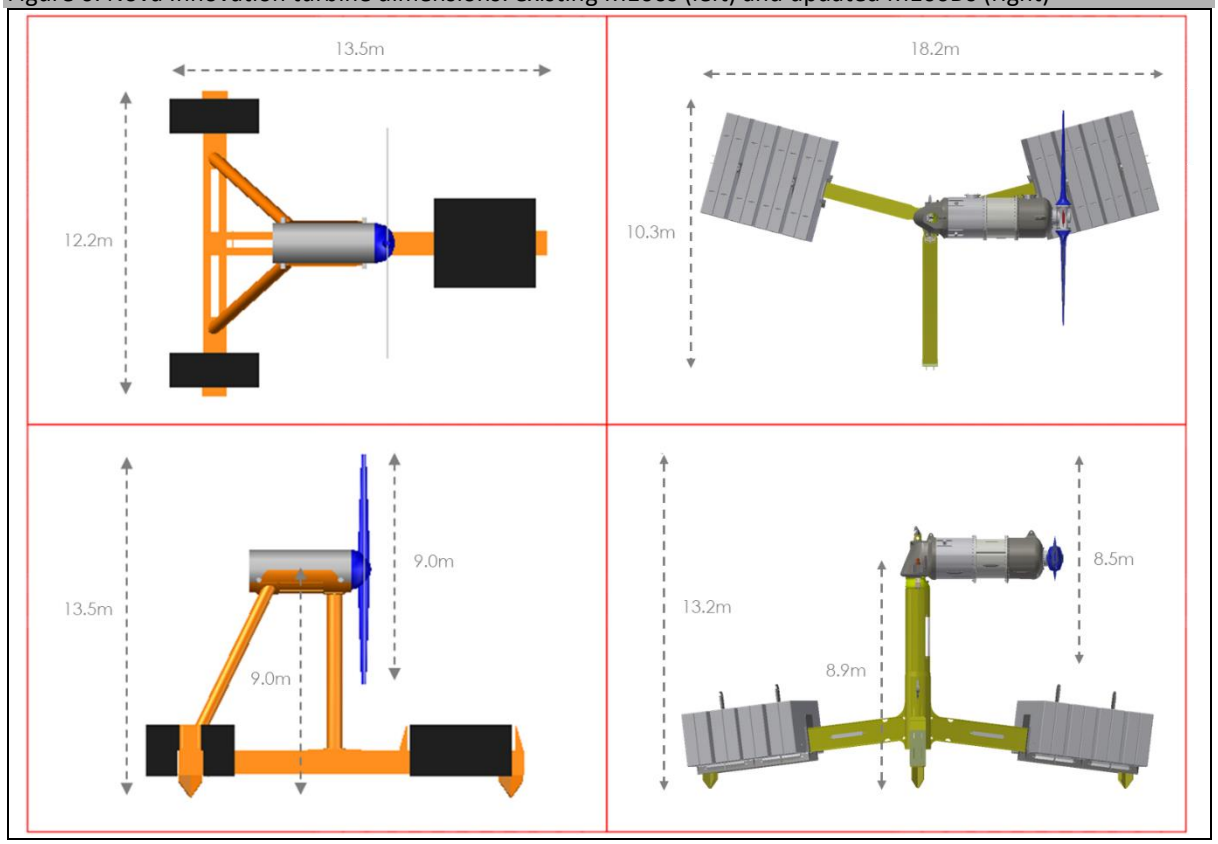
(continued on next page)

	UTM V30		WGS84 GPS Lat/Long (decimal)	
	Northing	**Easting**	**Latitude**	**Longitude**
T3 Cable				
Turbine T3	6730923	610049	60.69876	- 0.98413
WP01	6730915	610048	60.69869	- 0.98417
WP02	6730883	610007	60.69841	- 0.98492
WP03	6730840	609939	60.69804	- 0.98620
WP04	6730809	609889	60.69778	- 0.98713
WP05	6730785	609813	60.69759	- 0.98852
WP06	6730768	609725	60.69746	- 0.99015
WP07	6730748	609564	60.69732	- 0.99310
WP08	6730742	609461	60.69730	- 0.99499
WP09	6730734	609335	60.69726	- 0.99730
SHORE	6730819	609287	60.69803	- 0.99814
T4 Cable				
Turbine	6731050	610050	60.69990	- 0.98404
WP01	6730980	610085	60.69926	- 0.98344
WP02	6730925	610130	60.69875	- 0.98265
WP03	6730880	610125	60.69835	- 0.98277
WP04	6730820	610010	60.69785	- 0.98490
WP05	6730790	609940	60.69760	- 0.98620
WP06	6730750	609855	60.69726	- 0.98778
WP07	6730705	609600	60.69693	- 0.99247
WP08	6730705	609340	60.69700	- 0.99723
SHORE	6730819	609287	60.69803	- 0.99814
T5/6 Cable				
T5/6 Hub	6731045	610090	60.69984	- 0.98331
WP01	6730990	610105	60.69934	- 0.98307
WP02	6730940	610140	60.69889	- 0.98246
WP03	6730880	610135	60.69835	- 0.98258
WP04	6730815	610010	60.69780	- 0.98491
WP05	6730785	609940	60.69755	- 0.98621
WP06	6730745	609855	60.69721	- 0.98778
WP07	6730695	609600	60.69684	- 0.99248
WP08	6730695	609350	60.69690	- 0.99706
SHORE	6730819	609287	60.69803	- 0.99814

2.5 Deposits

There are some minor differences between the existing three M100 turbines and the three new M100D turbines that are to be deployed. The newer turbines are heavier, with slightly reduced rotor diameter and blade tip height. The tripod substructure for the new turbines is now "Y" shaped rather than "T" shaped, but the total contact area with the seabed is unchanged. See Figure 6 and Table 4 for details.

Figure 6: Nova Innovation turbine dimensions: existing M100s (left) and updated M100Ds (right)



Source: Copyright © Nova Innovation 2019

Table 4: Comparison of key dimensions and dry/wet weights between M100 and M100D turbine models

Parameter	Original (M100)	Updated (M100D)
Nacelle weight	13.5t / 1.0t	21.7t / 10.1t
Steel substructure weight (inc. cable attachment)	32.0t / 28.0t	25.6t / 22.4t
Concrete ballast blocks (each)	7.2t / 4.6t (14 individual blocks)	9.1t / 5.7t (16 blocks in 4 cages)
Steel ballast cage (holds 4 concrete blocks)	n/a	3.0t/2.6t
Weight of ballast units (total)	101.0t / 63.7t	157.6t / 101.7t
Total weight	146.3t / 93.4t	206.8t / 138.5t
Hub height	9.0m	8.9m
Rotor diameter	9.0m	8.5m
Blade tip height	13.5m	13.2m
Substructure plan view footprint	13.5 x 12.2 m	10.3 x 18.2m
Points of contact with seabed	Three single point contacts per turbine (>0.4m^2 each point)	

Source: Copyright © Nova Innovation 2019

Both types of turbine substructure are ballasted using concrete blocks. For the M100s, 14 individual blocks are used. The M100Ds are ballasted with 16 individual blocks, loaded in sets of 4 into 4 steel ballast cages. See Figure 7 and dry/wet weights in Table 4 above.

Figure 7: Individual ballast block; 4-block ballast cage and two ballast cages as installed on substructure

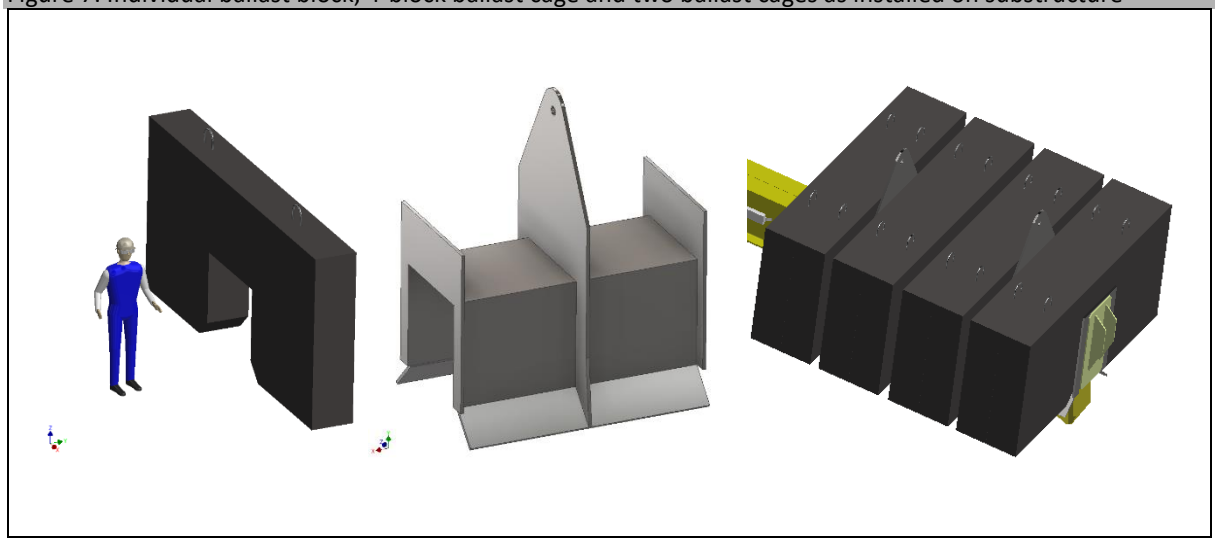


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Table 5 outlines the total deposits associated with the updated deployment plan, compared to the amounts detailed in Nova Innovation's marine license.

Table 5 Comparison of licensed deposits and approximate totals from updated deployment plan

Marine License 06642/18/0					**Current deployment plan**
Deposit	**Units**	**Amount**	**QTY**	**Totals**	**Totals**
Steel/iron	tonnes	50	6	**300**	**<300**
Plastic/synthetic	m^2	30	6	**180**	**<180**
Concrete	m^3	50	6	**300**	**<300**
Subsea cables	m	1,200 x 4 600 x 3	7	**6,600**	**<6,600**
Subsea sensor frames	kg	500	4	**2,000**	**<2,000**
Nortek Signature 500 ADCPs	kg	n/a	4	**4**	**4**

Source: Copyright © Nova Innovation 2019

As discussed in 2.1, turbines T1, T2, T3 and T4 have their own dedicated cables to shore, whereas T5 and T6 will be connected via jumper cables to a subsea hub (a steel tube of approximately 1m diameter and 2m length), to which a single export cable is connected. No additional deposits are required to secure the cables. Approximate cable lengths are as shown below (maximum totals in Table 5):

- T1 = 1,007m
- T2 = 1,085m
- T3 = 971m
- T4 = 1,341m
- T5/6 hub = 1,351m
- T5 and T6 jumper cables = 110m (each cable, 2 in total)
- Total length = 5,931m

From time to time, seabed sensor frames will be deployed on site with Acoustic Doppler Current Profilers/Velocimeters, as covered by the existing marine license.

2.6 Construction schedule

Table 6 sets out the construction schedule for the initial deployments of turbines T4, T5 and T6. The first site surveys were first carried out in 2014 and subsequent surveys have been carried out in parallel with maintenance works on the existing three turbines. A final pre-installation video survey of the precise set-down locations is planned for February 2019. The construction works to install the T4 machine are scheduled to commence in April. The installation of the T5 and T6 machines is scheduled for September 2020.

Table 6: T4-6 deployments in 2020

Turbine		Jan	Feb	Mar		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T4	Deploy substructure													
	Lay T4 export cable													
	Deploy nacelle													
	Normal operations													
T5+6	Deploy 2 x substructures													
	Lay hub and export cable													
	Deploy 2 x jumper cables													
	Deploy 2 x nacelles													
	Normal operations													

Source: Copyright © Nova Innovation 2019

Following a year of turbine operations and related site resource measurements and numerical modelling work, the turbines T4, T5 and T6 are to be relocated as part of an investigation into tidal turbine wakes and array interaction modelling under the EnFAIT (Enabling Future Arrays in Tidal) project.

Table 7 sets out the construction schedule for the reconfigured deployments of turbines T4, T5 and T6.

Table 7: Array reconfiguration in 2021

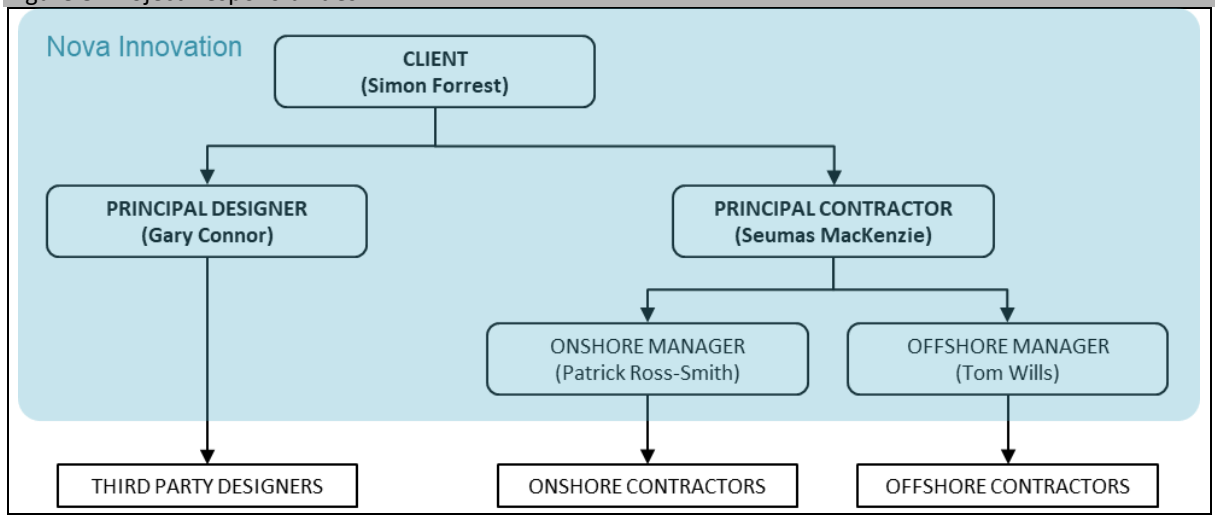
Turbine		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
T4-6	Normal operations												
	Recover 3 x nacelles												
	Recover T4 cable												
	Recover 2 x jumper cables												
	Relocate 3 x substructures												
	Lay T4 cable												
	Deploy 2 x jumper cables												
	Deploy 3 x nacelles												
	Normal operations												

Source: Copyright © Nova Innovation 2019

2.7 Responsibilities

Nova Innovation has primary responsibility for implementing the CMS and in line with the UK Construction (Design and Management) Regulations 2015, the company is acting as client, principal designer and principal contractor for the development. To ensure accountability, named individuals within Nova Innovation are appointed to these different roles (Figure 8).

Figure 8: Project Responsibilities



Source: Nova Innovation 2020

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	07584 625 441
Tom Wills, Offshore Manager	tom.wills@novainnovation.com
	07958 943 038

Contact details for nominated offshore contractors are detailed in Nova's Marine Licence (available here: http://marine.gov.scot/ml/marine-licence-deposits-tidal-array-bluemull-sound-shetland-04859), while contact details for onshore contractors are detailed in Nova's Construction Phase Plan.

In addition to the above Nova personnel, Kate Smith, Nova's Environmental Manager is responsible for overseeing delivery of the environmental monitoring programme for the Shetland Tidal Array and associated licence conditions. Contact details are as follows: kate.smith@novainnovation.com, 01286 239 710.

2.8 CMS compliance and review

As mentioned in Section 1, Nova regularly updates a Marine License Conditions Status Register and sends this to MS-LOT for review.

2.9 Good practice and mitigation

Table 8 outlines the environmental mitigation and good practice measures which Nova will follow in order to ensure compliance with the appropriate license conditions. This table will also be included in the operational documentation provided to the offshore contractor.

Table 8: Environmental mitigation and good practice measures

Mitigation or good practice measure	Responsible person(s)	Corresponding licence condition
Minimising disturbance to wildlife during site operations		
All personnel to adhere to the Scottish Marine Wildlife Watching Code during all installation, operation and maintenance activities. Copies of the code kept in site files at Cullivoe, and Nova offices and onboard all vessels engaged in Works. Included in all site briefings.	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 8
Avoidance of damage to seabed habitats and species		
Benthic survey to identify benthic habitats or species on the recommended Priority Marine Features list will be carried out prior to commencement of works to identify micro-siting of device foundations and final turbine layout/location of all infrastructure.	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 4; 7
Siting of turbines and cables undertaken utilising visual feedback system such as a camera or ROV, to prevent placing in or on maerl or horse mussel beds.	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 4; 7
All lifting equipment appropriately certified and all lifts and offshore operations appropriately risk assessed to minimis the risk of dropped objects during deployment and retrieval. MS-LOT to be notified within 24 hours in the event of a dropped object event.	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 3
Managing collision risk for marine wildlife with operational turbines		
Use of land-based bird and mammal surveys of the Project area to understand potential spatial overlap and collision risk factors.	Kate Smith	Marine Licence condition 3.1.10 Works Licence conditions 3 & 11
Use of subsea video monitoring to understand interactions of marine wildlife with turbines and collision risk factors.	Kate Smith	Marine Licence condition 3.1.10 Works Licence conditions 3 & 11
Any collision events observed in subsea video footage to be reported immediately to Marine Scotland and Shetland Islands Council (noting analysis of footage is *post hoc* and not in real time).	Kate Smith	Marine Licence condition 3.1.10
Waste and pollution		
All debris or waste material (including that below MHWS) will be removed from the site at Cullivoe and disposed of responsibly (recycled where possible).	Patrick Ross Smith	Marine Licence condition 3.1.10 Works Licence condition 3

Only contractors with ISO 14001:2015 environmental management systems accreditation to be used in marine operations	Tom Wills	Marine Licence condition 3.1.10
All turbine and substructure fabrication takes place with appropriate storage and pollution prevention facilities and procedures.	Alex Boswell (Edinburgh). Patrick Ross Smith (Shetland)	Marine Licence condition 3.1.10
No chemicals or fuel storage on site. If situation changes, materials will be stored appropriately including use of bunding if necessary.	Patrick Ross Smith	Marine Licence condition 3.1.8; 3.1.10; 3.2.1.3
No drilling or piling to be carried out, avoiding significant underwater noise and associated impacts	Tom Wills	Marine Licence condition 3.1.10
Unexpected pollution or breaches of environmental obligations		
Any accidental pollution or breaches to be reported to Marine Scotland within 24 hours.	Tom Wills	Marine Licence condition 3.2.1.2
Copy of Shetland Contingency Plan kept on site at Cullivoe and onboard all vessels engaged in Works. Measures in the Plan to be followed as appropriate.	Tom Wills	Marine Licence condition 3.1.10; 3.2.1.2 Works Licence condition 3
Decommissioning		
All reasonable, appropriate, and practicable steps will be taken to restore the Site to its original condition before the Works were undertaken, or to as close to its original condition as is reasonably practicable. To be detailed in Decommissioning Programme	Tom Wills	Marine Licence condition 3.2.1.4
Biosecurity and Invasive Non Natives Species (INNS)		
Turbines and substructures will be shipped to Shetland by road rather than sea to minimise potential for transfer of INNS	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 9
Northern Isles-based vessels used for marine operations, to minimise potential for transfer of INNS	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 9
Operator used for marine operations follows its own biosecurity good practice and has ISO 14001:2015 environmental management systems accreditation	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 9
Turbines, substructures, cables and hub will not be deployed subsea elsewhere before deployment in Bluemull Sound.	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 9
Temporary moorings (e.g. chains) used during deployment will be sourced from Shetland or pressure washed / air dried prior to use in Bluemull Sound.	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 9
Turbines and substructures will undergo visual inspections when removed from the water. INNS ID cards to be used during inspections. Biological material is removed as standard (on Cullivoe or Belmont Pier), to avoid dangerous handling conditions. If inspections identify INNS species, care will be taken to avoid contaminated material entering the marine environment. Any INNS identified will be reported to Shetland Islands Council, Marine Scotland and Scottish Natural Heritage.	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 9

3 Construction method statement

This chapter covers the offshore operations associated with the Shetland Tidal Array – surveying, installation, maintenance and decommissioning – including the nature of the mooring and the type of vessels to be used. All operations will be managed and overseen locally by Nova Innovation personnel who will be resident in Shetland for the duration of the operations. Details of the vessels and operators Nova intends to use to assist with operations have been provided separately to MS-LOT.

3.1 Vessels to be used

The scale of Nova's tidal devices allows small, readily available multicat workboats to be used for all installation, maintenance and recovery operations. An example of a suitable vessel is shown in Figure 9.

Figure 9: Representative turbine deployment and retrieval vessel (Leask Marine C-Odyssey)

Source: Delta Marine

These types of vessel have proven capability of operating in the conditions commonly experienced in and around the Bluemull Sound, particularly during the installation and maintenance of the existing three M100 turbines since 2016. They have sufficient margin of additional operational safety capacity to comfortably deal with the size and weight of equipment for this project. Any additional surveying operations will be conducted using a smaller, local vessel. Nova do not intend to ever have more than one vessel on site at any time. As with previous STA operations, a 4-point mooring will be used as required.

3.2 Communications Strategy

Nova will communicate with all relevant parties to ensure that they have the information they require in order to ensure the works are carried out safely and without risk to marine navigation.

Direct notifications will be issued to MS-LOT, SIC, CES and the UKHO one month in advance of the construction phase and following the completion of the construction works.

We will notify the following organisations of the start of site works via a Notices to Mariners (NtMs) issued at least one month prior to commencement of these works:

- Maritime and Coastguard Agency
- Crown Estate Scotland
- Marine Scotland Licensing Operations Team (MS-LOT)
- SIC (Works License Team)

- SIC Ports and Harbours
- SIC Ferries
- Northern Lighthouse Board
- Shetland Fisherman's Association (SFA)
- Shetland Shellfish Management Organisation (SSMO)
- Royal Yachting Association (RYA) – admin@ryascotland.org.uk
- Lerwick Boating Club
- Clyde Cruising Club
- Royal National Lifeboat Institution (RNLI) – Lerwick Lifeboat Station
- Shetland Maritime Rescue Coordination Centre (MRCC)
- UK Hydrographic Office
- Local Recreational Angling Associations/Operators

If necessary, additional NtMs will be issued to update the relevant parties on the progression of the works.

A Transportation Audit Sheet (TAS) will be submitted within 14 days of the end of any calendar month where construction work is actively undertaken.

In addition, we will provide information for the Kingfisher fortnightly maritime safety bulletins.

Table 9 provides an overview of the communications strategy for these works.

Table 9: STA Communications Strategy Overview (Construction Works)

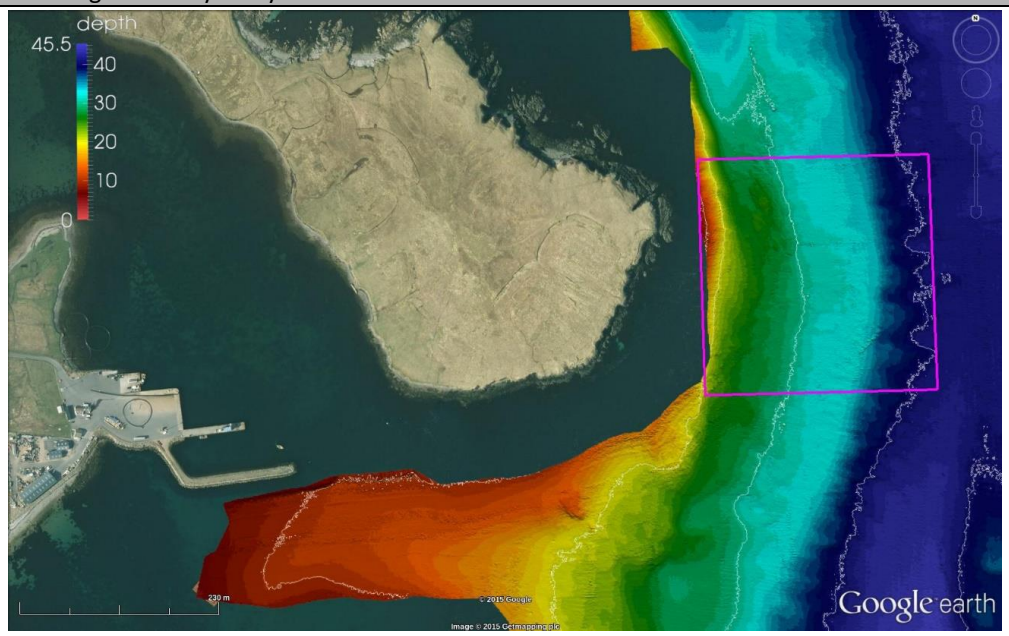
<table>
<tr><th rowspan="2">Organisation</th><th rowspan="2">1 month prior to commencement</th><th colspan="2">During active construction work</th><th rowspan="2">Within 1 month of completion</th></tr>
<tr><th>Weekly</th><th>Monthly (within 14 days of end of month)</th></tr>
<tr><td>UKHO</td><td rowspan="4">Direct notification in writing (by email)</td><td rowspan="5">Ensure NtM live and accurate</td><td>n/a</td><td>Notify in writing, confirm detail and coordinates of deployed equipment.</td></tr>
<tr><td>MS-LOT</td><td>Transportation Audit Reports</td><td>Confirm completion date in writing, submit audit report.</td></tr>
<tr><td>CES</td><td rowspan="3">n/a</td><td rowspan="2">Notify in writing.</td></tr>
<tr><td>SIC</td></tr>
<tr><td>NtM list</td><td>Issue NtM</td><td rowspan="2">De-activate notifications</td></tr>
<tr><td>Kingfisher Bulletin</td><td>Provide information for Bulletin</td></tr>
</table>

Source: Nova Innovation, 2020

3.3 Site surveys

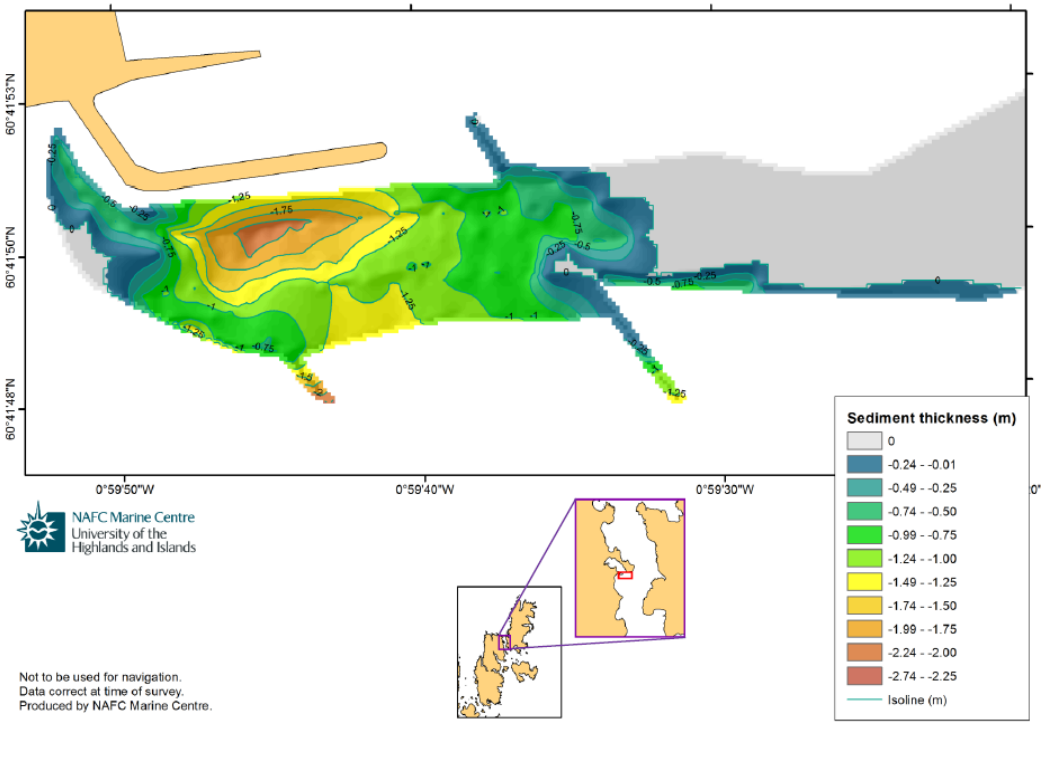
Nova Innovation already has a very detailed knowledge of the site and lease area from five years of operations, including bathymetry data (Figure 10) and sediment thickness data (Figure 11) as well as hundreds of hours of video footage from drop camera and diver operations.

Figure 10: Existing site bathymetry data



Source: Copyright © Nova Innovation 2017

Figure 11: Total sediment thickness, drawn at 250 cm intervals with overlaying isolines. No sediment was identified in the rest of the cable route and array area to the East of the location shown.



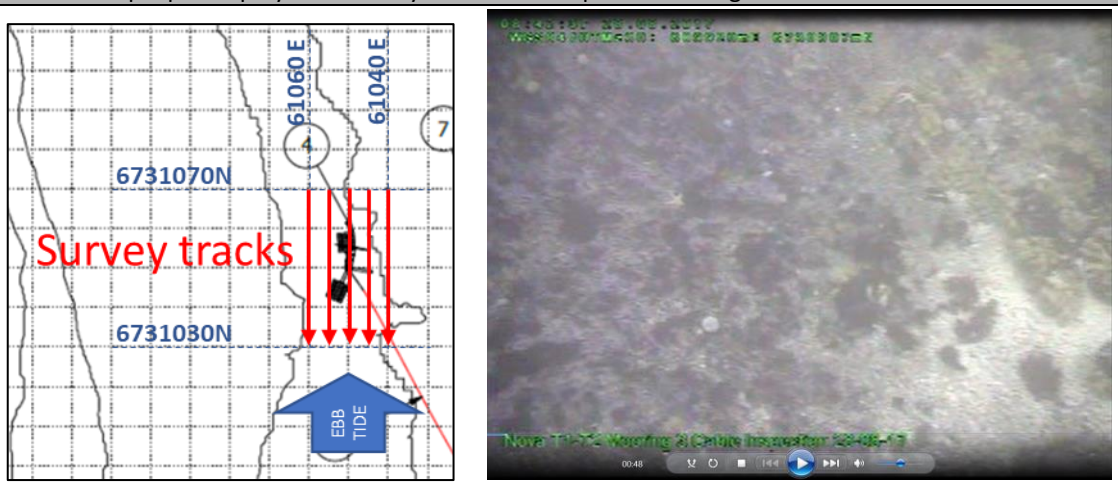
Source: Copyright © Nova Innovation 2017

Detailed video surveys were conducted of the deployment site and cable route in 2010 and 2014. No evidence of species on the marine priority list (in particular Horse Mussels and Maerl) was observed. See Appendix B.

3.3.1 Pre-deployment surveys

To confirm that the target area of seabed is clear of obstructions and any particularly sensitive species, including benthic habitats or species on the recommended Priority Marine Features list, pre-deployment surveys of the turbine installation locations will be carried out prior to construction works commencing. These surveys will use a drop video camera. Using a high water slack (when the building ebb tide will be running to the north - away from the existing machines), a series of survey transects will be carried out as shown in Figure 12. Initial survey tracks will be separated by 5-10m: closer or additional tracks may be used if required.

Figure 12: Example pre-deployment survey tracks and drop camera image



Ref	Item	UTM30 (E)	UTM30 (N)	Heading
4	M100D T4 TURBINE	610050	6731050	010

Source: Copyright © Nova Innovation 2020

A final pre-deployment survey of each turbine installation will also be carried out on the day of deployment operations, using the same Spyball drop video camera deployed from the multicat vessel, which will maintain accurate position keeping using a four-point mooring (Figure 13). The same methodology will be used to carry out seabed surveys prior to cable and cable hub installation. Flashcards will be used (see Appendix A) to inform *in situ* interpretation of video footage by on-board personnel, but all video will also be recorded for *post-hoc* examination.

Deployment of the substructure will be carried out using a lift beam fitted with a Gyrocompass, ensuring that accurate reading of the heading and tilt of turbine foundations are recorded.

3.3.2 Post-deployment surveys

To confirm the locations and surrounding environment of all deployed equipment, surveys of the deployed turbines, cable routes and other infrastructure will be conducted using a drop camera deployed from a suitable vessel. Geolocation will be provided by the vessel GPS. The confirmed positions of the deployed devices and cable will be communicated to UKHO to be marked on hydrographic charts.

The position of the deployed devices and cables will also be communicated to MS-LOT, along with GIS shapefiles detailing the locations of the turbines and associated infrastructure following initial deployment, redeployment and final deployment.

Figure 13: Multicat drop camera deployment and sample image from cable survey

Source: Copyright © Nova Innovation 2020

All pre- and post-deployment surveys will be carried out with due consideration of sensitive habitats and species: the survey team will carry species ID cards in order that species of interest can be identified - see Section 3.8 and Appendix A.

3.3.3 Survey reporting

Pre- and post-deployment video survey data will be verified by a suitably experienced expert able to confirm species and habitat identifications to the appropriate biotope or species level. Information from these surveys will be reported in monitoring reports submitted as part of the environmental monitoring strategy set out in the PEMP. If sensitive benthic habitats or species are identified from the footage, micro-siting will be used to avoid any physical impacts. It should be noted that no such habitats or species have been observed in previous video surveys of the Shetland Tidal Array Project area. For details of previous surveys, see Appendix B.

3.4 T4-6 device installations

The T4 turbine will be deployed in the following stages:

1) **Load-out substructure**: the Substructure will be assembled and have the Cable Backpack and Nacelle trial-fitted onto it at Belmont Pier in Unst. A mobile land-based crane will then transfer the steel substructure from its storage location on Belmont Pier, Unst to the Multicat deployment vessel.

2) **Deploy substructure:** The substructure will be transported from Belmont Pier to the installation location, where it will be lowered to the correct position on the seabed.

3) **Ballast substructure:** The Multicat will pick up the concrete ballast units at Cullivoe Pier, Yell, before transporting them to site and lowering them onto the relevant locations on the turbine substructure.

4) **Deploy cable:** The reeled cable will be carried by the Multicat from Cullivoe Pier to the installation location. The cable will be laid from the Multicat as a single length from the turbine location to the pier at Cullivoe. At the offshore end, the subsea cable attaches to the substructure. At the shore end, the cable is led up the beach and terminated inside an onshore GRP housing. No additional deposits are required to secure the cables.

5) **Deploy nacelle:** The Multicat will collect the turbine nacelle from Cullivoe Pier and carry it to the installation location. The nacelle will be lowered from the vessel to the substructure, to which it will be mechanically locked. The electrical connection is made by a remotely actuated wet-mate connector.

The process for installing the T5 and T6 machines will be as outlined above, with the difference that these two turbines will be connected via jumper cables to a subsea hub with a single cable to shore. The subsea hub will be lowered to the seabed by the Multicat installation vessel and the cable laid back to shore and terminated. The jumper cables will then be installed to connect the turbines to the cable hub. As with previous STA operations to date, a 4-point mooring will be used for positioning when required.

Operations are designed to be diverless, but a dive team will be on standby should they be required. Nova do not plan to use any ROVs. Equipment deployment and recoveries will be carried out using a combination of the main vessel winch and the vessel Hi-Ab crane, plus vertically lowered and surface-actuated recovery tools.

3.5 T4-6 device redeployments (array reconfiguration)

Following an initial period of turbine operations, site measurements and related numerical modelling work, the T4-6 devices will be relocated closer to the T1-3 devices, as part of Nova's work to validate and optimise tidal array operations through the EU-funded EnFAIT (Enabling Future Arrays in Tidal) project.

Pre-deployment site surveys will first be carried out of the T4-6 redeployment locations that have been identified, to confirm these areas are free of obstructions and any particularly sensitive species.

The T4 turbine will be repositioned in the following stages:

1) **Recover turbine:** The Multicat will moor up over the turbine, lower a recovery tool onto the turbine, release the mechanical lock and disengage the wet-mate connector so that the turbine can be recovered to Cullivoe Pier.

2) **Recover cable:** Once the subsea cable has been disconnected at the shore end, the Multicat will load this end of the cable. Then, using a powered cable reeler, the vessel will begin pulling the cable aboard onto a reel, moving towards the offshore location. At the offshore end, the vessel will moor up and recover the offshore end of the cable from the substructure onto the vessel deck, using a weighted grab tool lowered vertically.

3) **Deballast, reposition and reballast substructure:** The Multicat will then recover an appropriate number of concrete ballast units from the substructure, so that the wet weight of the partially deballasted substructure can be taken by the main vessel winch and the substructure can be repositioned in the appropriate location, before the ballast units that have been removed are reinstated. The turbine cable and nacelle can then be reinstated as outlined below.

4) **Redeploy cable:** The reeled cable will be carried by the Multicat from Cullivoe Pier to the installation location. The cable will be laid from the Multicat as a single length from the turbine location to the pier at Cullivoe. At the offshore end, the subsea cable attaches to the substructure. At the shore end, the cable is led up the beach and terminated inside an onshore GRP housing.

5) **Redeploy turbine:** The Multicat will collect the turbine nacelle from Cullivoe Pier and carry it back to the installation location. The nacelle will be lowered from the vessel to the substructure, to which it will be mechanically locked. The electrical connection is made by a remotely actuated wet-mate connector.

The process for recovering and redeploying the T5 and T6 machines will be as outlined above, with the difference that these two turbines are connected via jumper cables to a subsea hub with a single cable to shore, so only the jumper cables need to be recovered and redeployed: the subsea hub can be left offshore.

Depending on the precise T4-6 locations that the EnFAIT research work defines, the hub may however need to be repositioned. The finalised locations for the redeployment of T4, T5, T6, the subsea hub and all related cable routes will be communicated to MS-LOT, CES, SIC and UKHO in advance of the reconfiguration works.

Post-deployment site surveys will be carried out of all the deployed equipment, to confirm their exact locations and proximity to any obstructions or particularly sensitive species.

As-deployed coordinates will be formally submitted to MS-LOT, CES, SIC and UKHO on completion of these reconfiguration works.

3.6 Management of installation

Offshore operations will be carried out during appropriately slack tides with suitable wave and weather conditions. The installation will be managed by Nova Innovation staff who will be resident in Shetland for the project. Following successful commissioning, monitoring of the devices will be undertaken remotely via a fibre optic cable. This will allow the devices to be monitored either from the shore or remotely via a secure internet connection.

3.7 Site marking / buoys

Given the depth of the turbine and the advice of marine navigation stakeholders to keep the area clear of potential hazards, the site will not be marked with any buoys or markers during normal operation. Temporary marker buoys required during vessel operations will be deployed in compliance with COLREGS and removed on completion of deployment.

3.8 Health, Safety and the Environment

The work will be conducted in compliance with Nova Innovation's HSE policy. All staff and personnel involved in the project will be fully briefed and trained and will exercise good health and safety and environmental work practices. This document should be read in conjunction with the Project Environmental Monitoring Plan (PEMP). Hard copies of all relevant Health and Safety and environmental protocols and codes of practice, along with project licences and associated documents are located at Nova's Cullivoe Pier office and shared with all personnel involved in operations.

Pollution prevention measures

There are no hazardous substances contained in the turbines. All exposed steel surfaces are painted with standard marine-grade paint. There will only be less than twenty litres of hydraulic fluid in each device, contained within a sealed unit which itself is contained within the watertight nacelle.

Measures to avoid the introduction of marine non-native species (NNS)

Nova has produced a biosecurity plan for the project, detailing measures to avoid contributing to the spread of invasive marine non-native species within the Shetland area. None of the new array equipment to be deployed in Bluemull Sound will have been deployed subsea previously. Temporary moorings (e.g. chains) will either be sourced from Shetland or will be pressure washed or air dried prior to deployment in the Bluemull Sound. Attempts will be made to use locally based boats for offshore operations where it is practical to do so. Additional measures to avoid introduction of NNS during the project lifetime are outlined in the PEMP, following recommendations in *A Biosecurity Plan for the Shetland Islands* (NAFC 2015).

Measures to avoid environmental harm during operations

Details of the environmental monitoring that will be carried out to monitor the effects of the operating turbines on marine wildlife are provided in the PEMP. Monitoring will continue to focus on the potential for marine wildlife to interact and collide with the operating turbines. In the event that monitoring detects collisions or other unacceptable environmental harm then devices can be shut down, if required. This can be done remotely from Nova Innovation's offices in Edinburgh or manually on-site. Details for determining an appropriate management response to any unacceptable environmental harm are set out in the PEMP. It is worth noting that to date Nova have recorded more than 10,000 hours of operational video footage, with no observed instances of any collisions or negative interactions between the devices and marine wildlife.

See also Table 8, section 2.9 for full details of all environmental good practice and mitigation measures that will be implemented during the Works.

3.9 Operations and maintenance

Each marine turbine comprises a cylindrical nacelle unit, rotor and a supporting gravity-based frame. The turbine blades are bidirectional, operating in both directions of tidal flow without the need for the nacelle to yaw. The turbine blades rotate in the tidal stream and power a generator that is housed within the nacelle. The electricity produced by the generator is exported to the grid by a subsea cable from the turbines to the shore (T1 to T4) or

via a small subsea hub (T5 and T6). All electrical power conditioning and control is based onshore at the grid connection point on Cullivoe Pier.

Communication to the machines is via a fibre optic cable embedded in the power cable, which can be accessed by a secure ISDN/broadband communications link, allowing each individual turbine to be accessed remotely over the internet. It is also therefore possible to control and monitor the turbines locally and remotely from Nova's Edinburgh office.

Nova may need to carry out unplanned maintenance activities on any of the existing or new turbines: this work would be accompanied by the relevant marine notifications – see Table 10.

Table 10: STA Communications Approach for Maintenance Works

Organisation	1 month prior to commencement (or as soon as possible if unscheduled)	During active maintenance work	Within 1 month of completion
MS-LOT	Direct notification in writing (by email)	Ensure NtM and Kingfisher Bulletin live and accurate	Notify in writing of any significant changes to deployed equipment.
CES			
SIC			
UKHO	Issue NtM		
NtM list			De-activate notifications
Kingfisher Bulletin	Provide information for Bulletin		

Source: Nova Innovation, 2020

Each turbine nacelle will be periodically removed from its base and taken back to Cullivoe Pier for servicing on land, following which it will be returned to its base. The stages involved in this process are set out below.

Retrieval: A release mechanism is activated by the service vessel using a recovery tool lowered vertically. This releases the nacelle from the base from where it is lifted to the surface, secured to the vessel and removed to Cullivoe Pier for servicing. Temporary marker buoys may be used.

Redeployment: On completion of servicing, the nacelle is returned to the site; the device is lowered onto the base and the structural connection is completed. The deployment tool is then recovered.

3.10 Operational environmental monitoring

Each device will be monitored manually and automatically for a period following deployment. If no harm is observed to the environment, then the device will continue to be monitored automatically during its operating lifetime. Details of the environmental monitoring that will be carried out are set out in the PEMP.

3.11 Contingency Plans for Loss of Device

In the highly unlikely event that any of the devices (or a part thereof) should become detached from their substructure, an alarm is immediately sent to the operator on duty who will co-ordinate retrieval operations.

The device is negatively buoyant, so will remain on the seabed in the event of failure. As discussed above, the amount of hydraulic fluid is minimal and all such fluids are housed within sealed units inside a watertight nacelle – i.e. are doubly contained.

3.12 Decommissioning

Removal of the devices at any time is relatively straightforward due to their relatively small scale. Means for the removal from site of the major sub-components are listed below:

1) **Turbine nacelle** removal follows the maintenance procedure described above. The nacelle will be dismantled onshore for re-use or recycling.

2) **Turbine base** is recovered by a lifting tool and raised from the seabed to the surface by a service vessel. The base is secured to the vessel and taken to shore, where it can be re-used or dismantled for recycling.

3) The **cable** is retrieved by drawing it on to a spool on a work boat, reversing the deployment process. Any protection associated with the cable (e.g. rock bags) is recovered at the same time.

4) **Switchgear and control** is housed in a stand-alone, ingress-protected GRP container on the pier at Cullivoe; it can easily be removed from the same.

Once the devices and associated structures are removed, the seabed and surrounding locality will return to their natural state with no permanent impact from the devices.

The full decommissioning programme will be agreed with MS-LOT.

3.13 Change Management

Significant changes to the schedule or methods outlined in this CMS (including those resulting from the COVID-19 outbreak) will be communicated to MS-LOT and the project team with this CMS being updated as appropriate. Nova's internal quality and change management procedures will be adhered to at all times.

4 Vessel Management Plan

The vessels to be used for offshore operations will be determined in advance of the operation depending on availability. The size and operational capability of vessels will be as follows:

1) Surveying: small local boat or Multicat vessel

2) Deployment and retrieval: Multicat vessel (see Figure 9)

Only one of these project vessels will be on site at any given time. The equipment deployment and recovery tasks to be carried out are of the same sort that Nova has been carrying out routinely in this area since 2014. The local harbour master and other users of Cullivoe and Belmont Pier are familiar with these operations, as are the identified vessel providers. No special vessel management arrangements are required.

The harbour master, Shetland Ports and Harbours and Shetland CGOC will be advised in advance of all operations (see 3.2). All quayside and harbour works will be undertaken in compliance with the direction of the harbour master.

All vessels involved in the installation, maintenance and decommissioning of the device will comply with all aspects of the International Regulations for Preventing Collisions at Sea (COLREGS)[1]. All vessels used will carry all equipment as required under the vessels' registration, e.g. the Code of practice for the safety of small workboats and pilot boats[2].

Notices to Mariners will be used to inform stakeholders of offshore operations. During all offshore operations we will adhere to the good practice guidelines associated with the Scottish Marine Wildlife Watching Code, hard copies of which are kept in Nova's office at Cullivoe Pier and onboard all vessels engaged in operations.

[1] Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS) (as amended)

[2] https://www.gov.uk/government/publications/small-craft-codes

5 Glossary

CPP	Construction Phase Plan
CES	Crown Estate Scotland
CMS	Construction Method Statement
EnFAIT	Enabling Future Arrays in Tidal
ERCOP	Emergency Response and Cooperation Plan, a copy of which is stored in the Nova site office, with another brought aboard the vessel by the Nova Offshore Rep
M100	The existing (gearbox-driven) 100kW Nova turbines (T1, T2 and T3)
M100D	The new (direct drive) 100kW Nova turbines (T4, T5 and T6)
MS-LOT	Marine Scotland Licensing Operations Team
RAMS	Risk Assessment and Method Statement(s)
SIC	Shetland Islands Council
STA	Shetland Tidal Array

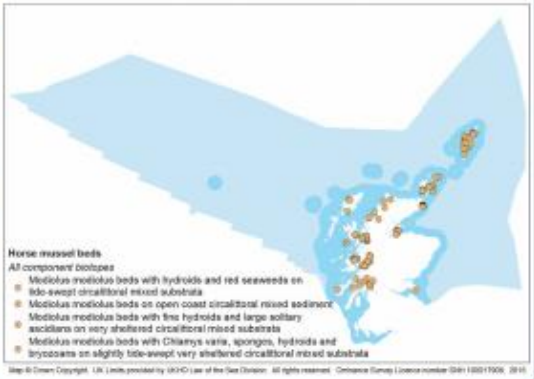
Appendix A Habitat ID flashcards

Ref: https://www.nature.scot/snh-commissioned-report-406-descriptions-scottish-priority-marine-features-pmfs

TERRITORIAL WATERS

Broad habitat

HORSE MUSSEL BEDS

Image	Distribution
 Image: Rob Cook	

Feature description

Characteristics - The horse mussel *Modiolus modiolus* occurs in scattered clumps, thin layers or dense raised beds, which can extend up to several hectares in size. Raised beds are formed of horse mussels bound together by a matrix of byssus threads. Silt, organically rich faeces and shells accumulate within the structure and further increase the bed height. Horse mussel beds significantly modify sedimentary habitats and provide hard substratum, refuge and ecological niches for a wide variety of organisms. The beds increase local biodiversity and may provide settling grounds for commercially important bivalves, such as queen scallops.

Environmental preferences - Weak to strong water movement on a variety of mixed substrata. Found at depths of 5-220m.

Scottish distribution - Recorded from sea lochs, embayments and open coast in Shetland, Orkney, off Caithness and down the west coast with scattered records from the Outer Hebrides and Moray Firth. Relatively small, dense beds of horse mussels can also occur on steep rocky surfaces within sea lochs.

Wider distribution - Recorded from the Ards Peninsula, Strangford Lough, off both ends of the Isle of Man, off north-west Anglesey and north of the Llŷn Peninsula, Wales.

Feature status - Scottish waters support 85% of all horse mussel beds in the British Isles which themselves represent most of the habitat within Europe. They are sensitive to physical disturbance and mobile fishing gears may damage and/or remove beds. The extent and quality of habitat has declined since the 1950s with formerly extensive beds in Strangford Lough (N. Ireland) lost as recently as 2007 due to scallop trawling and dredging. The condition of beds in Loch Creran and Loch Duich on the west coast of Scotland has also deteriorated but the cause is currently unknown.

Natural heritage importance	Information sources
EC Habitats Directive Annex I	MarLIN
OSPAR T&D	OSPAR Case Report
Scottish Biodiversity List	UK BAP Habitat Definitions
UK BAP	UK Marine SACs Overview

Component biotopes in Scottish waters

Modiolus modiolus beds with hydroids and red seaweeds on tide-swept circalittoral mixed substrata - **SS.SBR.SMus.ModT**.
Modiolus modiolus beds on open coast circalittoral mixed sediment - **SS.SBR.SMus.ModMx**.
Modiolus modiolus beds with fine hydroids and large solitary ascidians on very sheltered circalittoral mixed substrata - **SS.SBR.SMus.ModHAs**.
Modiolus modiolus beds with *Chlamys varia*, sponges, hydroids and bryozoans on slightly tide-swept very sheltered circalittoral mixed substrata - **SS.SBR.SMus.ModCvar**.

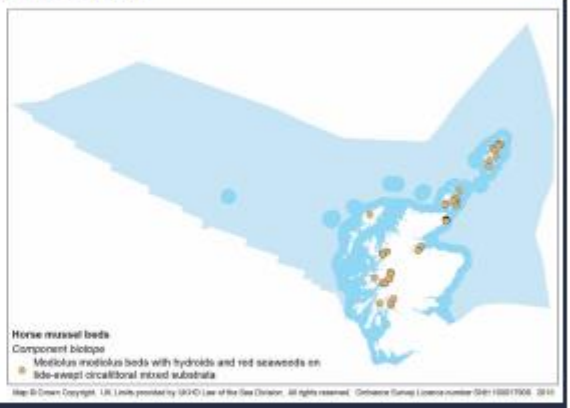
TERRITORIAL WATERS

Component biotope name

***MODIOLUS MODIOLUS* BEDS WITH HYDROIDS AND RED SEAWEEDS ON TIDE-SWEPT CIRCALITTORAL MIXED SUBSTRATA (SS.SBR.SMus.ModT)**

Image

Distribution



Feature description

Characteristics - In strong currents or tide-swept conditions, the horse mussel (*Modiolus modiolus*) forms raised beds on mixed muddy substrates. The beds are made up of living and dead mussels, bound together with byssus threads, and an accumulation of silt and mussel faeces. In some cases they can be several metres high and many metres long providing refuge for a variety of other organisms. Red seaweeds and sea firs grow on or amongst the horse mussels. Brittlestars are often common in this habitat, along with tube worms, whelks, clams and sea anemones.

Environmental preferences - Typically found on the open coast but also in the tide-swept channels of marine inlets on mixed, muddy substrata (cobbles and pebbles) from 5-50m.

Scottish distribution - Recorded from Shetland (e.g. Basta Voe and Yell Sound), Orkney (Shapinsay Sound), the Caithness coast (Noss Head), the Moray Firth, the Outer Hebrides (Loch Roag) and within sea lochs of the west coast of Scotland (e.g. Loch Carron, Loch Linnhe and Loch Long).

Wider distribution - There are very few records of this biotope outside of Scotland but it has been recorded in the Irish Sea off the north-west Llŷn Peninsula (North Wales) and off Co. Down (Northern Ireland).

Feature status - Supporting the majority of horse mussel beds in the British Isles, Scottish waters are nationally important for this habitat which is sensitive to physical disturbance. Mobile fishing gears may damage or completely remove horse mussel beds.

Natural heritage importance	Information sources
EC Habitats Directive Annex I (Reefs, typical of Large shallow inlets and bays) OSPAR T&D Scottish Biodiversity List UK BAP	JNCC Marine Habitat Classification MarLIN OSPAR Case Report UK BAP Habitat Definitions

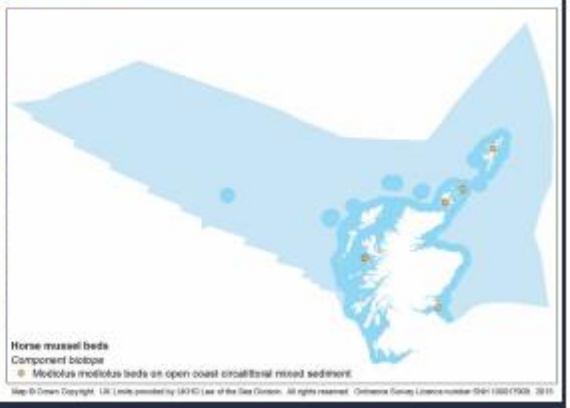
Sub-component biotopes in Scottish waters

No sub-component biotopes

TERRITORIAL WATERS

Component biotope name

***MODIOLUS MODIOLUS* BEDS ON OPEN COAST CIRCALITTORAL MIXED SEDIMENT (SS.SBR.SMus.ModMx)**

Image	Distribution
 Image: Richard Shucksmith	

Feature description

Characteristics - Beds of horse mussels (*Modiolus modiolus*) on or within mixed muddy and gravel sediments in deep water. Clumps of live and dead shells are bound together by byssal threads providing a stabilising effect on the sea bed. The accumulation of silt and mussel faeces upon and around the beds provides a habitat that attracts a rich diversity of organisms, in particular polychaete worms. Venerid bivalves and brittlestars are also commonly present.

Environmental preferences - Typically occurs on current swept, moderately sheltered circalittoral mixed sediment (muddy sand and gravel, with shells and stones) at depths of 40-100m.

Scottish distribution - Recorded from the Northern Isles (Sullom Voe, Shetland and Hoy Sound, Orkney) as well as from the Small Isles on the west coast, and Isle of May on the east.

Wider distribution - There are a number of records in the Irish Sea, with scattered records on the east coast of Ireland, Northern Ireland and England. Records of *M. modiolus* off Norway, in the Kattegat Sea and off the west coast of France may represent examples of this biotope.

Feature status - *M. modiolus* is a long lived species with poor recruitment. Horse mussel beds are sensitive to physical disturbance which can adversely affect bed integrity. Mobile fishing gears may damage or completely remove beds.

Natural heritage importance	Information sources
EC Habitats Directive Annex I (Reefs)	JNCC Marine Habitat Classification
OSPAR T&D	MarLIN
Scottish Biodiversity List	OSPAR Case Report
UK BAP	UK BAP Habitat Definitions

Sub-component biotopes in Scottish waters

No sub-component biotopes

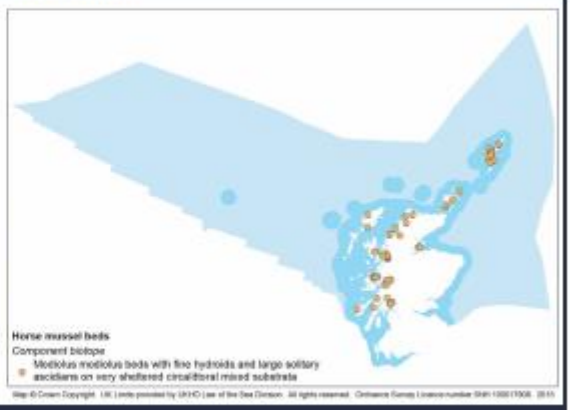
TERRITORIAL WATERS

Component biotope name

***MODIOLUS MODIOLUS* BEDS WITH FINE HYDROIDS AND LARGE SOLITARY ASCIDIANS ON VERY SHELTERED CIRCALITTORAL MIXED SUBSTRATA (SS.SBR.SMus.ModHAs)**

Image

Distribution



Feature description

Characteristics - In wave sheltered areas, the horse mussel (*Modiolus modiolus*) forms beds or scattered clumps on mixed muddy substrates. The beds or clumps consist of living and dead mussels bound together by byssus threads. They provide refuges and substratum for sea firs, solitary sea squirts and fish species. The beds also support a variety of brittlestars, together with commercially important shellfish (e.g. queen scallops), hermit crabs, spider crabs and whelks.

Environmental preferences - This biotope typically forms on mixed, muddy substrata (cobbles and pebbles) in sheltered conditions with slight tidal movement at depths of 5-30m.

Scottish distribution - Found in sea lochs and voes in Shetland (e.g. Sullom Voe), Orkney (e.g. North Sanday and Shapinsay Sound), the Outer Hebrides (e.g. Loch Roag and Loch Tarbert) and the west coast (e.g. Loch Sunart and Loch Duich).

Wider distribution - This biotope is only recorded in Scotland.

Feature status - This biotope is unique to Scottish waters and, like the other horse mussel bed biotopes, is sensitive to physical disturbance which can adversely affect bed integrity. Mobile fishing gears may damage or completely remove *M. modiolus* beds.

Natural heritage importance	Information sources
EC Habitats Directive Annex I (Reefs, typical of Large shallow inlets and bays) OSPAR T&D Scottish Biodiversity List UK BAP	JNCC Marine Habitat Classification MarLIN OSPAR Case Report UK BAP Habitat Definitions

Sub-component biotopes in Scottish waters

No sub-component biotopes

TERRITORIAL WATERS

Component biotope name

***MODIOLUS MODIOLUS* BEDS WITH *CHLAMYS VARIA*, SPONGES, HYDROIDS AND BRYOZOANS ON SLIGHTLY TIDE-SWEPT VERY SHELTERED CIRCALITTORAL MIXED SUBSTRATA (SS.SBR.SMus.ModCvar)**

Image

Distribution

Feature description

Characteristics - Beds of horse mussels (*Modiolus modiolus*) on or in gravelly mud sediments. Beds are made up of living and dead mussels, bound together with byssus threads, and an accumulation of silt and mussel faeces. The beds provide refuge and substratum for a variety of other organisms. The variable scallop (*Chlamys varia*) is characteristically present amongst the horse mussels. Brittlestars, feather stars, hermit crabs, spider crabs and whelks are also found in this biotope. Sponges, sea firs, sea mats and sea squirts grow on the mussels.

Environmental preferences - This biotope forms beds on slightly tide-swept, very sheltered circalittoral mixed sediment (pebbles and shells on sandy mud) at depths of 5-220m.

Scottish distribution - Restricted to a small number of sea lochs on the west coast (Loch Fyne, Loch Creran and on Skye), as well as from Orkney and within Bluemull Sound in Shetland. An atypical deep water variant of this biotope has recently been recorded within the Sound of Canna.

Wider distribution - There are only a few records of this biotope outside of Scottish waters, these are primarily in the Irish Sea (Northern Ireland and north-west Wales).

Feature status - This is a rare horse mussel bed biotope and like all biogenic reefs is sensitive to physical disturbance which can adversely affect bed integrity. Mobile fishing gears may damage or completely remove *M. modiolus* beds.

Natural heritage importance	Information sources
EC Habitats Directive Annex I (Reefs, typical of Large shallow inlets and bays) OSPAR T&D Scottish Biodiversity List UK BAP	JNCC Marine Habitat Classification MarLIN OSPAR Case Report UK BAP Habitat Definitions

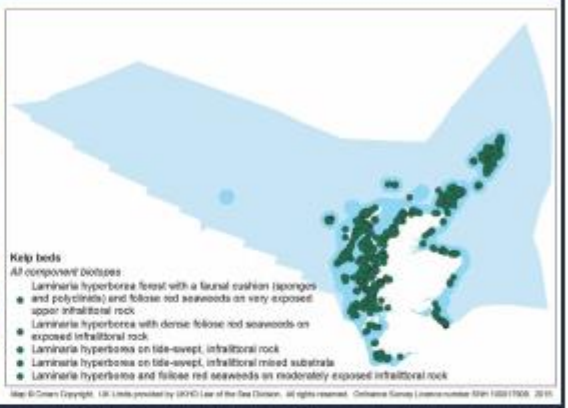
Sub-component biotopes in Scottish waters

No sub-component biotopes

TERRITORIAL WATERS

Broad habitat

KELP BEDS

Image	Distribution
 Image: Richard Shucksmith	

Feature description

Characteristics – Beds of the kelp *Laminaria hyperborea* form as forests and parks in rocky coastal areas, under a variety of wave and tidal conditions. The kelp provides a canopy under which a wide range of animals and other seaweeds thrive. A rich diversity of red seaweeds grow among the kelp and on the kelp stipes, while depending on conditions, sea mats and sea firs may colonise the fronds. The rocks below the kelp are often encrusted with coralline algae or support cushion forming fauna, such as sea anemones, sponges and sea squirts. Small crustaceans and worms live among the kelp holdfasts, while sea urchins and sea snails graze on the seaweeds, and fish find shelter from predators among the fronds.

Environmental preferences - Kelp beds occur in shallow waters (to a maximum of 20-30m), on bedrock and boulders in a range of wave exposure regimes and tidal conditions.

Scottish distribution - Widely recorded around all coasts of the Scottish mainland and islands. The more exposed biotopes are particularly recorded from Atlantic coasts in the west and the north.

Wider distribution - Widely recorded around the coasts of the UK and Ireland, although more exposed biotopes are only found on the west coast of Ireland, off Cornwall and south-west Wales.

Feature status - Scotland holds a significant proportion of the UK records of kelp beds and therefore the habitat is considered to be nationally important. The kelp component may be a target for seaweed harvesting, with potential effects on habitat structure and species diversity. Activities which cause changes in wave exposure or tidal flow could also have effects on this habitat.

Natural heritage importance	Information sources
EC Habitats Directive Annex I (Reefs) Scottish Biodiversity List (IR.MIR.KR.LhypT & IR.MIR.KR.LhypTX only) UK BAP (IR.MIR.KR.LhypT & IR.MIR.KR.LhypTX only)	JNCC Marine Habitat Classification MarLIN

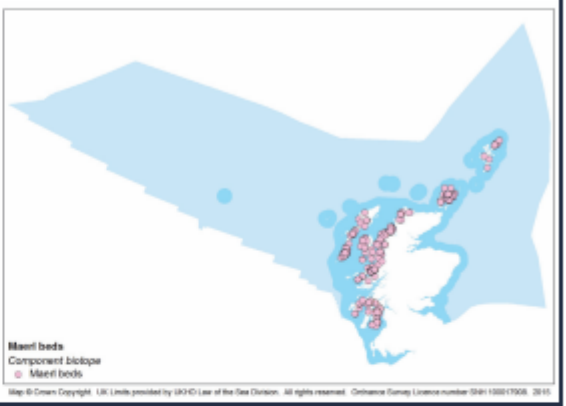
Component biotopes in Scottish waters

Laminaria hyperborea forest with a faunal cushion (sponges and polyclinids) and foliose red seaweeds on very exposed upper infralittoral rock - **IR.HIR.KFaR.LhypFa**.
Laminaria hyperborea with dense foliose red seaweeds on exposed infralittoral rock - **IR.HIR.KFaR.LhypR**, including: **IR.HIR.KFaR.LhypR.Ft** & **IR.HIR.KFaR.LhypR.Pk**.
Laminaria hyperborea on tide-swept, infralittoral rock - **IR.MIR.KR.LhypT**, including: **IR.MIR.KR.LhypT.Ft** & **IR.MIR.KR.LhypT.Pk**.
Laminaria hyperborea on tide-swept infralittoral mixed substrata - **IR.MIR.KR.LhypTX**, including: **IR.MIR.KR.LhypTX.Ft** & **IR.MIR.KR.LhypTX.Pk**.
Laminaria hyperborea and foliose red seaweeds on moderately exposed infralittoral rock - **IR.MIR.KR.Lhyp**, including: **IR.MIR.KR.Lhyp.Ft**; **IR.MIR.KR.Lhyp.Pk**; **IR.MIR.KR.Lhyp;GzFt** & **IR.MIR.KR.Lhyp:GzPk**.

TERRITORIAL WATERS

Broad habitat

MAERL BEDS

Image	Distribution
	

Feature description

Characteristics - Maerl beds are formed by an unusual red seaweed with a hard chalky skeleton that grows as small rounded nodules or short branched twig-like shapes. In high abundance, maerl can form loosely interlocking beds through which water is able to circulate, providing the perfect conditions for the development of diverse communities of plants and animals (on, within or under the beds). Red seaweeds, sea firs, sea urchins, brittlestars, starfish, sea anemones and scallops may colonise the surface. Maerl needs light to grow, so living maerl is restricted to the surface of the beds overlying the chalky skeletons of dead maerl. Three maerl species exist in the British Isles and the relative composition of these within a bed, and the proportion of living / dead maerl within and between beds, varies with factors such as salinity and wave exposure. Maerls are extremely slow growing and extensive beds may be 1000s of years old.

Environmental preferences - Coarse clean sands and gravels either on the open coast or in tide-swept channels to a depth of about 20m. Occasional records from muddier sediments e.g. Loch Torridon.

Scottish distribution - Widespread on the west coast (e.g. Arran, Loch Sween, Sound of Arisaig and Loch Laxford), the Outer Hebrides (e.g. Sound of Barra and Loch nam Madadh) and in tide-swept areas of Orkney (e.g. Wyre and Hoy Sound) and Shetland (e.g. Bluemull Sound).

Wider distribution - Recorded on the south English coast, in Wales, Ireland and Northern Ireland, NW Iceland, NW France, NW Spain and the Canaries. Also known to occur in Sweden and Norway.

Feature status - Scotland has approximately 30% of the maerl beds in north-west Europe and most of the beds in the UK. They are sensitive to physical disturbance, smothering, increased suspended sediment and changes in water flow. Pressures are known to include mobile demersal fishing activity, aquaculture, pollution and extraction (for soil conditioner).

Natural heritage importance	Information sources
EC Habitats Directive Annex I (Subtidal sandbanks)	JNCC Marine Habitat Classification
OSPAR T&D	OSPAR Case Report
Scottish Biodiversity List	UK BAP Habitat Definitions
UK BAP	UK MarineSACs Overview

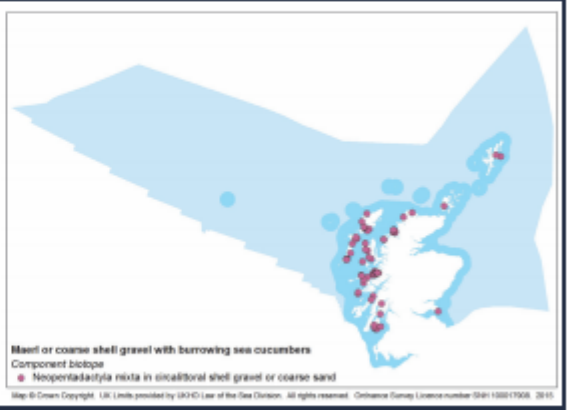
Component biotopes in Scottish waters

Maerl beds - **SS.SMp.Mrl**, including:**SS.SMp.Mrl.Pcal** (inc. **Pcal.R** & **Pcal.Nmix**); **SS.SMp.Mrl.Lgla**; & **SS.SMp.Mrl.Lcor**.

TERRITORIAL WATERS

Broad habitat

MAERL OR COARSE SHELL GRAVEL WITH BURROWING SEA CUCUMBERS

Image	Distribution
	

Feature description

Characteristics - Gravel, maerl gravel (dead maerl) or coarse sands with high densities of the gravel sea cucumber, *Neopentadactyla mixta*. Scallops, brittlestars, crabs and dragonets live on the surface of the sediment (some seaweeds may also be present) with widespread species such as tube dwelling sea anemones, sand mason worms and parchment worms living within the coarse substrates. This biotope may occur adjacent to maerl beds. During winter months, the gravel sea cucumbers bury deep in the sediment and become dormant.

Environmental preferences - Found in sublittoral clean, gravel, maerl gravel (dead maerl) and / or coarse sands in moderately wave-exposed, fully saline conditions at 10-50m.

Scottish distribution - Found primarily along the west coast and the Outer Hebrides, with occasional records from Orkney (Scapa Flow), Shetland (Lunna Ness and Out Skerries) and the Isle of May (outer Firth of Forth).

Wider distribution - This habitat is not recorded outside of the British Isles. The gravel sea cucumber itself has a wider recorded distribution, from northern Norway to the Bay of Biscay.

Feature status - This habitat is highly sensitive to physical disturbance and pressures are known to include mobile demersal fishing (including scallop dredging) and the extraction of maerl (for soil conditioner).

Natural heritage importance	Information sources
EC Habitats Directive Annex I (Subtidal sandbanks) Scottish Biodiversity List UK BAP	JNCC Marine Habitat Classification MarLIN

Component biotopes in Scottish waters

Neopentadactyla mixta in circalittoral shell gravel or coarse sand - **SS.SCS.CCS.Nmix**.

Figure 14: Maerl (Lithothamnion glaciale)

Figure 15: Maerl (Phymatolithon calcareum)

Figure 16: Horse mussels (modiolus modiolus)

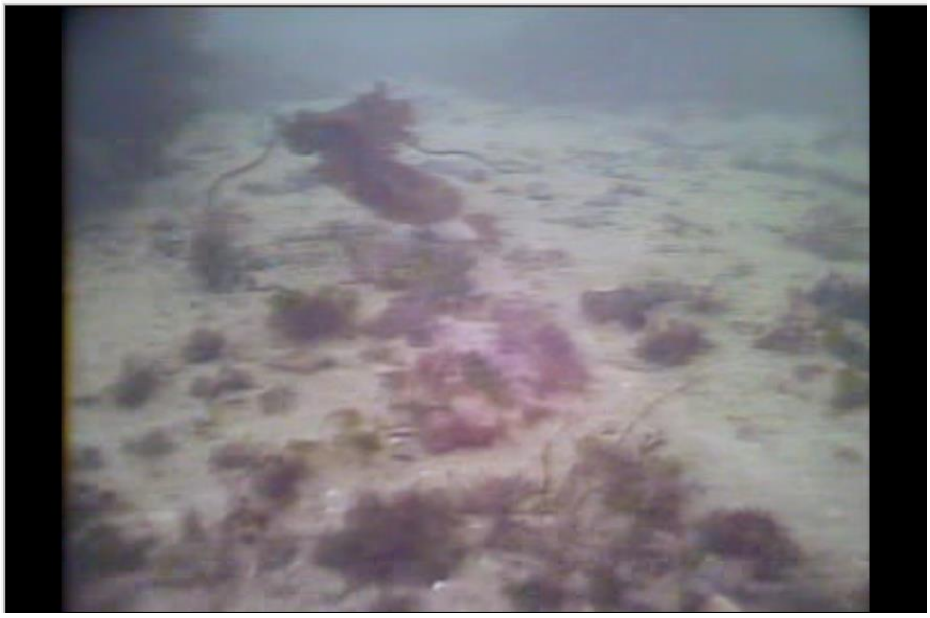
Figure 17: Horse mussel bed with hydroids and red seaweed, Linga Sound, Shetland.

Appendix B Results from previous site surveys

Representative stills are shown below from the surveys undertaken on November 2010 and May 2014.

Near the shore the surveys cover the sublittoral zone. The sublittoral zone progresses from a coarse sandy seabed to boulder and cobble plains with little sediment in the sound. As the tidal flow becomes more severe the sea-bed becomes progressively rockier with rapidly reducing levels of flora and fauna. The sublittoral fringe is dominated by the kelp Laminaria digitata but little Laminaria hyperborean as has been reported elsewhere in Bluemull Sound. The species most observed were common sea urchins or Skaddiman's Head and colonies of Alcyonium digitatum. No survey observed any BAP species such as maerl or horse mussel.

Figure 18 Plate 1: Fine and Coarse Sand

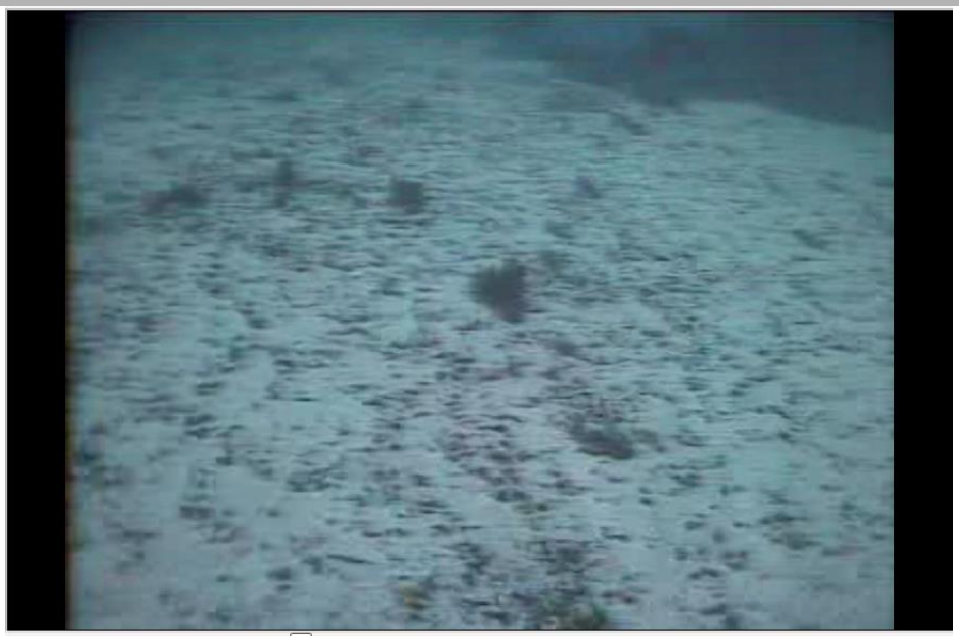


Source: Copyright © Nova Innovation 2015

Figure 19 Plate 2: Fine and Coarse Sand

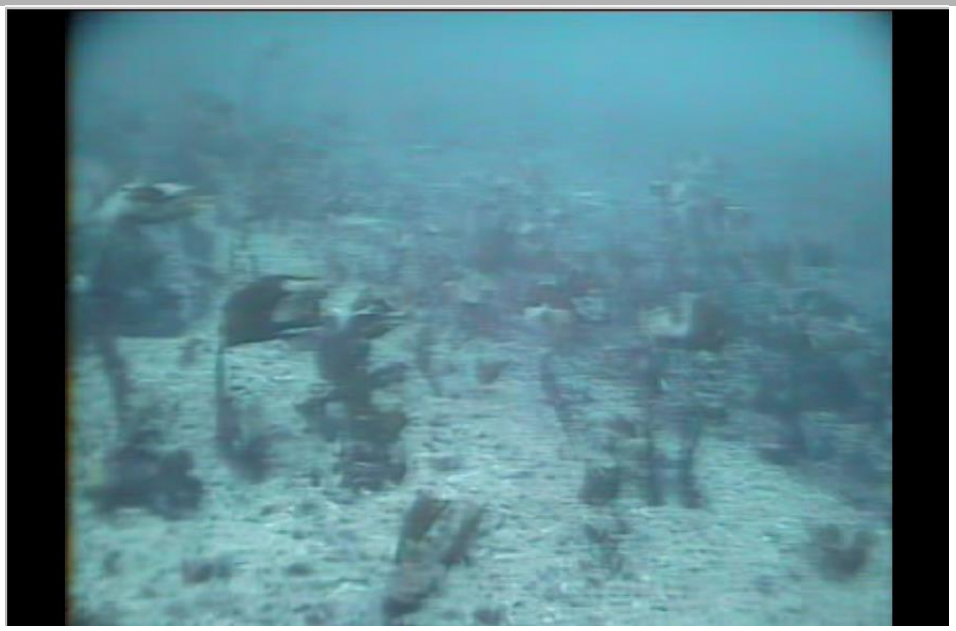
Source: Copyright © Nova Innovation 2015

Figure 20 Plate 3: Coarse Sand



Source: Copyright © Nova Innovation 2015

Figure 21 Plate 4: Coarse Sand and Fine Gravel

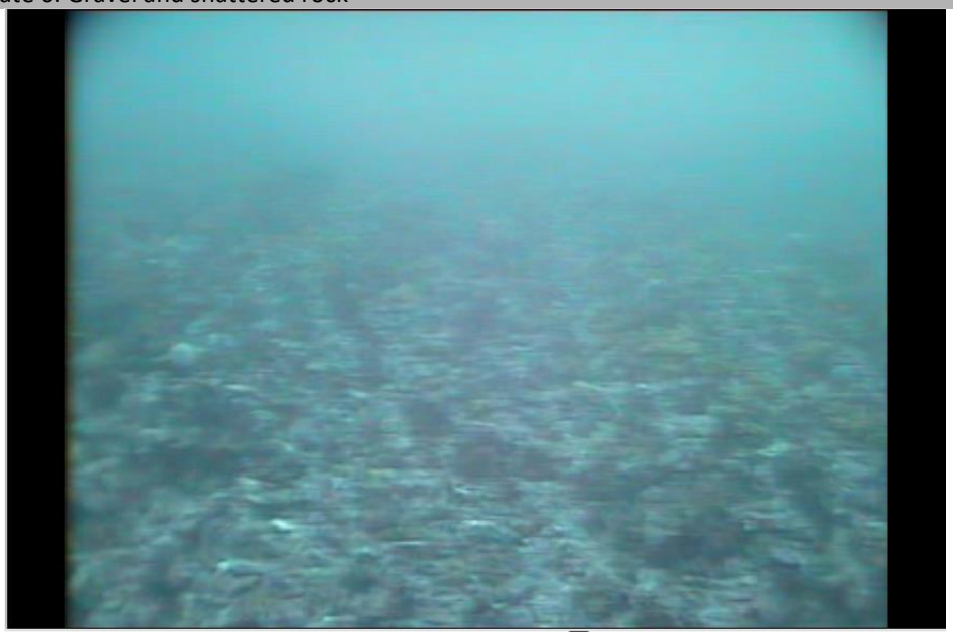


Source: Copyright © Nova Innovation 2015

Figure 22 Plate 5: Gravel and small stones

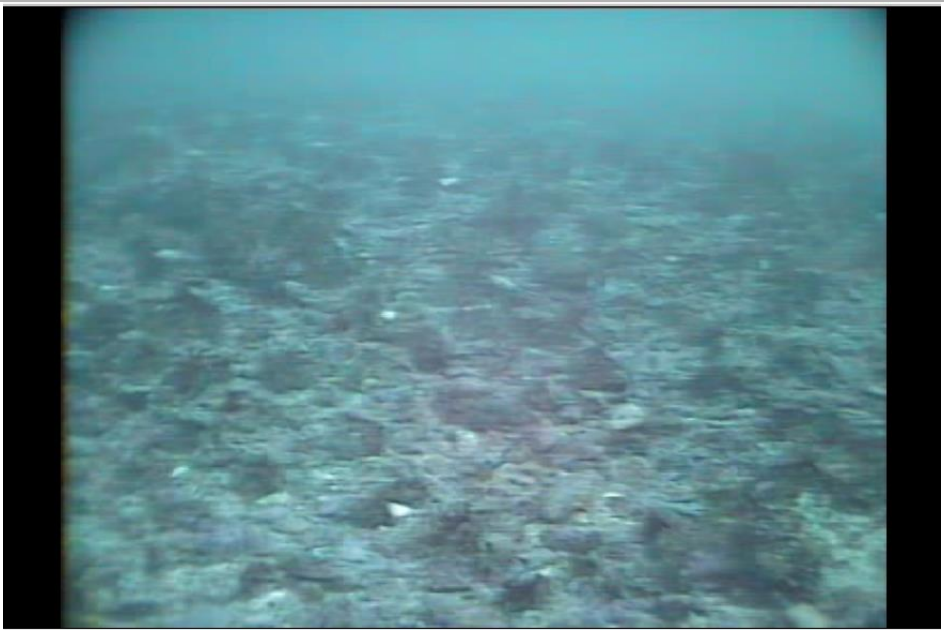
Source: Copyright © Nova Innovation 2015

Figure 23 Plate 6: Gravel and shattered rock



Source: Copyright © Nova Innovation 2015

Figure 24 Plate 7: Shattered rock and small boulders



Source: Copyright © Nova Innovation 2015

Figure 25 Plate 8: Shattered rock, small and large boulders

Source: Copyright © Nova Innovation 2015

Figure 26 Plate A: Shattered rock, small boulders and Alcyonium digitatum (Dead Man's Fingers)

Source: Copyright © Nova Innovation 2015

Figure 27 Plate B: Large boulders, shattered rock and Alcyonium digitatum

Source: Copyright © Nova Innovation 2015

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdar air fad airson Alba air fad

Your ref: 06642

Our ref: CNS/REN/TP/Shetland – Bluemull Sound – Nova Innovation – 6 Tidal Turbine Array/CLC149573

Date: 2 March 2018

Sophie Humphries
Marine Scotland
Marine Laboratory
PO Box 101
375 Victoria Road
Aberdeen
AB11 9DB

By email only:
MS.MarineRenewables@gov.scot

Dear Sophie,

SNH ADVICE – MARINE LICENCE FOR THE DEPLOYMENT AND OPERATION OF THE SHETLAND TIDAL ARRAY BY NOVA INNOVATION LTD - 6 TURBINES

Thank you for consulting us on 22 February 2018 for the marine licence for the Shetland tidal array by Nova Innovation Ltd at Bluemull Sound. This current proposal includes the deployment of an additional single tidal turbine increasing the total number of turbines from 5 to 6 within the array.

Background

We provided screening advice for a Shetland Islands Council marine works licence and a marine licence with respect to this proposal on 19 December 2017. We subsequently met with Nova Innovation, MS LOT and Shetland Islands Council on 26 January 2018 to discuss this proposal and ongoing monitoring for the Shetland Tidal Array.

Following previous advice (letters of 24 June 2013, 27 August 2015, 26 January 2016) with regard to the licences and discussions at the recent meeting, and taking account of the documents provided in support of the 6 turbine work licence application, we have updated our advice to take account of this proposed additional turbine, notably with respect to collision risk.

We provided updated collision risk assessments for the 6 turbine array to inform this marine licence and related Shetland Islands Council (SIC) works licence application (9 February 2018). We include an assessment for the Bluemull and Colgrave Sounds proposed SPA (pSPA) for breeding red-throated diver qualifying interests. This site has been proposed as a pSPA since the consent of the 5 turbine array and therefore is a relevant consideration in our assessment for the 6 turbine proposal. We note and welcome that the advice we provided on 9 February 2018 has been incorporated into the latest *Shetland Tidal Array Extension – Environmental Assessment Report* submitted by Nova for this marine licence.

Scottish Natural Heritage, Battleby, Redgorton, Perthshire PH1 3EW
Tel: 01876 580236 E-mail: tracey.begg@snh.gov.uk www.nature.scot

Advice

We consider that the deployment and operation of this array of 6 tidal turbines and associated infrastructure can be implemented without serious adverse effects on natural heritage interests. However, the proposal requires consideration of natural heritage issues of international and national importance. Appendices A, B and C include our detailed advice.

The proposed array is likely to have a significant effect on qualifying interests of:

- Yell Sound Coast Special Area of Conservation (SAC) (harbour seals; see Appendix A)
- Hermaness, Saxa Vord and Valla Field Special Protection Area (SPA) and
- Bluemull and Colgrave Sounds proposed SPA (pSPA) (see Appendix B).

We have concluded that the project **will not have an adverse effect on site integrity for these Natura sites**.

In addition, we advise that a European Protected Species (EPS) will be required with respect to relevant cetaceans for the project construction phase (see Appendix C – Advice on natural heritage interests). We have considered other relevant marine species (see Appendix C) and have concluded that significant adverse effects can be avoided.

Environmental Monitoring and Mitigation Plan (EMMP)

We refer you to our most recent detailed advice relating to the EMMP (letter of 15 August 2017) for the previous works and marine licence applications. This advice remains relevant for the current 6 turbine array application. We recommend continued liaison between Marine Scotland and SIC in the formation of licence conditions, notably with respect to details of monitoring requirements within the EMMP.

Further information and advice

We hope this advice is helpful. If further information or advice is required please contact me in the first instance: tracey.begg@snh.gov.uk or 01876 580236.

Yours faithfully

Dr Tracey Begg
Policy & advice officer - Marine energy and seaweed harvesting

Cc marine.planning@shetland.gov.uk

APPENDIX A

NOVA INNOVATION TIDAL ARRAY, BLUEMULL SOUND, SHETLAND

HABITATS REGULATIONS APPRAISAL – SPECIAL AREA OF CONSERVATION (SAC)

1. Where a plan or project could affect a Natura site, the Habitats Regulations require the competent authority – the authority with the power to undertake or grant consent, permission or other authorisation for the plan or project in question – to consider the provisions of regulation 48. This means that the competent authority has a duty to:

- determine whether the proposal is directly connected with or necessary to site management for conservation; and, if not,
- determine whether the proposal is likely to have a significant effect on the site either individually or in combination with other plans or projects; and, if so, then,
- make an appropriate assessment of the implications (of the proposal) for the site in view of that site's conservation objectives.

2. This process is now commonly referred to as **Habitats Regulations Appraisal** (HRA). HRA applies to any plan or project which has the potential to affect the qualifying interests of a Natura site, even when those interests may be at some distance from that site.

3. The competent authority, with advice from SNH, decides whether an appropriate assessment is necessary and carries it out if so. It is the applicant who is usually required to provide the information to inform the assessment. Appropriate assessment focuses exclusively on the qualifying interests of the Natura site affected and their conservation objectives. A plan or project can only be consented if it can be ascertained that it will not adversely affect the integrity of a Natura site (subject to regulation 49 considerations).

4. SACs relevant under this HRA can be determined by (a) species observed at the site during site survey, (b) the distance between SACs and the proposed development site, and (c) the foraging range of species designated as qualifying interests. Consequently, we recommend that the only SAC relevant for consideration under HRA is Yell Sound Coast SAC.

Yell Sound Coast SAC

5. Yell Sound Coast SAC is designated for harbour seals and otters. The proposal is approximately 28km from the nearest part of the SAC.

Step 1:	Is the proposal directly connected with or necessary for the conservation management of the SAC?

6. The proposal is not directly connected with or necessary for the conservation management of the Yell Sound Coast SAC.

Step 2:	Is the proposal likely to have a significant effect on the qualifying features of the SAC either alone or in combination with other plans or projects?

7. The conservation objectives of the site are:

(i) to avoid deterioration of the habitats of the qualifying species or (ii) significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features;

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

(iii) Population of the species as a viable component of the site,
(iv) Distribution of the species within site,
(v) Distribution and extent of habitat supporting the species,
(vi) Structure, function and supporting processes of habitats supporting the species,
repeat of (ii) No significant disturbance of the species

8. Otters designated as qualifying interests of the Yell Sound Coast SAC are unlikely to have connectivity with the proposal due to the distances and depths involved. Consequently, we advise that there is no likely significant effect upon otters and no further consideration of this species is required within HRA.

9. This distance separating the proposed development site and Yell Sound Coast SAC is well within the foraging range of harbour seals and we therefore advise that there is a **likely significant effect upon harbour seals as a qualifying feature of the Yell Sound Coast SAC**. As a consequence, Marine Scotland and SIC, as the competent authorities, are required to carry out appropriate assessments (AA) in view of the site's conservation objectives for this qualifying interest. Impacts upon harbour seals are of particular concern due to declining populations, including a condition status of 'unfavourable declining' for the Yell Sound Coast SAC. **We provide an appraisal of proposal below, in relation to seals as a qualifying feature of the SAC.**

Step 3: Can it be ascertained that the proposal will not adversely affect the integrity of the SPAs either alone or in combination with other plans or projects?

10. Potential sources of impact upon harbour seals are discussed in turn:

<u>Potential disturbance and displacement of seals:</u>

11. The use of gravity-bases, as opposed to rock-drilling, greatly reduces the potential for disturbance by limiting the sources of anthropogenic noise and allowing more rapid deployment of devices. The relatively small size of devices and the vessels therefore required for deployment and maintenance works also limit the potential for disturbance. In addition, the construction programme involves the deployment of devices spaced over an extended period of time, further limiting the potential for any sustained source of disturbance. Overall, we advise that potential disturbance of harbour seals is not of a scale or severity that would lead to an adverse effect on site integrity.

<u>Potential collision with operational tidal turbines:</u>

12. Table 1 below contains the collision risk estimates from the updated ERM model with a 98% avoidance rate applied for the harbour seal qualifying interest from Yell Sound Coast SAC for which LSE was previously identified.

Table 1: Collision risk estimates for the harbour seal qualifying interest of Yell Sound Coast SAC

Species	Updated ERM model with updated turbine parameters – BREEDING SEASON (June to August)	Updated ERM model with updated turbine parameters – ALL YEAR	Updated ERM model with updated turbine parameters – Seals-at-sea density (availability accounted for)
Harbour seal	0.17	3.96	4.00

13. The rate of collision predicted from the updated modelling during the breeding season is very similar to what was previously calculated (0-1 seal per year) and the current PBR for harbour seals for the Shetland Seal Management Unit [1] is 20 individuals. Furthermore, we are mindful of the underwater camera monitoring undertaken for the deployed turbines in Bluemull Sound for which no collision or near misses were detected during operational periods to date, and the ongoing commitment by Nova Innovation through their EMMP for further collision risk monitoring together with the emergency shutdown protocol in the event of any collision.

14. Through consideration of the above points, our advice is that there will be **no adverse effect on the integrity of the Yell Sound Coast SAC** according to its conservation objectives.

15. Cumulative / in-combination assessment: We advise that, based on our appraisal of this proposal and our knowledge of other developments/activities in Shetland, any potential cumulative and in combination effects will not adversely affect the integrity of this SAC.

[1] http://www.gov.scot/Topics/marine/Licensing/SealLicensing

APPENDIX B

NOVA INNOVATION TIDAL ARRAY, BLUEMULL SOUND, SHETLAND

HABITATS REGULATIONS APPRAISAL (HRA) – SPECIAL PROTECTION AREA (SPA)

See Appendix A for information on the HRA process and role of the competent authority.

SPAs relevant under this HRA can be determined by (a) species observed at the site during site survey, (b) the distance between SPAs and the proposed development site, (c) the foraging range and diving ability of birds designated as qualifying species and (d) the scale of the proposal. Relevant SPAs for consideration under HRA are Hermaness, Saxa Vord and Valla Field SPA and Bluemull and Colgrave Sounds proposed SPA (pSPA).

1. Hermaness, Saxa Vord and Valla Field SPA

1. Hermaness, Saxa Vord and Valla Field SPA is designated for a suite of breeding-bird interests. The proposal is approximately 3km from the nearest part of the SPA.

Step 1:	Is the proposal directly connected with or necessary for the conservation management of the SPA?

2. The proposal is not directly connected with or necessary for the conservation management of the Hermaness, Saxa Vord and Valla Field SPA.

Step 2:	Is the proposal likely to have a significant effect on the qualifying features of the SPA either alone or in combination with other plans or projects?

3. The conservation objectives for Hermaness, Saxa Vord and Valla Field SPA are:

(i) to avoid deterioration of the habitats of the qualifying species or (ii) significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained;
and to ensure for the qualifying species that the following are maintained in the long term:

(iii) Population of the species as a viable component of the site,
(iv) Distribution of the species within site,
(v) Distribution and extent of habitat supporting the species,
(vi) Structure, function and supporting processes of habitats supporting the species,
repeat of (ii) No significant disturbance of the species

4. Qualifying species for Hermaness, Saxa Vord and Valla Field SPA are as follows (*indicates assemblage qualifier only):
    a. Fulmar (*Fulmarus glacialis)**
    b. Gannet (*Morus bassana)*
    c. Great skua (*Catharacta skua)*
    d. Guillemot (*Uria aalge)**
    e. Kittiwake (*Rissa tridactyla*)*
    f. Puffin (*Fratercula arctica)*
    g. Red-throated diver (*Gavia stellata)*
    h. Shag (*Phalacrocorax aristotelis)**

i. Seabird assemblage

5. The conservation objectives for which consideration is required are (ii) and (iii) as listed above. The other objectives require no further consideration due to the distance between the SPA and the proposed development site and/or the small scale of the proposal.

6. Conservation objective (ii) is concerned with ensuring that there is no significant disturbance of species designated as qualifying interests of the site, such as through vessel activity or other cause of bird displacement. Although the proposed development would be within the foraging range of all of the above listed breeding populations for Hermaness, Saxa Vord and Valla Field SPA, we advise that there is no likely significant effect in this regard, due to the small scale of the development, the expected limited duration of installation procedures and the distance from nesting sites.

7. In this case, conservation objective (v) is relevant to the risk of collision between birds and operational turbines. Consequently it is only relevant to birds with diving capabilities that may place them at risk of interaction with the device. **We advise that there is a likely significant effect for gannets, puffins, red-throated divers, guillemots and shags from Hermaness, Saxa Vord and Valla Field SPA.**

2. <u>Bluemull and Colgrave Sounds pSPA</u>

9. Bluemull and Colgrave Sounds pSPA is designated for breeding red throated diver qualifying interests. The proposal is within the pSPA.

Step 1:	Is the proposal directly connected with or necessary for the conservation management of the pSPA?

10. The proposal is not directly connected with or necessary for the conservation management of Bluemull and Colgrave Sounds pSPA.

Step 2:	Is the proposal likely to have a significant effect on the qualifying features of the pSPA either alone or in combination with other plans or projects?

11. The draft conservation objectives for Bluemull and Colgrave Sounds pSPA are:

> To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species.
>
> This contribution will be achieved through delivering the following objectives for each of the site's qualifying features:
>
> a) Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term;
> b) To maintain the habitats and food resources of the qualifying features in favourable condition.

12. Conservation objective a) is concerned with ensuring that there is no significant mortality, injury and disturbance of species designated as qualifying interests of the site, such as through collisions, vessel activity or other cause of bird displacement. In this case, there is risk of collision between red-throated divers and operational turbines that may place them at risk of interaction with the device.

13. For conservation objective b) although the proposed development would be within the foraging range of the breeding population for Bluemull and Colgrave Sounds pSPA, we advise that there is no likely significant effect in this regard, due to the small scale of the development relative to available habitats and food resources within the pSPA.

14. We advise that due to the risk of collisions with operational turbines **there is a likely significant effect for breeding red-throated from Bluemull and Colgrave Sounds pSPA.**

15. As a consequence, Marine Scotland and SIC, as the competent authorities, are required to carry out appropriate assessments (AA) in view of the site's conservation objectives for breeding red-throated diver. **We provide an appraisal of potential collision impacts below.**

Step 3: Can it be ascertained that the proposal will not adversely affect the integrity of the SPAs either alone or in combination with other plans or projects?

Collision risk assessment

16. Collision risk impacts for the following European sites and their qualifying interests for which a Likely Significant Effect (LSE) was previously identified are outlined below (Table 1).

Table 1: Bird interests and sites for which LSE is identified with respect to collision risk

European site	Qualifying interest(s)
Hermaness, Saxa Vord and Valla Field SPA	Atlantic puffin
	Red-throated diver
	Northern gannet
	Common guillemot
	European shag
Bluemull and Colgrave Sounds pSPA	Red-throated diver

17. We consider that our original advice still remains relevant (letter dated 24 June 2013), except where it has been updated with respect to the project-specific Environmental Mitigation and Monitoring Plan (EMMP). We refer you to our most recent detailed advice relating to the EMMP (letter of 15 August 2017).

1. Hermaness, Saxa Vord and Valla Field SPA
Bluemull and Colgrave Sounds pSPA

18. Table 2 below contains the collision risk estimates from the updated ERM model with a 98% avoidance rate applied for the SPA / pSPA breeding bird species for which LSE is identified. We have manually extracted the monthly densities for gannet and shag in order to be able to calculate the breeding season more accurately. We have not undertaken this for puffin, red-throated diver or common guillemot, and so the breeding season for these three species is taken as March to October, reflecting the way in which the survey data was presented to us.

Table 2: Collision risk estimates for SPA qualifying interests

Species	**Updated ERM model with updated 6 turbine parameter – BREEDING SEASON**	**Updated ERM model with updated 6 turbine parameter – ALL YEAR**
Atlantic puffin	1.45	1.36
Red-throated diver	0.13	0.15
Northern gannet	0.00	0.00
Common guillemot	0.37	0.36
European shag	4.87	11.25

19. For all of the above mentioned species, the collision risk estimates (using a 98% avoidance rate) are of a magnitude similar to previous predictions. **We are therefore content that these collision rates will not lead to an adverse effect on site integrity for Hermaness, Saxa Vord and Valla Field SPA and Bluemull and Colgrave Sounds pSPA.**

20. Cumulative / in-combination assessment: We advise that based on our appraisal of this proposal and our knowledge of other developments/activities in Shetland, any potential cumulative and in-combination effects will not adversely affect the integrity of these SPAs/pSPAs.

APPENDIX C

NOVA INNOVATION TIDAL ARRAY, BLUEMULL SOUND, SHETLAND

ADVICE ON NATURAL HERITAGE INTERESTS

Below we provide advice on the following natural heritage interests:

- Protected species
- Marine Protected Area qualifying interests

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1. Protected species

European Protected Species (EPS)

European Protected Species (EPS) are species listed in Annex IV of the Habitats Directive and are afforded protection under The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017. Marine Scotland provides guidance on the protection of Marine European Protected Species from injury and disturbance for Scottish Inshore Waters[2].

EPS – Cetaceans

On 19 January 2018 we were consulted by Marine Scotland regarding an extension to the EPS licence (expiry date 23 January 2018) for the array. We advised that it would be appropriate to issue a short extension to the licence in advance of gaining a better understanding about the results of the monitoring, the potential for activities causing disturbance and also for any further deployment activity associated with the 6 turbine array.

Further information available from the documents submitted for the licence allows us to provide further advice with respect to EPS.

- Disturbance during construction

The construction programme involves the phased deployment of infrastructure and turbines: cable installation Q3, 2019; turbine 4 installation, Q3, 2019; turbines 5 and 6, Q2, 2020; reconfiguration of array relocating turbines 4,5 and 6, Q1, 2021.

There is the potential for disturbance from installation works such as cable and turbine installation and associated vessel movements. However, installation works will be temporary and noise levels are likely to be relatively low and unlikely to cause significant disturbance.

The use of gravity-bases, as opposed to rock-drilling, greatly reduces the potential for disturbance, by limiting the sources of anthropogenic noise and allowing more rapid deployment of devices. The relatively small size of turbines and the vessels therefore required for deployment works also limit the potential for disturbance.

[2] http://www.gov.scot/Resource/0044/00446679.pdf

Overall, we advise that installation works including cable and turbine installation / relocation and associated vessel activities could potentially cause disturbance to cetaceans and **we advise that an EPS licence for all relevant cetacean species with respect to disturbance during construction is required**.

We conclude that for the reasons outlined above, it is unlikely that there will be any significant disturbance, and project **will not be detrimental to the maintenance of the populations of relevant cetacean species at a favourable conservation status in their natural range.**

We recommend good practice should be applied during all marine and coastal works by following the guidelines associated with the Scottish Marine Wildlife Watching Code (SMWCC)[3].

- Collision with operational turbines

There is a potential for injury and mortality due to collision risk with the operational turbines. Due to the current lack of monitoring data from operational tidal arrays, the behaviour of marine mammals around tidal turbines is uncertain and the collision risk estimated.

Table 3 below contains the collision risk estimates from the updated ERM model with a 98% avoidance rate applied for the other marine animal species found in Bluemull Sound. Due to the way the survey information has been supplied we have used an 'all year' density figure for all three species presented in the table, apart from grey seal where we have manually extracted the monthly densities to be able to calculate the breeding season more accurately.

Table 3: Collision risk estimates for marine mammals recorded in the Bluemull Sound

Species	**Updated ERM model with updated turbine parameter – BREEDING SEASON**	**Updated ERM model with updated turbine parameter – ALL YEAR**	**Updated ERM model with updated turbine parameters – SCANSII (Area J) (Availability accounted for)**
Grey seal	2.85	7.15	N/A
Harbour porpoise	N/A	2.20	1.74
Minke whale	N/A	0.16	1.06

We have considered the updated collision risk estimates against the population estimates for the relevant management units for harbour porpoise (1-2 per year from a population of 228, 000) and minke whale (0-1 per year from a population of 229,000).

The level of predicted collisions for cetaceans is low and **will not be detrimental to the maintenance of the populations of relevant cetacean species at a favourable conservation status in their natural range.**

[3] https://www.nature.scot/professional-advice/land-and-sea-management/managing-coasts-and-seas/scottish-marine-wildlife-watching-code

We advise that an EPS licence for the operational phase is <u>not</u> required, unless through monitoring the modelled predictions and reality indicated a need to consider this further.

The EMMP should include sufficient detail with respect to ongoing monitoring as agreed with Marine Scotland and SIC. This monitoring should focus on gathering data on the behaviour of marine mammals in close proximity to the tidal turbines. Monitoring results will allow review to inform our EPS advice for cetaceans with respect to future licensing requirements.

<u>EPS - Otters</u>

Otters are EPS commonly seen in various parts of Bluemull Sound. We provided advice in relation to otters for earlier licence applications (letter of 4 June 2013). This advice remains relevant for this application and as a result, we advise that there is no requirement for further EPS licensing considerations in relation to otters.

Basking sharks

Basking sharks receive protection through the Wildlife and Countryside Act 1981 (as amended, including the Wildlife and Natural Environment (Scotland) Act 2010), with licensing requirements similar to EPS.

Although there are no established population estimates for basking sharks, they are a very wide-ranging species. There has been only one basking shark observation for this development since monitoring began in 2010, from the land based or underwater monitoring. Consequently, the applicant will not require a basking shark licence to address potential disturbance during installation or operational collision risk. **We consider that the Shetland Tidal Array will not have a negative impact on the conservation status of basking sharks.**

Seals

Seals as a qualifying feature of SACs are addressed in Appendix A. However, there is potential for impact upon harbour seal and grey seal interests not connected with Natura sites. Seals are protected under the Marine (Scotland) Act 2010. Impacts upon harbour seals are of particular concern due to their declining status across UK waters. Potential impact types are discussed in turn below:

- Potential disturbance and displacement of seals:

For reasons described in relation to the HRA for harbour seals in Appendix A, for both harbour and grey seals not connected to Natura sites we advise that potential disturbance would not be of a scale or severity of particular concern. We advise on the need for monitoring to improve our knowledge and understanding as to whether any patterns in the distribution and behaviour of seals in Bluemull Sound varies concurrently with the presence and or operation of the turbines. Also, good-practice should be applied during all marine and coastal works by following the guidelines associated with the SMWCC.

- Potential collision with operational tidal turbines:

The outcome of collision risk modelling for harbour seals is detailed in Appendix A. As grey seals also frequently occur in Bluemull Sound, collision risk estimates for this species have been generated (Table 3). The collision risk estimate (between 3-7 animals per year) is within the PBR limits (239) for the Shetland Seal Management Unit. **We are therefore content that these rates of collision do not necessitate mitigation for wider seal interests, as previously advised.**

Black guillemots

Black guillemots are the most frequently occurring non-SPA bird species recorded at the development site. The species is also a feature of the nearby Fetlar to Haroldswick nature conservation Marine Protected Area (NC MPA).

- Potential disturbance and displacement:

Due to the small scale of the development compared to the availability of suitable foraging and loafing habitat for black guillemots, disturbance away from the proposed development site is unlikely to be important at the population level.

- Potential collision with operational tidal turbines:

Table 4 below contains the collision risk estimates from the updated ERM model with a 98% avoidance rate applied for black guillemot.

Table 4: Collision risk estimates for black guillemot

Species	**Updated ERM model with updated turbine parameter – BREEDING SEASON**	**Updated ERM model with updated turbine parameter – ALL YEAR**
Black guillemot	16.27	27.72

Using Seabird 2000 and other recent counts, we consider that Shetland has a regional population of 15,329 black guillemots. If the higher number of predicted collisions is used (28), then this would equate to a small percentage - 0.2% of the population each year. **We consider that the Shetland Tidal Array will not have a negative impact on the conservation status of black guillemot.**

Humphries S (Sophie)

From: Fiona Read <fiona.read@whales.org>
Sent: 16 March 2018 17:11
To: Humphries S (Sophie); MS Marine Renewables
Cc: Sarah Dolman
Subject: RE: Nova Innovations Ltd - Shetland Tidal Array Extension, Bluemull Sound, Shetland - Consultation - Response required by 09 March 2018

Dear Sophie,

Thank you for including WDC in the Shetland Tidal Array Extension at Bluemull Sound consultation.

Although we have concerns regarding the impact of tidal devices on harbour seals and cetaceans we note that with the lack of piling driving, the revised collision models and the underwater video monitoring at the site, our concerns are reduced for the present development. We request that the 6th turbine is only consented once there is further evidence to prove that the addition of turbines 4 and 5 have no impact marine mammals, i.e., there are no collisions. We are pleased to note that the developers are committed to continue the underwater monitoring as a condition of consent.

WDC request to be involved in the development of the revised PEMP.

We would be happy to discuss any of these comments further.

Best wishes,

Fiona

Fiona Read
Policy officer
End Bycatch

Telephone: [redacted]
whales.org

30 YEARS OF PROTECTING
WHALES AND DOLPHINS

From: Sophie.Humphries@gov.scot [mailto:Sophie.Humphries@gov.scot]
Sent: 22 February 2018 13:34
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Cc: Joao.Queiros@gov.scot; Panos.Pliatsikas@gov.scot
Subject: Nova Innovations Ltd - Shetland Tidal Array Extension, Bluemull Sound, Shetland - Consultation - Response required by 09 March 2018

Dear Sir/Madam

MARINE (SCOTLAND) ACT 2010, PART 4 MARINE LICENSING

06642 – Nova Innovations Ltd – Shetland Tidal Array Extension – Bluemull Sound, Shetland

Central Latitude Coordinates	Central Longitude CoOrdinates
60°41.976'N	0°58.999'W

(WGS84)

Nova Innovation Ltd

Marine Scotland Licence Application and Shetland Islands Council Works License Application

Shetland Tidal Array Extension – Environmental Assessment Report

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Version:	1.0
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Approval Record

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Prepared by:	Gavin McPherson	Head of Policy and Research
Reviewed by:	Simon Forrest	CEO
Authorised by:	Simon Forrest	CEO
Date of issue:	12/02/2018	

Amendment Record

Revision Number	Date	Summary of Amendments	Purpose of Revision
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Executive Summary

This Environmental Assessment Report (EAR) has been prepared in support of Nova's applications for a Marine Licence from Marine Scotland and a Works Licence from Shetland Islands Council.

Nova Innovation proposes to expand the Shetland Tidal Array (STA) in Bluemull Sound from 5 to 6 turbines. This expansion is part of the Enabling Future Arrays in Tidal (EnFAIT) Project, a Horizon 2020 flagship project, led by Nova in collaboration with 8 leading European industrial and academic partners. The project aims to demonstrate the development and operation of the world's first offshore tidal array over a five-year period, to prove a cost reduction pathway for tidal energy that shows it can be cost competitive with other forms of renewable energy.

Based on earlier advice from MS-LOT and SNH, collision of the turbine blades with marine mammals and birds was identified as the most significant environmental risk for the proposed extension. The EAR presents the results of a revised collision risk assessment conducted by SNH, which found that there would be no adverse impacts of extending the array from 5 to 6 turbines, assuming a suitable PEMP is agreed and implemented for the array.

The EAR provides the following key information:

- Identification of potential environmental impacts of the STA extension
- Assessment of the key potential environmental impacts
- Contextualisation of the potential environmental impacts
- Approach to mitigating and addressing residual uncertainty about key environmental impacts.

1 Introduction

Nova Innovation intends to expand the Shetland Tidal Array (STA) in Bluemull Sound from 5 to 6 turbines. This Environmental Assessment Report (EAR) presents an assessment of the potential environmental impacts of the expansion of the STA, in support of applications for the necessary consents. These are a Marine Licence from Marine Scotland (under Part 4 of the Marine (Scotland) Act 2010) and a Works Licence from Shetland Islands Council (under Zetland County Council Act 1974).

Nova currently holds a Marine Licence (04859/15/1), Shetland Islands Council (SIC) Works Licence (2016/025/WL) and seabed lease from The Crown Estate for a five turbine offshore tidal array. The Marine Licence was issued on December 4, 2015 and is valid until January 1, 2035. An extension to the existing Crown Estate lease is also being sought to permit the expansion of the number of turbines in the array from 5 to 6. The SIC Works License was issued on 26th August 2013 and is valid until 26th August 2019.

The proposed expansion of the STA from 5 to 6 turbines will be undertaken as part of the EnFAIT Project (Enabling Future Arrays in Tidal). EnFAIT is an EU funded Horizon 2020 flagship project, led by Nova, in collaboration with 8 partners. The project aims to build investor confidence in tidal energy, allowing the technology to move closer to commercialisation.

1.1 Purpose of Environmental Assessment Report

In their formal EIA screening opinion on the proposed STA extension issued on 9 January 2018, Marine Scotland advised Nova that the Scottish Ministers are of the opinion that:

> *"an Environmental Impact Assessment (EIA) will not be required to be undertaken in support of … [the proposed project]".*

However, MS-LOT did advise that certain information will be required to support the marine licence application, including updated collision risk modelling and information on the monitoring and analysis from the current operating STA, to provide context for this extension.

This EAR has been prepared in support of Nova's applications for a Marine Licence and Works Licence for the STA extension, to meet requirements set out by MS-LOT and SIC, on advice from their consultees including SNH[1]. The EAR provides the following key information:

- Section 2: The project (including a summary of the existing operational STA and the proposed extension)
- Section 3: Identification of potential environmental impacts of the STA extension
- Section 4: Assessment of the key potential environmental impacts of the STA extension
- Section 5: Contextualisation of the key potential environmental impacts of the STA extension
- Section 6: Approach to mitigation and addressing residual uncertainty about key environmental impacts
- Appendix A: List of other designated sites potentially linked to the project
- Appendix B: Potential impact of the STA on other designated sites

In relation to Section 5, the EAR provides a summary of the status of the STA project, the associated environmental assessment and operational monitoring, along with additional available evidence, for example from other tidal energy deployments and relevant research programmes. This additional information provides important context and evidence to inform the assessment of the potential effects of the proposed extension and the implications for features of natural heritage importance associated with the Bluemull Sound area.

[1] Including the Screening opinion on the Installation of the Nova Innovation Ltd Tidal Array Project in Bluemull Sound, Shetland (MS-LOT, 9 January 2018) and associated advice, and responses to the Works License consultation received by SIC from SNH and RSPB.

2 The project

2.1 Site location

The Shetland Tidal Array is in the Bluemull Sound, Shetland, between the islands of Unst and Yell. The site is located near the Ness of Cullivoe, a narrow 1 km long headland to the north-east of Yell. Figure 2.1 shows the exact location of the STA lease area and cable corridor. All turbines will be located in the area delineated by the black box, as per the existing Marine Licence, Shetland Island Council Works Licence and Crown Estate Lease.

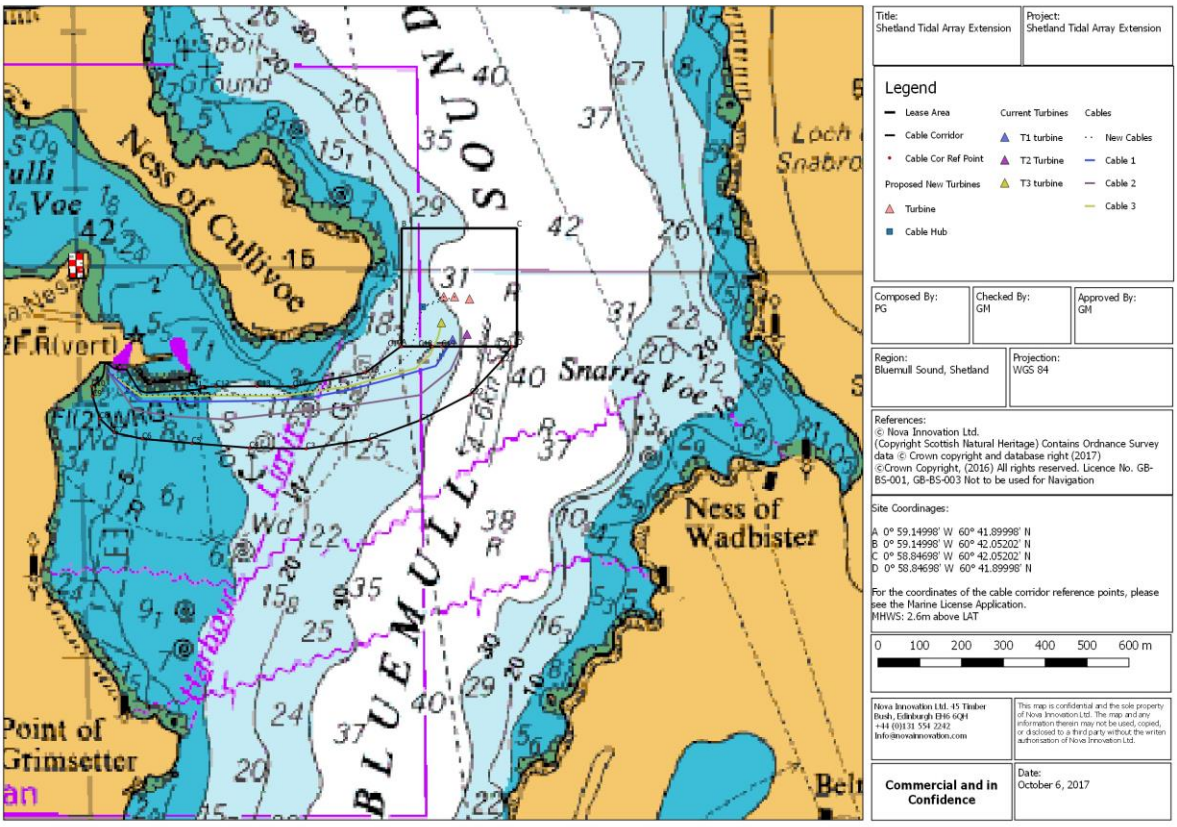

Figure 2.1 Location of the STA site and cable corridor. Please note, the exact location of the proposed new turbines is still to be finalised.

2.2 The existing Shetland Tidal Array (5 turbines)

2.2.1 Consented under existing licenses

Five Nova M100 turbines each with individual cables running back to shore. Turbine locations are shown in Figure 2.1.

2.2.2 Currently deployed on site

Three Nova M100 turbines: T1, T2 (deployed in 2016) and T3 (deployed in January 2017).

2.2.3 Project schedule

Following deployment of the two final turbines (T4, T5), the array would operate until 2035, at which point the turbines and all associated equipment would be decommissioned.

2.3 The requested STA extension (6 turbines)

2.3.1 Requested STA extension

An additional sixth turbine (T6) will be deployed after T4 and T5. These three turbines will be connected to shore via a subsea hub and a single export cable, as shown in Figure 2.1.

Following an initial period of operation, T4, T5 and T6 will be repositioned within the site to explore the effect of turbine wakes on array performance. The repositioned turbines will still be located within the existing seabed lease area.

2.3.2 Future project schedule

- Cable, subsea hub and T4 deployment (Q3 2019)
- T5, T6 deployment (Q1 2020)
- Reconfigure array (Q1 2021)
- Array operation (2018 to 2038)
- Decommissioning (2038)

Further project details are provided in the Schedule and Method Statement and maps that accompany the licence application.

2.4 The Nova M100 turbine

The turbines to be deployed in the array are Nova M100 tidal turbines: a 2-bladed, horizontal axis device installed subsea at a depth of 30-40m. The turbines use gravity base foundations that require no piling or drilling. An illustration of the Nova M100 turbine is shown in Figure 2.2.

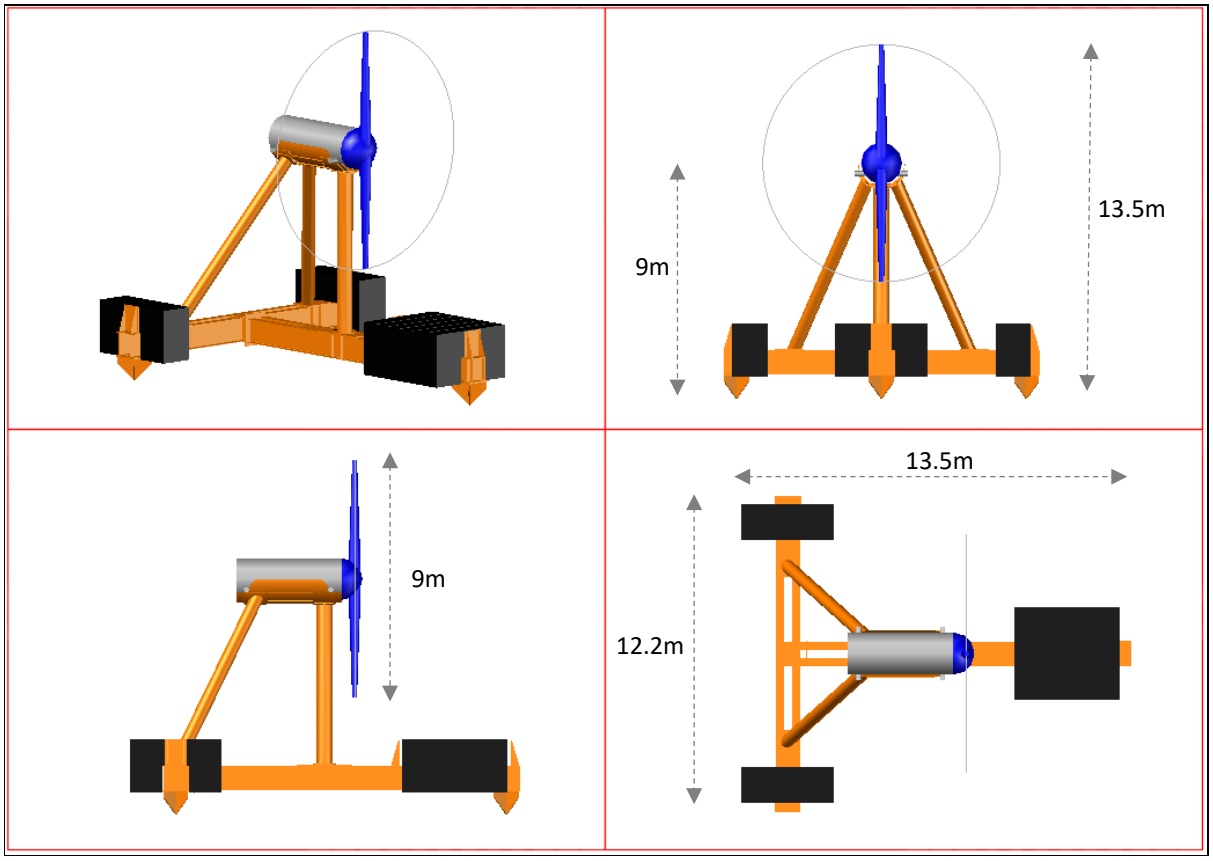

Figure 2.2 The Nova Innovation Nova M100 Tidal Turbine *Source: Nova Innovation 2018*

3 Potential impacts on Designated Sites

3.1 Initial identification of impacts

Appendix A provides an overview of all sites and receptors that could potentially be impacted by the Shetland Tidal Array, identified using Marine Scotland's IMPACT assessment tool[2]. Advice provided by MS-LOT and SNH as part of the EIA screening process and pre-application discussions[3] has enabled Nova to refine this list of potential impact pathways and sensitive receptors to those on which the environmental assessment to support consent applications for the STA extension should focus. These are detailed in the following sections.

3.2 Previous advice from MS-LOT, SIC and SNH

In their advice to MS-LOT and SIC on the EIA screening request, SNH advised that:

> *"Due to the location of the proposed turbine within Blue Mull and Colgrave Sounds pSPA, we advise that, as part of any marine licence application, consideration is given to this SPA and the potential impacts of the proposed additional turbine to the qualifying feature – breeding red throated divers. We also advise that consideration is given to the other key nature conservation features assessed as part of the array application".*

For the existing 5 turbine STA, SNH identified physical interactions between marine wildlife and the operation of the turbines as the main impact pathway of concern[4]. It is proposed that this should be the focus of additional effort to support the STA extension application, building on the assessment of these impacts undertaken to support the existing STA project.

Impact pathways such as disturbance or displacement are also considered semi-quantitatively within this report, building on information provided to support the original application. Additional context is provided in the form of some initial data from ongoing monitoring associated with the STA project and evidence gathered from other tidal energy sites, such as the European Marine Energy Centre.

3.3 Identification of relevant Natura features

On advice from MS-LOT and SNH, Nova has identified the features of Special Protection Areas and Special Areas of Conservation that could potentially be affected by the Shetland Tidal Array extension, and therefore require further assessment[5].

> *… [SNH] advised as part of the Habitats Regulations Appraisal – a likely significant effect for:*
>
> - *the harbour seal feature of Yell Sound Coast SAC due to the risk of collision from operating turbines and disturbance effects during installation of each turbine from associated marine work, and*
> - *features at the Hermaness, Saxa Vord and Valla Field SPA due to the potential for collision with operating turbines for puffin, gannet, red-throated diver, guillemot and shag.*

3.3.1 Special Protection Areas

The STA, including the proposed extension, is located within the Bluemull and Colgrave Sounds proposed Special Protection Area (pSPA), for which the qualifying feature is breeding red throated diver (*Gavia stellata*). The STA

[2] http://www.gov.scot/Topics/marine/Licensing/marine/tool

[3] Nova meeting with MS-LOT, SIC and SNH in Aberdeen on 26/02/2018

[4] MS-LOT, Consideration of a Proposal Affecting a Designated SAC or SPA, November 2016

[5] Advice received from SNH 15th August 2017

extension also has the potential to impact on the features of the nearby Hermaness, Saxa Vord and Valla Field SPA[6], given the foraging range of its breeding seabird features[7].

3.3.2 Special Areas of Conservation

The STA extension has the potential to impact the harbour seal (*Phoca vitulina*) feature of the Yell Sound Coast SAC[8]. Whilst the project is not located within the boundary of this site, the potential for harbour seals associated with this SAC to interact with the operating devices and any consequences need to be considered and assessed.

3.3.3 Impact on other designated sites

In consultation with SNH (regarding the STA Decommissioning Programme), Nova has identified additional designated sites that could potentially be affected by the array. Based on the results from collision model analysis discussed below, the potential impact on other linked designated sites is outlined in Appendix B.

In cases where the Designated Sites were included based on the foraging range of breeding seabirds, only those seabirds within foraging range of the site were included as qualifying features.

3.3.4 European Protected Species and basking shark

The environmental assessment for the initial STA application included a consideration of possible disturbance to species provided strict protection under Annex IV of the Habitats Directive ("European Protected Species"). Possible disturbance to basking shark, also strictly protected, under Schedule 5 of the Wildlife and Countryside Act (As amended) was also considered. Licences for the possible disturbance of European Protected Species (EPS) and basking shark were issued to Nova for the STA on 21st July 2017.

Monitoring to date has not recorded any sightings of basking shark in or around the STA. Nova are therefore of the view, on advice from MS-LOT provided verbally in a pre-application meeting (26 January 2018), that a licence to disturb this species will not be required for the STA extension. A licence to disturb EPS may be required; an EPS license has been awarded for the existing project by Marine Scotland, valid to 23 April 2018.

3.4 Potential disturbance

For the 5 turbine STA, SNH advised that in addition to collision risk it was necessary to consider the likely significant effects (LSE) of the development on the distribution of harbour seals within the Yell Sound Coast SAC. They have therefore also been considered for the STA extension. The main mechanisms of disturbance will be the noise and an increase in vessel movements arising during the installation (and decommissioning) operations as well as potential collisions with the devices. SNH considered for the 5 turbine array that the proposal is of a sufficiently small scale so as not to require consideration under the following conservation objectives[9]:

- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species

[6] Partially underpinned by Hermaness Site of Special Scientific Interest (SSSI), Saxa Vord SSSI and Valla Field SSSI.

[7] The assessment of foraging ranges of bird species is based on the following sources:

Christ Eastham, Scottish National Heritage, The use of breeding seabird foraging ranges for assessing impacts to Special Protection Areas (SPAs) from wave and tidal renewable energy proposals, and

Thaxter et Al, Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas, Biological Conservation, December 2012

[8] Partially underpinned by the Yell Sound Coast Site of Special Scientific Interest (SSSI)

[9] MS-LOT Habitat Risk Assessment, November 2015

Section 5 provides further context on the potential impact of the six-device array in terms of disturbance, and section 6 discusses how monitoring and adaptive management can be used as mechanisms for managing any residual risk associated with this potential impact.

3.5 IMPACT tool

The Scottish Government has developed an online tool called IMPACT that allows developers to assess the impact of tidal and wave energy development on Scotland's marine ecological environment. The tool provides developers with an initial assessment and overview of:

- The key potential issues (impact pathways) affecting wildlife and natural heritage;
- Preliminary desk-based studies that can be undertaken to further assess the site-specific impacts;
- Further baseline characterisation surveys;
- Further desk-based studies; and
- Options for monitoring during and post installation.

The IMPACT tool allows Nova to identify the following potential impacts of extending the Shetland Tidal Array.

Table 3.1 Potential Impacts of expanding the array on marine mammals and basking sharks

Risk	Description	Comment
Barrier to Movement	Potential barrier to movement for marine mammals and basking sharks due to the physical presence of wave and tidal energy converters and associated moorings / support structures	The impact of adding one turbine to the project is unlikely to be significant, but key impact pathways are further considered in this Environmental Assessment Report. Potential impacts will continue to be addressed through measures to be set out in the PEMP, including surface and subsea video monitoring.
Displacement of Essential Activities	Potential displacement of essential activities of marine mammals and basking shark due to the presence of wave and tidal energy converters and associated moorings / support structures	
Collision	Potential for collision between marine mammals and basking shark and offshore wave and tidal energy converters and associated moorings / support structures	
Underwater Noise	The potential effects on marine mammals and basking shark from underwater noise generated by wave and tidal device operation.	
Noise above the surface	The potential effects on marine mammals from above surface noise generated by operations associated with wave and tidal energy converters.	

Table 3.2 Potential impacts of expanding the array on marine birds

Risk	Description	Comment
Displacement of Essential Activities	Potential displacement of marine birds due to the presence of wave and tidal energy converters and associated moorings / support structures	The scale of the project and the distance from the designated sites means the effects adding one more turbine to the project are unlikely to be significant, but key impact pathways are further considered in this Environmental Assessment Report. Potential impacts will continue to be addressed through measures to be set out in the PEMP.
Collision	Potential for collision between diving birds and the moving turbine blades of tidal energy converters	
Underwater Noise and Vibration	The potential effects on diving birds from underwater noise and vibration generated by wave and tidal energy converters	
Changes in Turbulence	Potential effects of changes in turbulence on foraging success of marine birds due to the presence of wave and tidal energy converters and associated moorings / support structures	

4 Assessment of potential impacts of the STA extension

4.1 Habitats Regulations Assessments undertaken in 2015

As part of Nova's existing Marine Licence (04859/15/1) and SIC Works Licence (2016/025/WL), Habitats Regulations Assessments (HRA) including Appropriate Assessments (AA) were carried out by Marine Scotland and Shetland Islands Council, in consultation with SNH. The AAs considered potential impacts of the STA on the qualifying features and conservation objectives of the following designated sites:

- Yell Sound Coast Special Area of Conservation
- Hermaness, Saxa Vord, and Valla Field Special Protection Area

As a result of their AAs, Marine Scotland and Shetland Islands Council concluded that the installation of devices in the STA would have no adverse effect on the features of designated sites. For the operation of the 5-turbine array, analysis was undertaken of the impact on the following species qualifying interests:

- the common/harbour seal at Yell Sound Coast SAC, and
- the gannet, guillemot, puffin, red throated diver, and shag at the Hermaness, Saxa Vord, and Valla Field SPA.

The AAs concluded that the 5-turbine array, operated in conjunction with an appropriate Environmental Management and Mitigation Plan (EMMP), would not on its own, or in-combination with other plans or projects, adversely affect the integrity of the designated sites.

4.2 Initial collision assessment for the 5-turbine array undertaken in 2015

To inform the AA, SNH undertook modelling to provide an estimate of the potential for encounters between the operating devices and sensitive receptors (species). The Encounter Rate Model (ERM), detailed within their own guidance on assessing collision risk between underwater turbines and marine wildlife[10], was used to establish the potential impact of the project on the following species: Harbour Seal; Puffin; Red-throated Diver; Northern Gannet; Guillemot; European Shag.

SNH have subsequently updated this modelling to allow for the additional sixth turbine. The updated results are presented in Section 4.3.

The ERM uses a physical model of the rotor and the body size and swimming activity of the animal to estimate a potential encounter (or collision) rate for the species assessed, based on the measured or estimated density of each of the species at the development location. The model contains a number of simplifications, whilst the lack of empirical information on near-field interactions between devices and wildlife further limits the accuracy of the calculations. As such, the outputs from the ERM provide a useful tool to indicate the possible magnitude of collision risk but should not be interpreted as a precise indication of collision risk. The outputs should be interpreted and contextualised, drawing on additional evidence and information.

The results of SNH's 2015 modelling (which assumed a 98% avoidance rate for all species assessed) can be found in Table 4.1 and Table 4.2

[10] Scottish Natural Heritage (2016). Assessing collision risk between underwater turbines and marine wildlife SNH guidance note.

Table 4.1 Collision Modelling on SPA qualifying features for Hermaness, Saxa Vord and Valla Field SPA (2015)

Species	Estimated annual mortality rate for 5-turbine array, BREEDING SEASON	Estimated annual mortality rate for 5-turbine array, ALL YEAR	SPA breeding population
Puffin	1.21	1.13	55,000
Red-throated diver	0.11	0.12	52
Northern Gannet	0.00	0.00	32,800
Common Guillemot	0.31	0.30	25,000
European Shag	4.06	9.37	900

Table 4.2 Collision Modelling on Harbour Seals for Yell Sound Coast SAC (2015)[11]

Species	Estimated annual mortality rate for 5-turbine array, BREEDING SEASON	Estimated annual mortality rate for 5-turbine array, ALL YEAR	Estimated annual mortality rate for 5-turbine array, Seals-at-sea density (availability accounted for)	Potential Biological Removal for Shetland
Harbour seal	0.14	3.30	3.33	20

4.3 Updated collision assessment for the 6-turbine array, undertaken in 2018

An updated Collision Risk Assessment was carried out by SNH in February 2018. This assessment revised the original assessment discussed above to include the deployment of a sixth turbine in the array. The results of the assessment (assuming a 98% avoidance rate) are summarised below.

Table 4.3 Collision Modelling on SPA qualifying interest for Hermaness, Saxa Vord and Valla Field SPA and Bluemull and Colgrave Sound pSPA (2018)

Species	Updated ERM model with 6-turbine array, BREEDING SEASON	Updated ERM model with 6-turbine array, ALL YEAR
Atlantic puffin	1.45	1.36
Red-throated diver	0.13	0.15
Northern gannet	0.00	0.00
Common guillemot	0.37	0.36
European shag	4.87	11.25

Table 4.4 Collision Modelling on SPA qualifying interest for Yell Sound Coast SAC (2018)

Species	Updated ERM model with 6-turbine array, BREEDING SEASON	Updated ERM model with 6-turbine array, ALL YEAR	Updated ERM model with 6-turbine array, Seals-at-sea density (availability accounted for)
Harbour seal	0.17	3.96	4.00

Table 4.5 Collision risk estimates for other marine mammals recorded in the Bluemull Sound (2018)

Species	Updated ERM model with 6-turbine array, BREEDING SEASON	Updated ERM model with 6-turbine array, ALL YEAR	Updated ERM model with 6-turbine array, SCANSII (Area J) (availability accounted for)
Grey seal	2.85	7.15	N/A
Harbour porpoise	N/A	2.20	1.74
Minke whale	N/A	0.16	1.06

Based on the updated Collision Risk Assessment, and assuming a suitable PEMP is agreed and implemented, SNH concluded the following[12]:

[11] For PBR see the Scottish Government website http://www.gov.scot/Topics/marine/Licensing/SealLicensing, accessed on 27/10/2017

[12] Advice received from SNH 09/02/2018

- “These collision rates will not lead to an adverse effect on site integrity for Hermaness, Saxa Vord and Valla Field SPA and Bluemull and Colgrave Sound pSPA”
- “This collision rate is unlikely to lead to an adverse effect on site integrity for Yell Sound Coast SAC”
- “These rates of collision do not necessitate mitigation for wider seal interests, as previously advised”
- “The rate of collision will not be detrimental to the maintenance of the populations of [Cetaceans] at a favourable conservation status in their natural range”
- “The Shetland Tidal Array will not have a negative impact on the conservation status of basking sharks”
- “The Shetland Tidal Array will not have a negative impact on the conservation status of black guillemot”

5 Context of predicted impacts of the STA extension

5.1 Preliminary results from environmental monitoring of the STA

Nova Innovation conducted an analysis of monitoring data collected from the STA, covering the period from August 2015 to January 2017. The review considered results from ongoing Vantage Point (VP) bird and mammal surveys, and subsea video data collected using cameras located on the turbines. Over 4,000 hours of video footage was analysed from the two turbines deployed during that period (T1 and T2).

Figure 5.1 A shoal of Atlantic Pollock at the T1 turbine, March 2016 *Source: Copyright © Nova Innovation 2018*

In analysis of video footage, no cases were observed of any collision between an animal and the turbine blades. Fish, birds and seals were observed on the cameras; however, both the fish and their predators were seen to exit the region of the turbine blades while the tide was flowing (and the blades were rotating), with fish moving to areas sheltered from the flow on the seabed. This behaviour, which should reduce the chance of interaction between marine animals and the blades, is not directly reflected in the parameters within the Encounter Risk Model, though a 98% avoidance rate was applied, based on the assumption that not all encounters would lead to collisions.

5.1.1 Summary of bird and mammal vantage point surveys conducted on-site

A continuous record of VP surveys has been undertaken at the Bluemull Sound site since November 2010. Approximately 3x 4-hour surveys have been conducted each month, recording: species, number, time, presence, location, behaviour, weather and sea-state.

Analysis has been conducted of 85 surveys conducted during the period from August 2014 to January 2017. A summary of the bird species observed on and around the site is given in Table 5.1. A summary of cetacean observations is given in Table 5.2. No basking sharks were observed during VP surveys.

Table 5.1 Summary of bird species observed in 85 VP surveys conducted between Aug 2014 and Jan 2017

Species	Number of counts in which species was recorded
Black guillemot	85
European shag	85

Northern gannet	53
Great black-backed gull	47
Common guillemot	47
Northern fulmar	45
Red-throated diver	34
Atlantic puffin	27
European herring gull	27
Common gull	21
Great cormorant	19
Black-legged kittiwake	12
Razorbill	11
Great skua	10
Arctic tern	8
Common eider	7
Long-tailed duck	7
Red-breasted merganser	5
Arctic skua	4
Eurasian wigeon	3
Great northern diver	3
Greylag goose	1
Storm petrel	1

Table 5.2 Summary of cetacean observations in VP surveys

Observation	Survey period	Total #individuals observed
Harbour porpoise	Aug 14 – Oct 14	29-32
Harbour porpoise	Nov 14 – Jan 15	5
Harbour porpoise	Feb 15 – Apr 15	9
Harbour porpoise	May 15 – Jul 15	4
Harbour porpoise	Aug 15 – Oct 15	70
Risso's dolphin	Aug 15 – Oct 15	3-4
Harbour porpoise	Nov 15 – Jan 16	40
Harbour porpoise	Feb 15 – Apr 16	55
Risso's dolphin	Feb 15 – Apr 16	20
Humpback whale	Feb 15 – Apr 16	2
Harbour porpoise	May 16 – Jul 16	12
Harbour porpoise	Aug 16 – Oct 16	19
Harbour porpoise	Nov 16 – Jan 17	25
Killer whale	Nov 16 – Jan 17	8-10

*Source: Copyright © Nova Innovation 2018, *Individual records, not necessarily different animals*

5.1.2 Summary of subsea video monitoring analysis results

Video footage collected during deployment and initial operation of T1 and T2 was analysed, covering the period from March 2016 to January 2017. Over 4,000 hours of footage were collected from six cameras located on the turbine nacelles at approximately 21m depth. Visibility was generally very good, providing clear images of the area swept by the blades and surrounding area. A small number of birds and seals were observed on the footage, but no interaction was observed between any animals and the turbine blades.

Table 5.3 Summary of bird and seal recordings in video analysis

Species	Date	Number of recordings*
Common seal	Oct 2015	2
	Nov 2015	9
	Mar 2016	1
	Sep 2016	1
European shag	Nov 2015	3
	Mar 2016	3
	Apr 2016	1
	Aug 2016	1
	Oct 2016	3
Black guillemot	Oct 2015	1
	Nov 2015	1
	Oct 2016	2
	Nov 2016	2

*Source: Copyright © Nova Innovation 2018; *Individual records, not necessarily different animals*

5.1.3 Ongoing monitoring of the array

There would be benefit in taking a more strategic approach to monitoring and data analysis for the project once a greater volume of data is available, and questions about methodology and monitoring will be addressed in the finalised PEMP. Section 6 discusses ongoing monitoring and data analysis as part of ongoing management of the project.

5.2 Disturbance and displacement effects

In their Appropriate Assessment of Nova's five-device STA project, Marine Scotland considered the possible effects of disturbance resulting from the project, on the features of the Hermaness, Saxa Vord and Valla Field SPA, Bluemull and Colgrave Sounds pSPA and Yell Sound Coast SAC. In undertaking this assessment, MS drew on advice from SNH. For all the assessed features of these sites, it was concluded that the effects of disturbance would be insignificant and there would be no adverse effect on the integrity of the sites. This assessment and the supporting evidence for its conclusions remain valid for the six-device STA.

Since Marine Scotland undertook this assessment of the possible impacts of the five-device STA, SNH have published a report presenting the analysis of land-based bird and mammal data gathered at the Billia Croo and Falls of Warness test sites at the European Marine Energy Centre (EMEC) in Orkney[13]. The study specifically investigated the potential influence of device installation, operation and related activity, on bird and mammal distribution and abundance to assess whether there were any displacement or disturbance effects.

Data from the Falls of Warness tidal test site off Eday indicated a change in density and redistribution of some bird species, including the great northern diver, black and common guillemot, cormorants, shags, ducks and geese, during construction work. However, in nearly all cases, numbers returned to around previous levels once the turbines were installed and operational. Observations of seals, whales and dolphins revealed similar findings. The analysis suggested the temporary effects of disturbance were likely to be due to increased vessel movements.

The vessels that Nova utilises for installation and operational activities—multicat vessels (Figure 5.2) or smaller—are significantly smaller and less intrusive that those often utilised at the EMEC test site.

[13] Long, C. 2017. Analysis of the possible displacement of bird and marine mammal species related to the installation and operation of marine energy conversion systems. Scottish Natural Heritage Commissioned Report No. 947.

Figure 5.2 Representative turbine deployment and retrieval vessel *Source: Leask Marine*

The Bluemull Sound is an active channel for shipping and the site is located next to a busy port. Cullivoe pier, located less than 1km from the site, is the 13th largest whitefish landing port in the UK[14], and is also busy year-round with traffic associated with the operation of nearby fish farms.

The level of activity in the vicinity of the site is illustrated in Figure 5.3, which shows surveys of Automatic Identification System (AIS) tracks from vessels in the Bluemull Sound from two, 2-week periods in July 2014 and February 2015. On a typical day, 10 or more AIS-enabled vessels pass within 1 km of the array site, with a similar level of activity observed for smaller, non-AIS enabled vessels. The AIS enabled vessels are of a similar size to, or larger than, the multicat vessels used for array operations.

[14] https://www.nafc.uhi.ac.uk/news/1-million-per-day.html

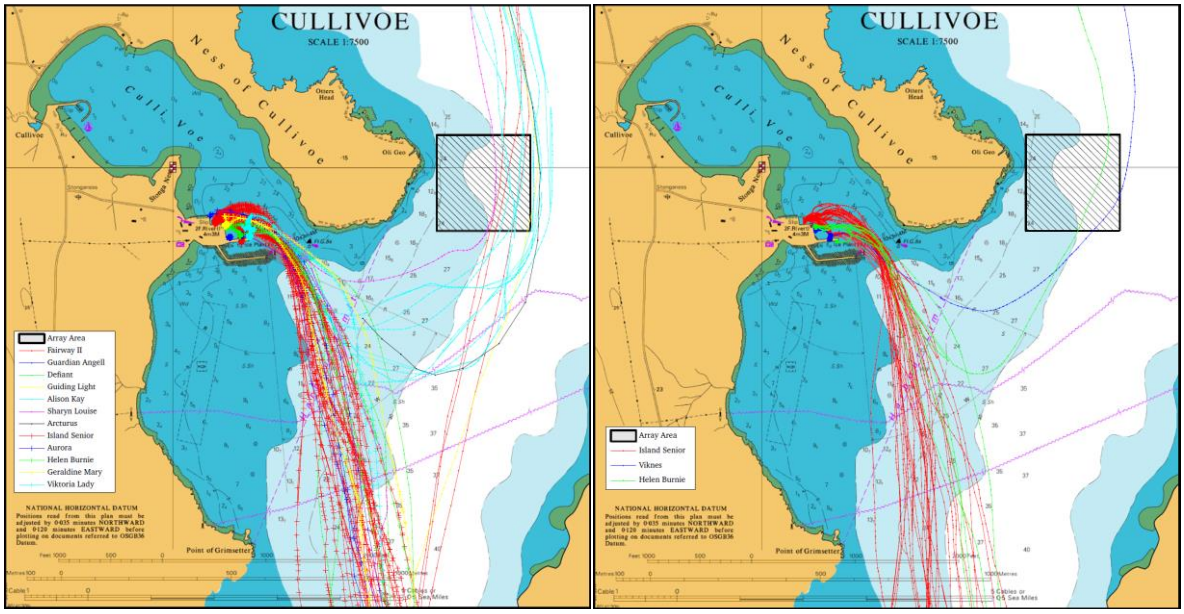

Figure 5.3 Vessel tracks from AIS surveys conducted over two 2-week periods in July 2014 (l) and Feb 2015 (r)
Source: Nova Innovation 2018

Given this local context, combined with the findings of the detailed analysis at EMEC, it would be reasonable and proportionate to assume that whilst the addition of a sixth turbine to the STA would be likely to increase the magnitude of any potential disturbance effects posed by the project, the impact is unlikely to be significant.

5.3 Interpretation of modelled encounter rates

5.3.1 Introduction

The outputs from the encounter modelling undertaken by SNH for the STA extension (based on 6 turbines) for diving birds and harbour seals are presented and discussed in the following section to provide some context for interpretation.

As stated in their 2016 guidance on collision risk modelling, and in their advice to Nova and Marine Scotland on this project, SNH consider that the principal concern about collision risks is likely to be whether levels of injury or death resulting from collisions will have an adverse effect on the species population. The SNH guidance goes on to state that to interpret whether additional mortality due to collisions would have an adverse effect on animal populations requires identification of the population affected by the collision mortality, and potentially a population viability analysis. Such population modelling requires a sound body of data – on the size and bounds of the population, age structure, and breeding success. Such a body of information is not readily available for the populations assessed within this report and to gather such information would not be proportionate to the risk that the small scale of this project poses, so a pragmatic approach has been taken to assessing the possible population consequences for populations in question, drawing on available evidence.

For all species, modelled encounter rates have been expressed as a percentage of the population associated with the corresponding protected site(s). For harbour seal, the modelled encounter rate has also been expressed as a percentage of the population of the Shetland Management Unit (MU) for the species, and in the context of the Potential Biological Removal (PBR) figure for this population, as calculated by the Sea Mammal Research Unit on behalf of Marine Scotland[15].

It is important to note that all the figures presented in this section require interpretation and should not be taken as definitive or absolute predictions of the likely impacts of the six turbine STA. The Encounter Risk Model on which the predicted encounter rates are based uses a physical model of the rotor and the body size and swimming activity of the animal to estimate a potential encounter rate for the species assessed, based on the

[15] For PBR see the Scottish Government website http://www.gov.scot/Topics/marine/Licensing/SealLicensing, accessed on 27/10/2017

measured or estimated density of each of the species at the development location. The model contains several simplifications, whilst the lack of empirical information on near-field interactions between devices and wildlife further limits the accuracy of the calculations. As such, the modelled encounter rates provide a useful tool to indicate the possible magnitude of the collision risk for the project, but they should not be interpreted as an absolute quantification of risk.

Similarly, figures expressing the modelled encounter rates in the context of populations of the protected species should not be interpreted as possible predicted declines in populations due to the six turbine STA. The overall effect of pressure or mortality on any population is the consequence of many different factors including existing pressures, density dependence and population demographics.

The modelled encounter rates and the figures presented within this Environmental Assessment Report should therefore be interpreted and contextualised, drawing on additional evidence and information, as discussed further in this section. Collision rates below are based on the updated collision assessment conducted by SNH in February 2018 and presented in section 4.3.

5.3.2 Quantification of encounters/collisions

Table 5.4 Modelled encounter rates for relevant (diving bird) features of Special Protection Areas

Species	Updated ERM model with 6-turbine array, ALL YEAR	SPA population	Annual encounters as % of population
Hermaness, Saxa Vord and Valla Field SPA			
Puffin	1.36	55,000 individuals*	**<0.01%**
Red-throated diver	0.15	26 pairs* 28 pairs**	**0.5 - 0.6%**
Northern gannet	0.00	12,000 pairs** 16,400 pairs*	**<0.01%**
Common guillemot*	0.36	25,000 individuals* 11,363 pairs**	**<0.01%**
European shag	11.25	450 pairs* 540 pairs**	**2.0 – 2.5%**
Bluemull and Colgrave Sound pSPA			
Red-throated diver	0.15	194 pairs***	**0.08%**

* Population cited in SPA citation and JNCC standard data form[16].
** Population cited in JNCC species account[17].
*** Population cited in SPA site selection document.

Table 5.5 Modelled encounter rate for harbour seal feature of Yell Sound Coast Special Area of Conservation

Species	Updated ERM model with 6-turbine array, ALL YEAR	SAC population* MU population**	Annual encounters as % of population	Potential Biological Removal for Shetland
Harbour seal	3.96	501—1,000 individuals* 3,039 individuals**	0.40—0.79% 0.13%	20

* Population cited in JNCC standard data form.
** Population for Shetland harbour seal management unit, from SCOS 2013[18].

[16] For JNCC Standard Data Forms, see http://jncc.defra.gov.uk/page-1409

[17] For JNCC Species Accounts see http://jncc.defra.gov.uk/page-1418

[18] SCOS 2013. Scientific advice on matters related to the management of seal populations, 2013. Available at: http://www.smru.st-andrews.ac.uk/pageset.aspx?psr=411

5.3.3 Model assumptions and contextual information

The modelled encounter rates detailed above are based on an assumed avoidance rate of 98%[19], since the outputs from the Encounter Risk Model do not take account of the probability that animals will avoid the site, choose routes of safe passage between turbines, or take successful evasive action in an escape response. The avoidance factor takes approximate account of these factors, but there remain precautionary assumptions within the model. Further, monitoring data gathered to date in and around the STA provide additional which should be considered when interpreting the outputs from the modelling exercise, as follows;

- The modelled encounter rates detailed above assume that an 'encounter' between a diving bird or seal with the turbines equates to a fatal collision, or an injury that will eventually lead to death. This is unlikely to be the case in reality.
- The modelled encounter rates are based on surface densities of birds and seals rather than underwater densities in or around the array area which would provide a more accurate quantification of the numbers of animals likely to be at risk of collision. There is currently no reliable methodology for gathering such data, particularly for birds and non-vocalising mammals. Underwater densities of wildlife interacting with the array are likely to be far lower than surface densities, since some birds and seals observed on the surface will be transiting through the area, and not diving and so at no risk of collision. Underwater camera footage to date gathered around the operating devices supports this assumption, with limited observations of birds and mammals in the underwater footage, even at times of relatively frequent greater surface observations[20].
- Concurrent observations from the underwater video footage and land-based Vantage Point surveys gathered as part of the monitoring programme strongly suggest that only a proportion of the birds and mammals observed in or around the array area are behaving in a way that would be expected to place them at actual risk of collision (i.e. diving or foraging). Even fewer were observed interacting directly with the turbines themselves. During the 4,000 hours of video footage analysed, there have been no observations of any marine wildlife colliding with the turbine blades.
- Modelled encounter rates have been expressed as a % of breeding bird populations associated with each SPA. A precautionary assumption has been made that if a single bird is removed, an entire breeding pair will be effectively lost from the population. This may be the case for species such as gannet or puffin, for which there is evidence that the species' mate for life. For other species this assumption may be unnecessarily precautionary, and it would be reasonable to assume that the loss of an individual will not lead to long term loss of a breeding pair of birds from the population. Further, this interpretation of the modelled encounter rates assumes that all losses will be adults of breeding age. This is clearly overly precautionary, given that all of the species breed in the locality, such that juveniles and sub-adults will also be present.
- The legal requirements to assess the impacts of the project on the features of protected sites which includes the SPA and SAC populations is acknowledged. However, seals and birds associated with the protected sites considered above are part of larger biogeographical populations. This is particularly important when considering whether the impacts of the STA will lead to population level consequences for the species in question.

The overall consequence of the points above is that the modelled encounter rates and interpreted figures in Table 5.1 and 5.2 are likely to be precautionary estimates of the actual collision risk, or of the likelihood that the project will negatively affect the population of the species in question. Figures in these tables indicate that the encounter or collision risk posed by the six turbine STA is unlikely to be of significant consequence for most species, with the possible exception of red-throated diver, European shag and harbour seal. Additional context to enable further interpretation and consideration of this risk for these species is therefore provided below.

[19] As stated in MS-LOT Appropriate Assessment for five device Shetland Tidal Array and SNH advise received on 09/02/2018

[20] Additional analysis of the monitoring data will enable this assumption to be tested and validated—see Section 6.

5.3.4 Further contextual information for Red-throated diver

Based on population size alone, the potential consequences of the modelled encounter rate are greatest for the population of birds associated with Hermaness, Saxa Vord and Valla Field SPA, as reflected in Table 5.1. However, the mean max foraging range for this species is 12.2 km[21] with a typical maximum foraging range of 10 km from the breeding site[22]. Statistically, birds encountering the array are far more likely to be associated with Bluemull and Colgrave Sounds pSPA, where the larger population size means any impacts are far less likely to affect population growth rate.

During the breeding season, birds forage primarily along the coast at tidal estuaries and over shallow sandy substrates close to their freshwater breeding territories[23]. The predominantly rocky habitat in which the STA is located is unlikely to be of optimal foraging value for the species, thus reducing the likely risk of collisions.

The typical range of depths for foraging dives by red-throated divers is cited as between 2 and 9m[24]. An analysis of the depth frequency distribution of 3,871 divers (unidentified but considered largely red-throated and black-throated diver) in the Kattegat showed that 88% of the observed divers were recorded in water of depths between 6m and 16m, with the largest group of records (20%) in the 10-12 m depth interval[25] (Petersen *et al.*, 2003). Although some birds may dive deeper, this evidence suggests that red-throated diver are unlikely to forage to the depth range of the turbines, which are located in water depths of 30 to 40m and maintain a minimum clearance of 15m between the tip of the blades and the surface, for navigational safety reasons.

Whilst red-throated divers have been observed during land-based VP surveys, no individuals have been observed on the underwater cameras, supporting the theory that the habitat in and around the STA is not of high foraging value for the species and that the species rarely forages to this water depth.

During the 4,000 hours of video footage recorded, there have been no observations of any marine wildlife colliding with the turbine blades. Whilst birds were observed on the cameras, they have not been observed near the swept area of the blades while the tide was flowing. The same behaviour was observed for fish species on which red-throated diver might prey. This behaviour should reduce the chance of any interactions between red-throated diver and the operating turbine blades.

In their Appropriate Assessment of Nova's five-device Shetland Tidal Array, Marine Scotland concluded no adverse effect on the integrity of the Hermaness, Saxa Vord and Valla Field SPA, with respect to possible effects on the red-throated diver feature. This conclusion drew on advice from SNH, that the predicted collision rate for the species was unlikely to lead to an adverse effect on site integrity of the SPA.

Whilst the addition of a sixth turbine to the STA would clearly increase the collision risk posed by the project, the evidence presented in this report indicates that the modelled encounter rates and interpreted figures in Table 5.1 for red-throated diver are likely to be very precautionary estimates of the actual collision risk and an unrealistic worst-case scenario. For reasons presented, the species is unlikely to come into close proximity with the turbines anything other than infrequently and monitoring to date supports this hypothesis. As a result, the collision risk is likely to be very low.

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[21] Thaxter CB, Lascelles B, Sugar M, Cook ASCP, Roos S, Bolton M, Langston RHW and Burton NHK (2012). Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation **156**: 61-53.

[22] Black J, Dean BJ, Webb A, Lewis M, Okill D and Reid JB (2015). Identification of important marine areas in the UK for red-throated divers (*Gavia stellata*) during the breeding season. JNCC Report Number 541.

[23] Okill JD and Wanless S (1990). Breeding success and chick growth of red-throated divers *Gavia stellata* in Shetland 1979-1988. Ringing and migration **11**: 65-72.

[24] Cramp S. and Simmons KEL (Eds.). 1977. Handbook of the Birds of Europe, the Middle East and North Africa: the Birds of the Western Palaearctic, Volume I. Oxford University Press, Oxford.

[25] Petersen IK, Fox AD and Clausager I (2003). Distribution and numbers of birds in the Kattegat in relation to the proposed offshore wind farm south of Læsø - Ornithological impact assessment. Report commissioned by Elsam Engineering A/S. National Environmental Research Institute. 116 pp.

It would therefore be reasonable and proportionate to conclude that the STA extension will not result in any negative consequences for the red-throated diver populations associated with either the Hermaness, Saxa Vord and Valla Field SPA or the Bluemull and Colgrave Sound pSPA. This agrees with the conclusion reached by SNH in their updated collision assessment for the six-turbine array, conducted in February 2018, and summarised in section 4.3. As an additional mitigation measure however, Nova will continue with the operational monitoring and anticipate this will be conditioned within the licence.

5.3.5 Further contextual information for European shag

Whilst European shag are capable of foraging to depths which take them into the area swept turbine blades, the species feeds exclusively diurnally[26]. It is therefore reasonable to assume that the underwater video provides an accurate evidence base on likely any interactions around the operating devices. During the 4000 hours of video footage recorded, there have been no observations of any marine wildlife colliding with the turbine blades. Whilst European shag were observed on the cameras (11 individual recordings over 16 months of reviewed video data, not necessarily different animals), they were not observed near the turbine while the tide was flowing. The same behaviour was observed for fish species on which European shag might prey. This behaviour should reduce the chance of any interactions between birds and the operating turbine blades.

European shag have also been recorded in and around the Shetland Tidal Array location during land-based Vantage Point surveys. For 85 4-hour counts conducted between August 2014 and January 2017, European shag were observed in all of them. Of these observations, only a small proportion of the birds were observed diving or exhibiting foraging behaviour, indicating that many were simply transiting the area. This has significant implications for the assessment of collision risk for the species which was based on surface density of birds.

European shag is part of the seabird assemblage feature of the Hermaness, Saxa Vord and Valla Field SPA rather than an independently qualifying feature. Birds associated with the SPA are likely to be part of a much larger population associated with Shetland.

In their Appropriate Assessment of Nova's five device STA project, Marine Scotland concluded no adverse effect on the integrity of the Hermaness, Saxa Vord and Valla Field SPA, with respect to possible effects on European shag, which are part of the seabird assemblage feature of the site. This conclusion drew on advice from SNH, who undertook an apportioning exercise and stable population analysis to understand what the impacts might be within the context of all breeding shag colonies within foraging range of the STA development. These further analyses concluded that whilst the overall modelled encounter risk for European shag was 9.37 birds annually, of these between zero and one bird would be expected to originate from Hermaness, Saxa Vord and Valla Field SPA. SNH advised that this collision rate would be unlikely to lead to an adverse effect on site integrity of the SPA.

Whilst the addition of a sixth turbine to the STA clearly increases the collision risk posed by the project (see section 4.3), the evidence presented in this report indicate that the modelled encounter rates and interpreted figures in Table 5.1 for European shag are likely to be precautionary estimates of the actual collision risk and an unrealistic worst-case scenario. The conclusions drawn from the apportioning exercise and stable population analysis undertaken by SNH are that the collision risk is likely to remain very low with the addition of a sixth turbine to the array.

It would therefore be reasonable and proportionate to conclude that the STA extension will not result in any negative consequences for the European shag population associated with the Hermaness, Saxa Vord and Valla Field SPA, or the wider Shetland population. However, it is acknowledged that populations of European shag, including those in Shetland, have declined over the past few decades, due in part to mass mortality events (or 'wrecks') which occur during prolonged periods of onshore gales, when the species finds it hard to forage[27]. Whilst the additional possible impacts to the population as a result of the Shetland Tidal Array are not likely to

[26] BirdLife International (2018) Species factsheet: *Phalacrocorax aristotelis*. Downloaded from http://www.birdlife.org

[27] Heubeck M, Mellor MR, Gear S and Miles WST (2015). Population and breeding dynamics of European Shags *Phalacrocorax aristotelis* at three major colonies in Shetland, 2001–15. SEABIRD **28**: 55–77.

be significant, as an additional mitigation measure, Nova will continue with the operational monitoring programme associated with the Shetland Tidal Array and anticipate that this requirement will be conditioned within the licence.

Monitoring to date has indicated that European shag are identifiable from the underwater video footage, providing confidence that continued data gathering will enable a fuller evidence base to develop on how this species interacts with the devices. If monitoring indicates that additional measures to further reduce collision risk might be necessary at any point in the future, to maintain the integrity of the Hermaness, Saxa Vord and Valla Field SPA, such decisions will be able to draw upon the monitoring data. For example, analysis of monitoring data should enable a greater understanding for the functional importance of the array area for the species, or of key factors influencing collision risk.

5.3.6 Further contextual information for Harbour seal

During the 4,000 hours of video footage recorded, there have been no observations of any marine wildlife colliding with the turbine blades. Whilst harbour seals were observed on the cameras, they were not observed near the swept area of the blades while the tide was flowing. The same was observed for fish species on which animals might prey. This behaviour should reduce the chance of any interactions between harbour seal and the operating turbine blades.

Field trials to measure the response of harbour seals to simulated tidal turbine sound in a narrow coastal channel subject to strong tidal flow indicated significant spatial avoidance by animals[28]. These findings suggest that a proportion of seals encountering tidal turbines will exhibit behavioural responses resulting in avoidance of physical injury. Whilst the modelled encounter rates detailed in this report have factored in a degree of avoidance of the turbines by animals, this work provides further evidence that collision risk may not be as severe as worst-case scenarios might suggest.

In 2015, the Scotland Government commissioned field trials to improve the evidence base on the physical consequences of collisions between seals and the blades of operating tidal turbines[29]. The study involved a series of collision trials between grey seal carcasses, using a shaped rigid bar fixed to the keel of a jet drive boat, to simulate the leading edge of a turbine blade. Carcasses were impacted at a range of effective speeds from 1.95 m/s to 5.32 m/s and the resulting injuries assessed. In all simulated collisions there was no evidence of skeletal trauma, nor obvious signs of trauma such as tears, avulsions or rupture in the integument, musculature or organs. Whilst these are just preliminary results, the authors did conclude that it seems likely that a significant proportion of slow speed collisions with the tips of tidal turbines, at less than 5.32 m/s would not be fatal.

During normal operation (assuming 90% turbine availability) the maximum tip speed for Nova M100 turbine blades in the Shetland Tidal Array would be less than 5.32 m/s for 40% of the time (this includes time when the blades are either stationary during slack tide, rotating slowly when leaving or approaching slack tide, or the device is removed for or awaiting maintenance). This further reduces the likelihood of harbour seals suffering damage from collisions with the turbine blades.

In their Appropriate Assessment of Nova's five device STA project, Marine Scotland concluded no adverse effect on the integrity of the Yell Sound Coast SAC, with respect to possible effects on harbour seal. In reaching this conclusion, they took advice from SNH, drawing on detailed collision risk modelling for the species and on calculations of Potential Biological Removal for the Shetland harbour seal Management Unit. SNH considered that the modelled collision rate for the five-device array would be unlikely to lead to an adverse effect on site integrity of the SAC and noted the value of ongoing monitoring in support of this conclusion.

[28] Hastie GD, Russell DJF, Lepper P, Elliott J, Wilson B, Benjamins S and Thompson D (2017). Harbour seals avoid tidal turbine noise: Implications for collision risk. Journal of Applied Ecology **2017**:1-10.

[29] Thompson D, Brownlow A, Onoufriou J and Moss SEW (2015). Collision risk and impact study: Field tests of turbine blade-seal carcass collisions. Sea Mammal Research Unit, University of S Andrews. Report to Scottish Government No. MR 7.2.3.

Whilst the addition of a sixth turbine to the STA clearly increases the collision risk posed by the project, the evidence presented in this report indicate that the modelled encounter rates and interpreted figures in Table 5.2 for harbour seal are likely to be precautionary estimates of the actual collision risk and an unrealistic worst-case scenario. The conclusions drawn from the analysis undertaken by Marine Scotland and SNH for the five-device array remain valid with the addition of a sixth turbine.

It would therefore be reasonable and proportionate to conclude that the STA extension will not result in any negative consequences for the harbour seal population associated with the Yell Sound Coast SAC. However, it is acknowledged that declines in the abundance of harbour seals have been noted in recent years throughout most of Scotland, including in Shetland. Whilst the additional possible impacts to the population as a result of the Shetland Tidal Array are not likely to be significant, as an additional mitigation measure, Nova will continue with the operational monitoring programme and anticipate that this requirement will be conditioned within the licence.

Monitoring to date has indicated that harbour seal are identifiable from the underwater video footage, providing confidence that continued data gathering will enable a fuller evidence base to develop on how this species interacts with the devices. If monitoring indicates that additional measures to further reduce collision risk might be necessary at any point in the future, to maintain the integrity of the Yell Sound Coast SAC, any decisions will be able to draw upon the monitoring data. For example, analysis of monitoring data should enable a greater understanding for the functional importance of the array area for the species, or of key factors influencing collision risk.

6 Monitoring and Mitigation

6.1 Project Environmental Monitoring Programme

Only a small number of tidal turbines have been deployed globally to date, resulting in a correspondingly limited evidence base about their potential interactions with the environment. It is therefore not possible at the point of application to draw conclusions about possible environmental impacts with absolute scientific certainty. The conclusions presented in this report are based on best available evidence and what Nova consider to be reasonable assumptions about the likely impacts of the STA extension, proportionate to the scale, location and nature of the project.

However, to acknowledge residual uncertainty about key impacts such as collision risk, Nova will produce a Project Environmental Monitoring Programme (PEMP) detailing the activities that will be carried out to improve the evidence base on the environmental impacts of the array on the environment which in turn, will inform the ongoing management of the project. This will help validate the conclusions in this EAR and ensure that any residual uncertainty about impacts is managed within acceptable limits. Monitoring will be used to identify risk factors for key impacts such as collision risk, and will help inform understanding about possible mitigation and adaptive management should they be required.

In operating the existing Shetland Tidal Array, Nova Innovation has collated a unique data set of turbine operational and environmental data. Under the PEMP this data set will be extended, and used to inform ongoing management of the STA, as detailed above. This data has the potential to benefit the wider tidal energy industry by expanding the evidence base on potential environmental impacts of marine energy. Given the cost and potential wider benefit of this work, Nova Innovation has partnered with Marine Scotland to apply for European funding that would enable detailed analysis of this data, as well as further expanding the environmental dataset through the deployment of additional sensors at the site.

Central to the PEMP is the use of video monitoring to observe underwater interactions of wildlife with the turbines. Every Nova turbine is equipped with cameras that are triggered by the presence of wildlife. To date, no collisions between the turbines and wildlife have been observed (see section 5).

Nova anticipate that the requirement for environmental monitoring, and the PEMP, will form an integral part of the Marine Licence and Works Licence for the STA extension. The PEMP will be developed and agreed in consultation with Marine Scotland and Shetland Islands Council, with guidance from SNH, prior to the deployment of the additional, sixth, turbine. Nova appreciate the guidance and advice received to date from SNH on the monitoring programme and will work with them to finalise and deliver the PEMP. Nova are fully committed to delivering on the monitoring requirements for the array and in recognition of the importance of monitoring, have employed an Environment Manager to oversee this programme.

7 Conclusion

This Environmental Assessment Report (EAR) has been prepared in support of Nova's applications for a Marine Licence from Marine Scotland and a Works Licence from Shetland Islands Council for extending the Shetland Tidal Array from 5 to 6 turbines.

The EAR provides the following key information:

- Identification of potential environmental impacts of the STA extension
- Assessment of the key potential environmental impacts
- Contextualisation of the potential environmental impacts
- Approach to mitigating and addressing residual uncertainty about key environmental impacts.

Based on earlier advice from MS-LOT and SNH, collision of the turbine blades with marine mammals and birds was identified as the most significant environmental risk for the proposed extension. The EAR presents the results of a revised collision risk assessment conducted by SNH, which found that there would be no adverse impacts of extending the array from 5 to 6 turbines, assuming a suitable PEMP is agreed and implemented for the array.

Nova Innovation will develop a PEMP for the array in consultation with Marine Scotland and Shetland Islands Council, and with guidance from SNH and other statutory consultees.

Appendix A List of designated sites potentially linked to the project

Table A.1 Designated Sites potentially linked to the project

Site Name	Designation Status	Date of Designation	Qualifying Features	Conservation Objectives	Site conditions
Hermaness, Saxa Vord & Valla Field	Special Protection Area	29/03/1994	Fulmar (Fulmarus glacialis), breeding, Gannet (Morus bassana), breeding, Great skua (Catharacta skua), breeding, Guillemot (Uria aalge), breeding, Kittiwake (Rissa tridactyla), breeding, Puffin (Fratercula arctica), breeding, Red-throated diver (Gavia stellata), breeding, Shag (Phalacrocorax aristotelis), breeding	To avoid deterioration of the habitats of the qualifying species (listed) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term: - Population of the species as a viable component of the site - Distribution of the species within site - Distribution and extent of habitats supporting the species - Structure, function and supporting processes of habitats supporting the species - No significant disturbance of the species	Favourable: Fulmar, Gannet, Great Skua, Guillemot, Puffin, Seabird Assemblage Unfavourable: Kittiwake, Red-Throated Diver, Shag
Yell Sound Coast	Special Area of Conservation	17/03/2005	Harbour seal (Phoca vitulina), Otter (Lutra lutra)		Favourable: Harbour Seal Unfavourable: Otter
Yell Sound Coast	SSSI	17/03/1998	Otter (Lutra lutra)		Considered as part of the Yell Sound Coast SAC
Bluemull & Colgrave Sounds	Proposed Special Protection Area	At consultation Stage	Red-throated diver (Gavia stellata), breeding		N/A
Fetlar	Special Protection Area	29/03/1994	Arctic skua (Stercorarius parasiticus), breeding, Arctic tern (Sterna paradisaea), breeding, Dunlin (Calidris alpina schinzii), breeding, Fulmar (Fulmarus glacialis), breeding, Great skua (Stercorarius skua), breeding, Red-necked phalarope (Phalaropus lobatus), breeding, Seabird assemblage, breeding, Whimbrel (Numenius phaeopus), breeding		Favourable: Arctic skua, Arctic tern, Dunlin, Great skua, Red-necked phalarope, Seabird assemblage, Whimbrel Unfavourable: Fulmar
Foula	Special Protection Area	27/11/1995	Puffin (Fratercula arctica), breeding, Red-throated diver (Gavia stellata), breeding, Arctic tern (Sterna paradisaea), breeding		Favourable: Red-throated diver Unfavourable: Puffin, Arctic tern
Mousa	Special Protection Area	27/11/1995	Arctic tern (Sterna paradisaea), breeding		Unfavourable
Noss	Special Protection Area	16/08/1996	Gannet (Morus bassanus), breeding, Puffin (Fratercula arctica), breeding		Favourable: Gannet Unfavourable: Puffin

Otterswick & Graveland	Special Protection Area	31/12/2001	Red-throated diver (Gavia stellata), breeding		Favourable
Fair Isle	Special Protection Area	16/12/1994	Gannet (Morus bassanus), breeding, Puffin (Fratercula arctica), breeding		Favourable: Gannet Unfavourable: Puffin
Sule Skerry & Sule Stack	Special Protection Area	29/03/1994	Gannet (Morus bassanus), breeding		Favourable
North Rona & Sula Sgeir	Special Protection Area	30/10/2001	Gannet (Morus bassanus), breeding		Favourable
St Kilda	Special Protection Area	31/08/1992	Gannet (Morus bassanus), breeding		Favourable

Appendix B Potential STA impact on other designated sites

The distance from the array to each potentially linked designated site (see Appendix A) was calculated. Foraging distance was used to identify potentially impacted species within each designated site; only those species within foraging distance of the array are included in the analysis below.

The approach adopted was to consider the same annual mortality rates shown in Table 4.3, which is informed by observations taken at the site. For all relevant species in each designated site, this mortality rate was then calculated as a percentage of the population to indicate the maximum potential impact of the six-turbine array on each designated site.

Note that the potential impacts below should not be added together to produce a total cumulative impact across all linked sites. The total impacts are assumed to be the values given in Section 4.3: the results below provide context by illustrating the small scale of these impacts on potentially linked designated sites.

Table B.1 Potential impact on Fetlar

Species	Estimated annual mortality rate for 6-turbine array	SPA breeding population	Mortality rate as % of population
Arctic skua	Of these species, only the Arctic tern is a diving bird, often employing plunge diving to gather food. The diving depth of the Arctic Tern is unlikely to be more than 50cm, therefore the Arctic tern will not encounter the turbines[30].		
Arctic tern			
Dunlin			
Fulmar			
Great skua			
Red-necked phalarope			
Whimbrel			

Table B.2 Potential impact on Foula

Species	Estimated annual mortality rate for 6-turbine array	SPA breeding population	Mortality rate as % of population
Atlantic puffin	1.36	96,000	**0.00%**
Red-throated diver	0.15	22	**0.68%**
Arctic Tern	The diving depth of the Arctic Tern is unlikely to be more than 50cm. As such, the Arctic tern will not encounter the turbines.		

Table B.3 Potential impact on Mousa

Species	Estimated annual mortality rate for 6-turbine array	SPA breeding population	Mortality rate as % of population
Arctic Tern	The diving depth of the Arctic Tern is unlikely to be more than 50cm. As such, the Arctic tern will not encounter the turbines.		

[30] Natural England Technical Information Note TIN137, Arctic tern: species information for marine Special Protection Area consultation, available at:

http://publications.naturalengland.org.uk/publication/3740693?category=9001, accessed on 27/10/2017

Table B.4 Potential impact on Noss

Species	Estimated annual mortality rate for 6-turbine array	SPA breeding population	Mortality rate as % of population
Northern Gannet	0.00	25,000	**0.00%**
Puffin	The puffin is part of the breeding assemblage; no SPA breeding population figures are available for puffins at this site.		

Table B.5 Potential impact on Otterswick & Graveland

Species	Estimated annual mortality rate for 6-turbine array	SPA breeding population	Mortality rate as % of population
Red-throated diver	0.15	54	**0.28%**

Table B.6 Potential impact on Fair Isle

Species	Estimated annual mortality rate for 6-turbine array	SPA breeding population	Mortality rate as % of population
Northern Gannet	The gannet is part of the breeding assemblage. No SPA breeding population figures are available for gannets at this site.		
Puffin	The puffin is part of the breeding assemblage. No SPA breeding population figures are available for puffins at this site.		

Table B.7 Potential impact on Sule Skerry & Sule Stack

Species	Estimated annual mortality rate for 6-turbine array	SPA breeding population	Mortality rate as % of population
Northern Gannet	0.00	9,780	**0.00%**

Table B.8 Potential impact on North Rona & Sula Sgeir

Species	Estimated annual mortality rate for 6 turbines	SPA breeding population	Additional mortality rate as % of population
Northern Gannet	0.00	18,000	**0.00%**

Table B.9 Potential impact on St Kilda

Species	Estimated annual mortality rate for 6 turbines	SPA breeding population	Additional mortality rate as % of population
Northern Gannet	0.00	120,800	**0.00%**

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MARINE SCOTLAND LICENSING OPERATIONS TEAM'S ("MS-LOT") ASSESSMENT OF THE PROJECT'S IMPLICATIONS FOR DESIGNATED SPECIAL AREAS OF CONSERVATION ("SAC"), SPECIAL PROTECTION AREAS ("SPA") AND PROPOSED SPECIAL PROTECTION AREAS ("pSPA") IN VIEW OF THE SITES' CONSERVATION OBJECTIVES.

APPLICATION FOR A MARINE LICENCE UNDER THE MARINE (SCOTLAND) ACT 2010 FOR CONSTRUCTION AND OPERATION OF THE EXTENDED NOVA TIDAL ARRAY, BLUEMULL SOUND, SHETLAND

SITE DETAILS: BLUEMULL SOUND, SHETLAND

Name	Assessor or Approver	Date
Sophie Humphries	Assessor	20/03/2018
Kerry Bell	Assessor	26/03/2018
Gayle Holland	Approver	05/04/2018

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MARINE SCOTLAND LICENSING OPERATIONS TEAM'S ("MS-LOT") ASSESSMENT OF THE PROJECT'S IMPLICATIONS FOR DESIGNATED SPECIAL AREAS OF CONSERVATION ("SAC"), SPECIAL PROTECTION AREAS ("SPA") AND PROPOSED SPECIAL PROTECTION AREAS ("pSPA") IN VIEW OF THE SITES' CONSERVATION OBJECTIVES.

APPLICATION FOR A MARINE LICENCE UNDER THE MARINE (SCOTLAND) ACT 2010 FOR THE CONSTRUCTION AND OPERATION OF THE EXTENDED SHETLAND TIDAL ARRAY, BLUEMULL SOUND, SHETLAND

SECTION 1: BACKGROUND

1 Appropriate assessment ("AA") conclusion

1.1 This AA concludes that, based on the content of the following assessment, there will be no adverse effect on the site integrity of the Yell Sound Coast SAC, the Hermaness, Saxa Vord and Valla Field SPA, and the Bluemull and Colgrave Sounds pSPA from Nova Innovation Ltd's proposal either in isolation or in combination with other plans or projects.

2 Introduction

2.1 This is a record of the AA of Nova Innovation Ltd.'s proposal to construct and operate the extended Shetland Tidal Array within Bluemull Sound, Shetland. The assessment has been undertaken by Marine Scotland - Licensing Operations Team ("MS-LOT"). This assessment is required under Regulation 48 of the Conservation (Natural Habitats, &c.) Regulations 1994 ("the Regulations"). This AA is in accordance with Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ("the Habitats Directive") and Council Directive 2009/147/EC on the conservation of wild birds ("the Birds Directive"). MS-LOT, as the 'competent authority' under the Regulations, has to be satisfied that the project will not adversely affect the integrity of any European site (SACs, SPA and pSPA) before it can grant consent for the project.

2.2 A detailed AA has been undertaken and Scottish Natural Heritage ("SNH") has been consulted.

3 Background to including assessment of new SPAs

3.1 Scottish Ministers, as a 'competent authority' under the Regulations, must be satisfied that the proposal will not adversely affect the integrity of any

European site (SACs and SPAs, known as Natura sites) either alone or in combination with other plans or projects before authorisations can be given for the proposal.

3.2 In Scotland, Scottish Ministers are currently in the process of identifying a suite of new marine SPAs. In 2014 advice was received from the statutory nature conservation bodies ("SNCBs") on the sites most suitable for designation and at this stage they became draft SPAs ("dSPAs"). Once Scottish Ministers have agreed the case for a dSPA to be the subject of a public consultation, the proposal is given the status of proposed SPA ("pSPA") and receives policy protection, which effectively puts such sites in the same position as designated sites, from that point forward until a decision on classification of the site is made. This policy protection for pSPAs is provided by Scottish Planning Policy (paragraph 210), the UK Marine Policy Statement (paragraph 3.1.3) and Scotland's National Marine Plan (paragraph 4.45).

3.3 It is not a legal requirement under the Habitats Directive or relevant domestic regulations for this assessment to assess the implications of the proposal on the pSPAs. The assessment includes an assessment of implications upon those sites in accordance with domestic policy. Scottish Ministers are also required to consider article 4(4) of the Birds Directive in respect of the pSPAs. The considerations under article 4(4) of the Birds Directive are separate and distinct to the considerations which must be assessed under this Habitats Directive assessment but they are, nevertheless, set out within this assessment (see paragraph 10.4).

3.4 In accordance with regulation 50 of the Regulations the Scottish Ministers will, as soon as reasonably practicable following the formal designation of the pSPAs, review their decisions if the proposal is authorised. This may include a supplementary AA being undertaken concerning the implications of the proposal on the sites as designated (as they are currently pSPAs their conservation objectives are currently in draft form, their conservation objectives are finalised at the point the sites are designated).

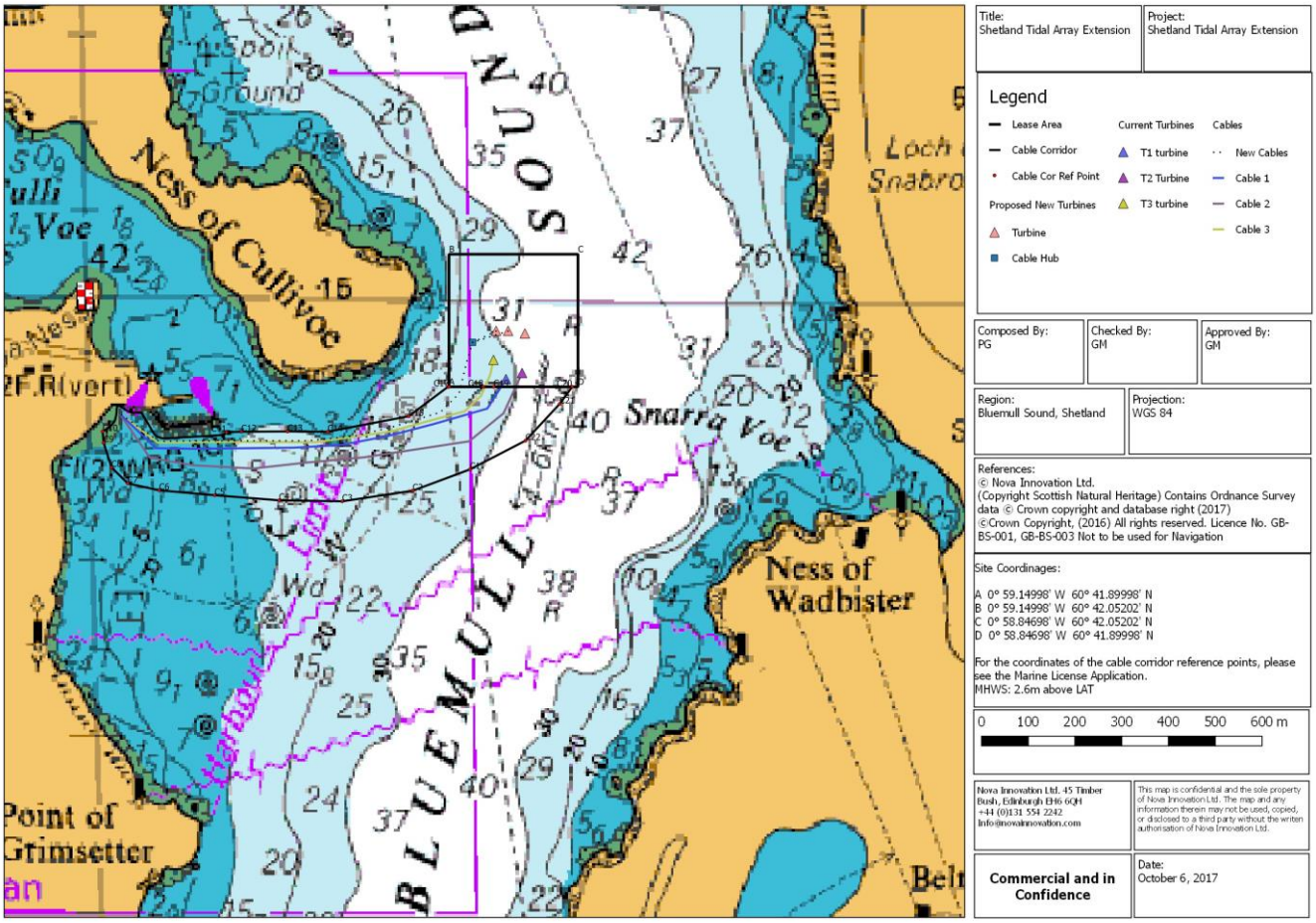
4 Details of proposed operation

4.1 The proposed full Shetland Tidal Array will consist of six 100 kW Nova M100 tidal turbines. A marine licence (04859/15/1) was previously granted, permitting the deployment of five turbines on the site however, so far only three of the turbines have been deployed. An AA was completed in 2015 in respect of the existing marine licence, the 2015 AA, however, did not include

an assessment of the pSPA as the site was not proposed as an SPA at the time of granting the existing marine licence.

4.2 The current proposal is to construct and operate an additional turbine (turbine six, during Q2 2020) within the same site and to allow for future reconfiguration of turbines four, five and six during Q1 2021 within the array area. The proposed operation also covers the maintenance and operation activities associated with the whole of the tidal array. Figure 1 shows the location of the Shetland Tidal Array and the proposed turbine layout.

Figure 1 Location of the Licence Boundary and Turbine Layout at the Shetland Tidal Array Site, Bluemull Sound, Shetland.



5 Consultation

5.1 Prior to consultation, discussion regarding the proposal together with the ongoing monitoring of the existing array, took place at a meeting on 26 January 2018 amongst MS-LOT, Shetland Island Council, SNH and Nova Innovations Ltd.

5.2 SNH subsequently provided updated collision risk assessments for the proposed six turbine array and included an assessment for the Bluemull and Colgrave Sounds pSPA.

5.3 SNH were consulted in respect of the proposal on 22 February 2018 and provided a response on 02 March 2018, which identified the requirement for an AA. This consultation response updated the advice SNH had previously provided in respect of the five turbines dated 24 June 2013, 27 August 2015 and 26 Janaury 2016.

5.4 Whale and Dolphin Conservation were consulted in respect of the proposal on 22 February 2018 and provided a response on 16 March 2018, requesting that the sixth turbine only be consented once further evidence on the impacts of turbines four and five has been analysed. MS-LOT are however content as further monitoring of the turbines is ongoing.

6 Main points raised during consultation

6.1 SNH note that the proposal is likely to have a significant effect on harbour seals of the Yell Sound Coast SAC as the distance between the proposal site and Yell Sound Coast SAC is well within the foraging range of the harbour seals.

6.2 SNH also note that the proposal is likely to have a significant effect on the gannets, puffins, red throated divers, guillemots and shags of the Hermaness, Saxa Vord and Valla Field SPA and the qualifying interests of the Bluemull and Colgrave Sounds pSPA, namely for breeding red-throated diver. This is due to the risk of collision between birds with diving capabilities and the operational turbines.

SECTION 2: INFORMATION ON NATURA SITES

7 Background information and qualifying interests for the relevant Natura sites

7.1 This section provides links to the Scottish Natural Heritage Interactive (“SNHi”) website where the background information on the site being considered in this assessment is available. The qualifying interests for the site are listed as are the conservation objectives.

Table 1 Name of Natura site affected and current status

Yell Sound Coast SAC
http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8409

Hermaness, Saxa Vord and Valla Field SPA
http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8512

Bluemull and Colgrave Sounds pSPA
http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=10483

Table 2 European qualifying interests

Yell Sound Coast SAC

- Harbour seal *(Phoca vitulina)*
- Otter *(Lutra lutra)*

Hermaness, Saxa Vord and Valla Field SPA

- Fulmar *(Fulmarus glacialis)**
- Gannet *(Morus bassana)*
- Great skua *(Catharacta skua)*
- Guillemot *(Uria aalge)**
- Kittiwake *(Rissa tridactyla)**
- Puffin *(Fratercula arctica)*
- Red-throated diver (*Gavia stellata)*
- Shag *(Phalacrocorax aristotelis)**
- Seabird assemblage

*indicates assemblage qualifier only

Bluemull and Cosgrave Sounds pSPA – Birds

- Red-throated diver (*Gavia stellata),* breeding

Table 3 Conservation objectives

Yell Sound Coast SAC

i. To avoid the deterioration of the habitats of the qualifying species (listed above) or
ii. significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features'

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

iii. Population of the species as a viable component of the site,
iv. Distribution of the species within site
v. Distribution and extent of habitat supporting the species
vi. Structure, function and supporting processes of habitats supporting the species, repeat of (ii) No significant disturbance of the species.

Hermaness, Saxa Vord and Valla Field SPA

i. To avoid the deterioration of the habitats of the qualifying species (listed above) or
ii. significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained;

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

iii. Population of the species as a viable component of the site,
iv. Distribution of the species within site
v. Distribution and extent of habitat supporting the species
vi. Structure, function and supporting processes of habitats supporting the species, repeat of (ii) No significant disturbance of the species.

Bluemull and Cosgrave Sounds pSPA (draft conservation objectives)

The following conservation objectives are still in draft form and have not yet been agreed.

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species.

This contribution will be achieved through delivering the following objectives for each of the site's qualifying features;

a) Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term;

b) To maintain the habitats and food resources of the qualifying features in favourable condition.

SECTION 3: ASSESSMENT IN RELATION TO REGULATION 48 OF THE CONSERVATION (NATURAL HABITATS, &C.) REGULATIONS 1994

8 Requirement for appropriate assessment

8.1 *Is the operation directly connected with or necessary to conservation management of the site?*

8.2 The operation is not directly connected with or necessary to conservation management of the site.

8.3 *Is the operation likely to have a significant effect on the qualifying interest?*

8.4 *In* their response dated 02 March 2018 SNH advised that the proposal would have a likely significant effect on:

Yell Sound Coast SAC

- Harbour seal *(Phoca vitulina)*

Hermaness, Saxa Vord and Valla Field SPA

- Gannet (Morus bassana)
- Guillemot (Uria aalge)
- Puffin (Fratercula arctica)
- Red-throated diver (Gavia stellata)
- Shag (Phalacrocorax aristotelis)

Bluemull and Cosgrave Sounds pSPA – Birds

- Red-throated diver (*Gavia stellata)*

8.5 SNH advised that the distance between the proposal and the Yell Sound Coast SAC is well within the foraging range of harbour seals and therefore advised that there is likely to be a significant effect on this qualifying species.

8.6 SNH also advised that there is a risk of collision between birds and operational turbines however note that this is only relevant to birds with diving capabilities that may place them at risk of interaction with the devices. SNH advised therefore that there is likely to be a significant effect on gannets, puffins, red-throated divers, guillemots and shags from the Hermaness, Saxa Vord and Valla Field SPA as well as the qualifying interests of the Bluemull and Colgrave Sounds pSPA, being the breeding red-throated divers.

8.7 MS-LOT agree with this advice and have undertaken an AA for the Bluemull and Cosgrave Sounds pSPA, Yell Sound Coast SAC and Hermaness, Saxa Vord and Valla Field SPA for the qualifying interests listed above.

8.8 SNH further advised that due to the distances and depths involved with the proposal it would be unlikely that there would be connectivity with otters, a

qualifying interest of the Yell Sound Coast SAC. Consequently SNH advised that there is no likely significant effect upon otters. MS-LOT agrees with this advice and therefore has not considered this qualifying interest further.

8.9 SNH also advised that in respect conservation objective (ii) whilst the proposal would be within the foraging range of all of the breeding populations for the Hermaness, Saxa Vord & Valla Field SPA, there would be no likely significant effect in this regard due to the small scale of the proposal, the expected limited duration of the installation procedures and the distance from nesting sites.

8.10 MS-LOT agrees with this advice and therefore has not considered this conservation objective of the Hermaness, Saxa Vord and Valla Field SPA any further.

9 Appropriate assessment of the implications for the site in view of the site's conservation objectives.

9.1 MS-LOT have considered the advice provided by SNH on 24 June 2013, 27 August 2015, 15 August 2017 and 02 March 2018 to support this assessment.

9.2 Yell Sound Coast SAC

9.3 Consideration of conservation objective (ii) identified that there is a likely significant effect upon harbour seals as a qualifying feature, in relation to potential disturbance and displacement of seals and potential collision with operational tidal turbines. SNH considered the following aspects of the proposal;

- the construction methods;
- construction timescales;
- type of vessels to be utilised;
- outputs from collision risk modelling as compared to 2015 (CRM);
- outputs from the ongoing underwater camera monitoring;
- the commitment by Nova Innovations Ltd to continue to conduct further CRM; and
- the implementation of the emergency shutdown protocol in the event of any collisions.

9.4 SNH concluded that, based on consideration of the factors above, there will be no adverse effect on the integrity of the Yell Sound Coast SAC according to its conservation objectives.

9.5 Hermaness, Valla Ford and Saxa Field SPA

9.6 SNH advised that consideration needed to be given to conservation objectives (i), (ii) and (iii) listed above.

9.7 Objective (ii) is concerned with ensuring that there is no significant disturbance of species designated as qualifying interests (e.g. through vessel activity or other activities). SNH advised that, although the proposal would be within foraging range of the above listed breeding populations, there is no likely significant effect in this regard due to the small scale of the development and the expected limited duration for installation procedures and the distance from nesting sites.

9.8 Consideration of objective (iii) identified the risk of collision between birds and operational turbines – relevant only to birds with diving capabilities placing them at risk of interaction with the devices. As such, SNH concluded that there is a likely significant effect for gannets, puffins, red-throated divers, guillemots and shags from Hermaness, Saxa Vord and Valla Field SPA.

9.9 Bluemull and Cosgrave Sounds pSPA

9.10 Consideration of conservation objective (a) identified the risk of collision between red-throated divers and operational turbines which may place them at risk of interaction with the device.

9.11 As such, SNH concluded that there is a likely significant effect for breeding red-throated divers from Bluemull and Cosgrave Sounds pSPA.

9.12 Consideration of conservation objective (b) concluded that there would no likely significant effect on the foraging range of the breeding population of the pSPA due to the small scale of the development relative to available habitats and food resources within the pSPA.

9.13 Collision Risk Modelling – Hermaness, Saxa Vord and Valla Field SPA and Bluemull and Cosgrave Sounds pSPA

9.14 SNH provided an appraisal of the potential collision risk impacts for the Hermaness, Saxa Vord & Valla Field SPA and Bluemull and Cosgrave

Sounds pSPA within their advice. The collision risk estimates are of a magnitude similar to the previous predictions (as presented in the 2015 AA) and SNH consider that their previous advice of 24 June 2013 (as updated on 15 August 2017) remains valid.

9.15 SNH concluded that, based on the updated collision risk models, the collision rates will not lead to an adverse effect on site integrity for the SAC, SPA or pSPA.

9.16 MS-LOT, therefore, conclude that the development alone will not have an adverse effect on site integrity for the Hermaness, Saxa Vord and Valla Field SPA, Yell Sound Coast SAC or the Bluemull and Cosgrave Sounds pSPA.

10 In-combination assessment

10.1 MS-LOT are aware of the following activities which currently have a marine licence and where LSE was identified on the qualifying interests of the relevant Yell Sound Coast SAC, Hermaness, Saxa Vord and Valla Field SPA and Bluemull and Cosgrave Sounds pSPA:

10.2 <u>Yell Sound Coast SAC</u>

10.3 *Seal Licensing – SMRU Research*

10.4 The current licence (which expires on 31/01/2019) is for the taking of seals for scientific, research or educational purposes across the whole of Scotland. The AA concluded that the activities would not adversely affect the integrity of any SPAs or SACs provided the conditions within the licence are adhered to (which prevent the taking harbour seals during the breeding season or in any one location for a period exceeding three consecutive days).

10.5 *Seal Licensing – Shetland*

10.6 The current licences (which expire on 31/01/2019) are for the shooting of seals as a last resort means of predator control at various locations. Fish farm companies and organisations responsible for the protection of river fisheries and netting stations can apply for licences to shoot seals as a last resort means of predator control to protect the health and welfare of farmed fish or to prevent serious damage to fisheries. Three separate licences were issued for locations where the shooting of seals could have a likely significant effect on the SAC, permitting a total of three seals to be shot.

Appropriate Assessment for Nova Innovations Ltd, Extended Shetland Tidal Array, March 2018.

10.7 The AA concluded that the activities would not adversely affect the integrity of the SAC provided that the conditions within the licences are adhered to and that the number of common seals that can be shot as a last resort means of predator control are limited to the lower maximum figure (of three seals). Licence conditions prevent the shooting of seals within 50 km of the SAC and the shooting of seals while hauled out on land and shooting is only permitted at fish farm sites currently stocked with aquaculture animals.

10.8 Hermaness, Saxa Vord and Valla Field SPA

10.9 *Dounreay Tri Floating Demonstration Project (Hexicon)*

10.10 The current licence (which expires on 16/03/2037) is for a demonstration floating offshore wind farm consisting of the following;

- A two turbine offshore wind farm with an installed capacity of between 8 to 12 megawatts (MW), at least 6km off Dounreay, Caithness;
- A single, 33kV, export cable to bring the power to shore immediately to the west of the Dounreay Restoration Site fence line; and
- Subject to a Connection Offer from Scottish and Southern Energy Power Distribution (SSEPD), the associated onshore electrical infrastructure to connect the Project at, or near, the existing substation at Dounreay.

10.11 The main offshore components will include:

- Two offshore wind turbines;
- A floating foundation;
- Mooring clump weight;
- Mooring chain and/or steel lines;
- Drag embedment anchors;
- One cable to bring the renewable electricity ashore; and
- Scour protection for the anchors and the export cable, where necessary.

10.12 A full project description can be found here. The company behind this development has gone into administration and presently the project is ‘on hold’. Although there is interest from other organisations in buying the existing consents, work is currently suspended.

10.13 The AA completed for the Dounreay Tri proposal concluded that there would be no adverse effect on the site integrity of the Hermaness, Saxa Vord and Valla Field SPA, either alone or in combination with other projects, on the qualifying interest of this site (gannet) as the collision risk modelling

predicted no collisions during the breeding or non-breeding seasons. Furthermore, northern gannet foraging ranges are extensive and any displacement impacts for this qualifying interest were considered to be insignificant.

10.14 EMEC – *Fall of Warness*

10.15 The European Marine Energy Centre ("EMEC") received consent (expires on 22 March 2023) for the construction and operation of a tidal test site at the Fall of Warness and has been in existence since 2005. There are (as of July 2014) 8 berths, all assigned to different developers.

10.16 Some redevelopment is planned for 2018, with potential to overlap with the seal licensing. A summary of the key envelope parameters are provided below:

- Mooring/foundation design and installation method - as per section 3.2 of the EMEC Fall of Warness Tidal Test Site: Environmental Appraisal.
- Rotor diameter - 25m (open-bladed rotors).
- Number of simultaneous turbines/rotors - 12 devices with up to 18 rotors
- Rotor depth - Minimum depth - 2.5m clearance from sea surface

10.17 A full project description can be found here.

10.18 The AA completed for the section 36 consent for EMEC Fall of Warness proposal concluded that there would be no adverse effect on the site integrity of the Hermaness, Saxa Vord and Valla Field SPA, either alone or in combination with other developments, provided the devices at this site do not exceed the parameters of the consent.

10.19 *Meygen Phase 1*

10.20 The current licence (which expires on: 01 January 2041) is for the installation and operation of a tidal array consisting of up to 61 fully submerged turbines, with a generating capacity of 86 MW. Phase 1 forms part of a much larger project, for which separate consent will be sought.

10.21 The devices are horizontal axis tidal turbines which are fixed to the seabed using one or a mixture of the following turbine support structures; gravity base foundations, pin piles or monopiles. The turbines and support structure

will be deployed using a DP vessel. The installation is proposed to be staggered as follows:

- Year 1 – 2-10 MW to deployed
- Year 2 – 10-20 MW to be deployed
- Year 3 – 56-74 MW

10.22 Each turbine has a separate electricity export cable which will be laid along the seabed for part of the distance onshore and then passed through Horizontally Directionally Drilled (HDD) bores for the remainder. There are 2 options for the cable landfall and onshore infrastructure along the north Caithness coast, Ness of Quoys and Ness of Huna, both of which have been granted planning permission.

10.23 The AA completed for the Meygen Phase 1 proposal concluded that there would be no adverse effect on the site integrity of the Hermaness, Saxa Vord and Valla Field SPA, either alone or in combination with other developments, as the low numbers of gannets recorded during site surveys suggested that the project area is not an important foraging area for this species. Furthermore, the collision risk modelling outputs predicted no collisions during the breeding or non-breeding seasons for this qualifying interest.

10.24 Furthermore, the AA concluded that any potential disturbance from increased vessel activity or installation works would be unlikely to be significant and any potential disturbance would be temporary and over a limited area. Any displacement and loss of foraging habits due to the physical presence of turbines would be over a limited area and unlikely to impact the population viability of the species.

10.25 <u>Bluemull and Cosgrave Sounds pSPA</u>

10.26 At present, no AAs have been conducted for proposals within this pSPA and therefore, MS-LOT conclude that there is no adverse effect on site integrity resulting from this proposal in-combination with other developments/activities.

10.27 No adverse effect was identified on the Bluemull and Cosgrave Sounds pSPA. However, as detailed at paragraph 3.3, as the sites are not yet designated, they also fall within the regime governed by the first sentence of Article 4(4) of the Birds Directive as follows:

"In respect of the protection areas referred to in paragraphs 1 and 2, Member States shall take appropriate steps to avoid pollution or deterioration of

habitats or any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of this Article. Outside these protection areas, Member States shall also strive to avoid pollution or deterioration of habitats."

10.28 MS-LOT consider that the NOVA proposal will not cause pollution, deterioration of habitats or significant disturbance of the qualifying interests of the Bluemull and Cosgrave Sounds pSPA.

10.29 In-Combination Assessment - Conclusion

10.30 SNH advised that, based on their appraisal of the proposal and their knowledge of other developments/activities in Shetland, any potential cumulative and in-combination effects will not adversely affect the integrity of the SAC, SPA or pSPA.

10.31 The appraisal above concludes that the proposal will not adversely affect the integrity of the Yell Sound Coast SAC, Hermaness, Saxa Vord and Valla Field SPA and the Bluemull and Cosgrove Sounds pSPA with respect to the individual qualifying features. Having determined that the proposal will not have a negative effect on the constitutive elements of the sites, on having regard to the reasons for which they were designated and the associated conservation objectives, overall MS-LOT concludes that there will no adverse effect on the site integrity of the Yell Sound Coast SAC, Hermaness, Saxa Vord and Valla Field SPA and the Bluemull and Cosgrove Sounds pSPA from this proposal either in isolation or in-combination with other plans and projects.

SECTION 4: CONDITIONS

11 Requirement for conditions.

11.1 The licensee must ensure that all of the mitigation measures set out in the Application and Supporting Documentation are implemented for the duration of the Works. This assessment is based on the works being of short duration and therefore no further conditions are required.