



Shetland Tidal Array Project Environmental Monitoring Plan (PEMP)

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1.0	30/04/2019	First draft
2.0	07/02/2020	Updated following feedback on Version 0.1 and monitoring field trials in 2019
3.0	29/05/2020	Updated following feedback from Marine Scotland, Shetland Islands Council and Scottish Natural Heritage on Version 0.2 and further field trials
4.0	30/07/2020	Final version for approval. Updated following feedback from Marine Scotland, Shetland Islands Council and Scottish Natural Heritage on Version 0.3.
5.0	16/12/2021	Updated with details of Marine Licence 00009110 issued 12/02/2021.
6.0	25/05/2022	Updated to amend monitoring reporting schedule.

Notice

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1 Non-technical summary

Nova Innovation has produced this Project Environmental Monitoring Plan (PEMP) to describe the methods and techniques that will be employed to monitor and proactively manage the environmental effects of the 600 kW array of Nova M100 tidal turbines in the Bluemull Sound near Cullivoe in Shetland (the “Shetland Tidal Array”).

The PEMP is a requirement of conditions attached to the following licences for the Shetland Tidal Array:

- Marine Scotland Marine Licence 00009110, issued under the Marine (Scotland) Act 2020, part 4
- Shetland Islands Council (SIC) Works Licence 2018/021/WL, issued under the Zetland County Council Act 1974

Nova is committed to best environmental practice and avoiding adverse environmental effects in all aspects of its business. Therefore, in addition to being a requirement of Project licences, the PEMP and the environmental management and monitoring measures it sets out are core Project components of the Shetland Tidal Array.

The PEMP provides an overarching framework for environmental monitoring and management during the construction, operation and decommissioning of the Shetland Tidal Array, to avoid adverse harm to marine habitats and species. It sets out the measures by which Nova will gather information on interactions between marine wildlife in Bluemull Sound and the turbines in the array. In doing so, the PEMP builds on the environmental monitoring Nova has already carried out in Bluemull Sound and around the Shetland Tidal Array since November 2010. Details of how this growing evidence base will be shared with Marine Scotland Licensing Operations Team (MS-LOT) and Shetland Islands Council (SIC) are provided. Finally, the PEMP details actions Nova will take to avoid or minimise the potential risk of damage to the Scottish marine area as a result of undertaking the licensed activities.

The PEMP is an iterative, live document to be kept under constant review throughout the lifetime of the Shetland Tidal Array to ensure it remains fit for purpose. As knowledge and the evidence base grows on the environmental effects of the Shetland Tidal Array and tidal stream energy more generally, monitoring objectives and methods may evolve and change over time.

2 Introduction

2.1 Structure and scope

The primary function of this Project Environmental Monitoring Plan (PEMP) for the Shetland Tidal Array is to meet the requirements and enable discharge of relevant conditions of Project licences. These include conditions referring specifically to the PEMP and environmental monitoring, as well as conditions to safeguard the natural environment more generally.

The PEMP is a requirement of conditions attached to the following licences for the Shetland Tidal Array:

- Marine Licence 00009110, issued by Marine Scotland Licensing Operations Team on behalf of the Scottish Ministers, under the Marine (Scotland) Act 2020, part 4
- Shetland Islands Council Works Licence 2018/021/WL, issued under the Zetland County Council Act 1974

The PEMP provides an overarching framework for environmental management and monitoring during the construction, operation and decommissioning of the Shetland Tidal Array, to avoid adverse harm to marine habitats and species. It sets out the measures by which Nova will gather information on interactions between marine wildlife in Bluemull Sound and the turbines in the array, with a focus on understanding the potential for collisions between diving birds and marine mammals. In doing so, the PEMP builds on the environmental monitoring Nova has already carried out in Bluemull Sound and around the Shetland Tidal Array since November 2010. Details of how this growing evidence base will be shared with MS-LOT and Shetland Islands Council are provided. Finally, the PEMP provides details of actions Nova will take to avoid or minimise the potential risk of damage to the Scottish marine area as a result of undertaking the licensed activities.

This information is structured in the following sections in this document:

Section 1: Non-technical summary

Section 2: Introduction

Structure and scope of the PEMP. Detailed requirements of Project licences of relevance to the PEMP, summary of document history and details of relationship between PEMP and other documents required under licence conditions.

Section 3: The Shetland Tidal Array

Overview of the location and technical details of the proposed Project, with a focus on offshore components. Full details are provided in the Project Construction Method Statement.

Section 4: Principles and objectives of environmental monitoring

Overarching principles for environmental monitoring activity to be accrued out at the Shetland Tidal Array, including high-level aims and objectives.

Section 5: Pre-installation drop-down video survey

Objectives, methods and data analysis and interpretation. This is a mandatory monitoring activity, delivered to meet the requirements of licence conditions.

Section 6: Land-based vantage point surveys

Objectives, methods and data analysis and interpretation. This is a mandatory monitoring activity, delivered to meet the requirements of licence conditions.

Section 7: Subsea video monitoring

Objectives, methods and data analysis and interpretation. This is a mandatory monitoring activity, delivered to meet the requirements of licence conditions.

Section 8: Additional monitoring activity

Proposed flow regime monitoring. These are value-added activities and not part of the mandatory monitoring to meet the requirements of licence conditions.

Section 9: Reporting and reviewing

Overview of how information and outputs from mandatory monitoring activity will be shared with Marine Scotland and Shetland Islands Council and review process for PEMP and monitoring activity.

Annex A: Shetland Tidal Array Biosecurity Plan

Annex B: Priority habitat reference cards

Annex C: Summary of new vantage point methodology trials

Annex D: Vantage point survey recording form

Annex E: Copy of Marine Licence and Shetland Islands Council Works Licence

2.2 Requirements of Project licences

Conditions of Marine Licence 00009110 and Works Licence 2018/021/WL relating explicitly to the PEMP, and environmental monitoring are detailed in Table 2-1. Full copies of Marine Licence 00009110 and Works Licence 2018/021/WL are provided in Annex E.

Table 2-1 Conditions of Project licences relating to the need for and scope of the PEMP.

Condition reference	Detail of condition requirement	Action undertaken or required
Marine Licence 00009110		
3.2.1.1	Nova must, within 3 months of the issue of this licence, unless otherwise agreed with Marine Scotland, submit a PEMP in writing to Marine Scotland for approval.	PEMP V4.0 submitted to MS-LOT 30/07/2020. This was the culmination of an iterative process of PEMP development, initiated through a PEMP scoping document and involving submission of a series of interim draft PEMPs for discussion between Nova and MS-LOT and their consultees.
3.2.1.1	Approval of the PEMP may only be granted following consultation by Marine Scotland with other ecological advisors or organisations as required. Marine Scotland must approve all methodologies for monitoring and where appropriate, in consultation.	MS-LOT consulted extensively on interim versions of the PEMP. Current version incorporates all comments and feedback. Methods for mandatory monitoring are set out in Sections 5 to 7 incorporate discussion with NatureScot (previously SNH) and key technical experts.
3.2.1.1	The PEMP must set out measures by which Nova must monitor the environmental impacts of the Works. Monitoring is required throughout the lifespan of Project where this is deemed necessary by Marine Scotland.	The process for reviewing the need for and nature of monitoring throughout the lifespan of the Project is set out in Section 10.
3.2.1.1	Monitoring must ensure that the data collected allows useful and valid comparisons between different phases of the Works. Monitoring may also verify predictions in the Application. In the event that further potential adverse environmental effects are identified, not predicted in the Application, Marine Scotland may require Nova to undertake additional monitoring.	Methods for mandatory monitoring set out in Sections 5 to 7 incorporate consideration of value and usefulness of the data, incorporating discussion with NatureScot (previously SNH) and key technical experts.

Condition reference	Detail of condition requirement	Action undertaken or required
3.2.1.1	The PEMP must cover, but not be limited to, the following matters: pre-construction, construction, operation and maintenance monitoring or data collection as relevant in terms of the environmental assessment report and any subsequent monitoring or data collection for marine mammals and birds.	This version of the PEMP focuses on construction and operational phases of the Project. Full details of objectives and methods for mandatory monitoring are set out in Sections 5 to 7.
3.2.1.1	The PEMP is a live document and must be regularly reviewed by Marine Scotland, at timescales to be determined by them to identify the appropriateness of ongoing monitoring. Following such reviews, Marine Scotland may require Nova to amend the PEMP for Marine Scotland approval following consultation with ecological, or such other advisors as may be required at the discretion of Marine Scotland.	The PEMP is an iterative document which will be reviewed in line with the process set out in Section 10 to ensure monitoring continues to be useful, necessary, appropriate and proportionate.
3.2.1.1	Nova must submit monitoring reports to Marine Scotland at timescales to be determined by them. Subject to any legal restrictions regarding the treatment of the information, results are to be made publicly available by Marine Scotland.	Monitoring reports will be submitted to MS-LOT in line with the process set out in Section 9.2.
3.2.1.1	Where appropriate and reasonable, the PEMP must take account of, and implement recommendations from, the Construction Method Statement (CMS) and any other such plans required by the terms of this licence.	The PEMP is a central repository for all measures relating to monitoring and safeguarding the environment. Cross-reference to the PEMP is provided in CMS and other plans.
3.2.1.1	Marine Scotland may agree that monitoring may be reduced or ceased before the end of the lifespan of the Works.	The monitoring review process to ensure it continues to be useful, necessary, appropriate and proportionate is set out in Section 10.
Work Licence 2018/021/WL		
3	During the lifespan of this works licence the sea area around the array should be monitored to assess the effect of the device if any on movements of seabirds and marine mammals. The survey methodology should be agreed with Shetland Islands Council under advisement from SNH.	Methods for mandatory monitoring are set out in Sections 5 to 7 and have been agreed with NatureScot (previously SNH) and key technical experts through the iterative process of PEMP development.
3, 11	Nova must submit before installation of the sixth turbine or movement of the existing turbines a PEMP detailing activities to improve the evidence base on the environmental impact of the array. Monitoring will be used to identify risk factors for key impacts such as collision risk. Central to the PEMP will be video monitoring to observe underwater interactions of wildlife with turbines.	Turbine 6 installation anticipated Q4 2022 but PEMP has been submitted to align with MS-LOT requirements. Mandatory monitoring measures are set out in Sections 5 to 7.
3, 11	The PEMP will be developed and agreed in writing by Shetland Islands Council with guidance from Marine Scotland and Scottish Natural Heritage.	Methods for mandatory monitoring set out in Sections 5 to 7 incorporate discussion with MS-LOT, SNH and key technical experts.
6	The PEMP will be adhered to. This iterative document accounts for final details within the CMS. The PEMP will take account of the CMS, phased approach and operation and maintenance aspects and provide detailed information on how environmental interest are being considered.	This document details all measures relating to monitoring, safeguarding the environment and how environmental interests are being considered. Cross-references to the PEMP are provided in the CMS.

Conditions of Marine Licence 00009110 and Works Licence 2018/021/WL relating to safeguarding the marine environment are detailed in Table 2-2. Full copies of Marine Licence 00009110 and Works Licence 2018/021/WL are provided in Annex E.

Table 2-2 Conditions of Project licences relating to safeguarding the environment.

Condition reference	Detail of condition requirement	Action undertaken or required
Marine Licence 00009110		
3.1.7	Submit all reports and notifications to Marine Scotland, as required and within time periods specified in this licence.	Environmental monitoring reports and reports on environmental conditions will be submitted to MS-LOT in line with the process set out in Section 9.2.
3.1.8	Ensure all chemicals to be utilised in the Works have been approved prior to use.	All materials to be used detailed in CMS. No hazardous substances will be utilised
3.1.9	Take precautions to prevent the unintentional release of fluorinated greenhouse gases.	No fluorinated greenhouse gases will be used at any stage in the Project.
3.1.10	Take all reasonable, appropriate and practicable steps to avoid or minimise any damage to the Scottish marine area caused as a result of the licensed activities.	Specific measures detailed in this table. Environmental sensitivities in all site briefings.
3.1.10	Ensure all personnel adhere to the Scottish Marine Wildlife Watching Code during all installation, operation and maintenance activities.	SMWWC kept on site at Cullivoe and onboard all vessels engaged in Works. Environmental sensitivities included in all site briefings.
3.1.10	All debris or waste material below MHWS will be removed from site.	All waste material removed from site and disposed of responsibly.
3.1.10	Ensure the risk of transferring marine non-native species to and from the Site is kept to a minimum by ensuring bio-fouling management practices are implemented.	Measures detailed in Project Biosecurity Plan (Annex A).
3.1.10	Oil-based drilling muds (if utilised) must be contained within a zero discharge system.	No oil-based drilling muds will be used at any stage in the Project.
3.2.1.2	Any breach of environmental obligations relating to the Works should be reported to Marine Scotland within 24 hours of the incident occurring.	Any breaches will be reported to MS-LOT within 24 hours.
3.2.1.3	Suitable bunding and storage facilities should be employed to prevent release of fuel oils and lubricating fluids associated with the plant and equipment into the marine environment.	Storage of fuel oils and lubricating fluids not envisaged but will be kept under review and best practice followed.
3.2.1.4	All reasonable, appropriate and practicable steps 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, in accordance with the PEMP.	Detailed in draft Decommissioning Programme submitted to MS-LOT in January 2020. Decommissioning Plan is being finalised and agreed with MS-LOT/BEIS.
3.2.2.2	Construction of the Works may not commence until the Licensee has submitted a Decommissioning Plan in accordance with Section 105 notice.	Draft Decommissioning Programme submitted to MS-LOT in January 2020. Decommissioning Plan is being finalised and agreed with MS-LOT/BEIS.
3.2.2.5	Submit a Proposed Activity Form for all aspects of the Works that will produce loud, low to medium frequency (10Hz-10kHz) impulsive noise.	No loud, low to medium frequency noise will be produced by the Works. No drilling or piling to be undertaken.

Condition reference	Detail of condition requirement	Action undertaken or required
Works Licence 2018/021/WL		
Site specific conditions		
4	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.	Video surveys conducted prior to device and cable installation using a subsea camera lowered from a survey vessel. Any maerl or horse mussel beds will be avoided by micro-siting.
5	The construction method statement provided to Shetland Islands Council will be adhered to and should be cross-referenced with the Environmental Management and Mitigation Plan ¹ .	PEMP details all measures relating to monitoring, safeguarding the environment and how environmental interests are being considered. Cross-references to the PEMP are provided in the CMS.
7	Benthic survey to identify benthic habitats or species on the recommended Priority Marine Features list prior to commencement of works to identify micro-siting of device foundations and final turbine layout/location of all infrastructure.	Video surveys conducted prior to device and cable installation using a subsea camera lowered from a survey vessel. Any sensitive habitats are avoided.
8	Adherence to good practice guidelines associated with the Scottish Marine Wildlife Watching Code SMWWC (www.marinecode.org) at all times during the Works.	SMWWC kept on site at Cullivoe and onboard all vessels engaged in Works. Environmental sensitivities included in all site briefings.
9	Good practice measures to minimise the introduction and spread of marine non-native species, as per the Scottish Government Code of Practice and International Maritime Organisation (IMO) Guidelines.	Measures detailed in Project Biosecurity Plan (Annex A).
Standard conditions		
3	All measures considered reasonably necessary for the clearance and removal of any environmental pollution causing a nuisance, on land or ashore or in the sea, in connection the Works.	All waste material removed from site and disposed of responsibly. Any pollution incident resulting from the Project will be dealt with in accordance with the Shetland Islands Council Marine Pollution Contingency Plan ² .

2.3 Document history

This PEMP replaces the previous Environmental Monitoring and Mitigation Plan (EMMP) for the Shetland Tidal Array³. It has been developed through an iterative, collaborative process, which has included the following key components and stages:

- Production and agreement of a scoping document setting out Nova's proposed approach to producing and finalising the PEMP and the tasks involved.
- Discussion and formal consultation with MS-LOT, Shetland Islands Council, Marine Scotland Science and Scottish Natural Heritage (now NatureScot), and consideration of previous advice on monitoring in Bluemull Sound.

¹ The reference in Works Licence 2018/021/WL to an Environmental Management and Mitigation Plan is taken to mean Project Environmental Monitoring Plan.

² Shetland Islands Council (2015). Shetland Marine Pollution Contingency Plan. Available at: <https://www.shetland.gov.uk/ports/contingencyplans/marinepollution.asp>

³ Nova Innovation (2015). Environmental Monitoring and Mitigation Plan. Shetland Tidal Array, Bluemull Sound, pp13.

- c. Analysis of the data gathered and lessons learnt from environmental monitoring in Bluemull Sound since November 2010 (results presented in separate reports).
- d. Discussions and input from technical experts, in particular Dr James Waggitt, marine ornithologist at Bangor University.
- e. Site visits to Bluemull Sound involving Nova, Scottish Natural Heritage (now NatureScot), Dr Waggitt (Bangor University), Dr Shaun Fraser (UHI) and Nova's field surveyor to discussion future design of monitoring.
- f. Trials of new monitoring methodologies and feedback to inform evolution of design.

Nova considers that this iterative and collaborative approach to finalising the PEMP demonstrates best practice, ensuring that environmental monitoring of the Shetland Tidal Array will be fit for purpose, deliverable, with a clear purpose and defined objectives.

2.4 Relationship with other documents

The PEMP takes account of and implements recommendations from other plans required under the terms of the licences for the Shetland Tidal Array. Table 2-3 sets out these other plans and their relationship with the PEMP. Nova Innovation also maintains an Excel-based record of the status of licence conditions for the Shetland Tidal Array, which is regularly shared with MS-LOT and Shetland Islands Council, to ensure that all relevant consent conditions including the submission and adherence to other plans required under the terms of the Project licences are being met.

Table 2-3 Details of other plans and reports required under the terms of Project licences and relationship with PEMP.

Plan or report	Details and relationship with PEMP
Reports on Shetland Tidal Array environmental monitoring programme	Set out the results of Nova's programme of environmental monitoring for the Shetland Tidal Array, to meet reporting requirements. Include analysis of data, knowledge gained about the impacts of the Project and lessons learnt about the efficacy of the methodologies, to feed into ongoing review of the PEMP. Key reports relevant to the current version of the PEMP include: <ul style="list-style-type: none"> - Subsea video monitoring report: EnFAIT-0346 (2020) - Vantage point surveys monitoring report: EnFAIT-0347 (2020)
Shetland Tidal Array Construction Method Statement: EnFAIT-0322	Describes the methods and techniques that will be employed to install, operate, reconfigure and decommission the 6-turbine Shetland Tidal Array, including cables and offshore infrastructure. Includes details of all environmental mitigation and good practice measures that will be employed throughout the construction phase of the Project to protect and safeguard the environment. Provides details of pre- and post-deployment seabed surveys carried out to prevent damage to any priority marine features (also detailed in Section 5).
Shetland Tidal Array Cable Plan: EnFAIT-0234	Describes the measures in place for the Project to ensure that all environmental and navigational issues are considered for the location and construction of the subsea cables for the Development. Includes details of all environmental mitigation and good practice measures that will be employed in relation to subsea cables throughout all Project phases to protect and safeguard the environment.

Shetland Tidal Array ERCoP: EnFAIT-0365	Construction Phase Emergency Plan between Nova Innovation and the Maritime and Coastguard Agency. Includes details of counter-pollution measures in place for the Project.
Shetland Tidal Array Navigational Risk Assessment: EnFAIT-0325	Describes the measures in place for the Project to ensure that all navigational issues are considered and hazards avoided. Includes details of measures to avoid the Project creating a navigational (and resulting environmental) hazard.

3 The Shetland Tidal Array

3.1 Project description

Phase 1 of the Shetland Tidal Array was deployed in 2016/2017 and consists of three operational 100 kW Nova M100 tidal turbines (T1 to T3) located in the Bluemull Sound, Shetland. Phase 2 (the extension to the array) will involve the addition of three further 100kW Nova M100D turbines (T4 to T6) and associated infrastructure, and the relocation of T4, T5 and T6.

The schedule for installation of infrastructure and turbines and relocation of turbines is as follows:

1. Turbine 4 and cable: Installed November 2020
2. Turbine 5 and 6 and cable installation: Q4 2022
3. Reconfiguration of array involving relocation of Turbines 4, 5 and 6: date to be determined

Full technical details of the Project are provided in the Construction Method Statement (CMS) submitted to Marine Scotland and Shetland Islands Council⁴.

3.2 Project location

The Shetland Tidal Array is situated in Bluemull Sound, between the islands of Unst and Yell, just offshore from the Ness of Cullivoe, as illustrated in Figure 3-1.



Figure 3-1 Map showing the general location of the Shetland Tidal Array in Bluemull Sound, Shetland. In the final map, the general location is indicated by the red rectangle.

Figure 3-2 and Figure 3-3 (over) show the layout of the turbines and infrastructure in the Shetland Tidal Array.

⁴ Nova Innovation (2020). Shetland Tidal Array Construction Method Statement: EnFAIT-0322.

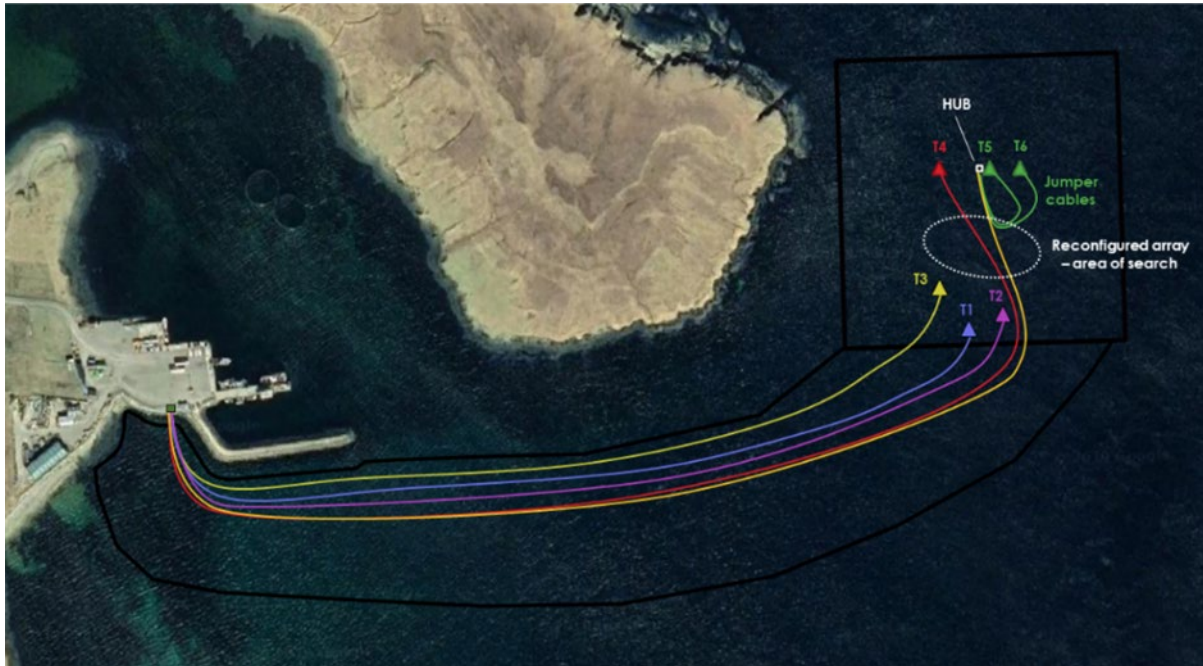


Figure 3-2 Satellite view showing the location of the Shetland Tidal Array layout including the location of the six turbines (T1 to T6), the offshore hub and cables. The location of the reconfigured array (T4 to T6 only) is also indicated.

Source: Nova Innovation 2020

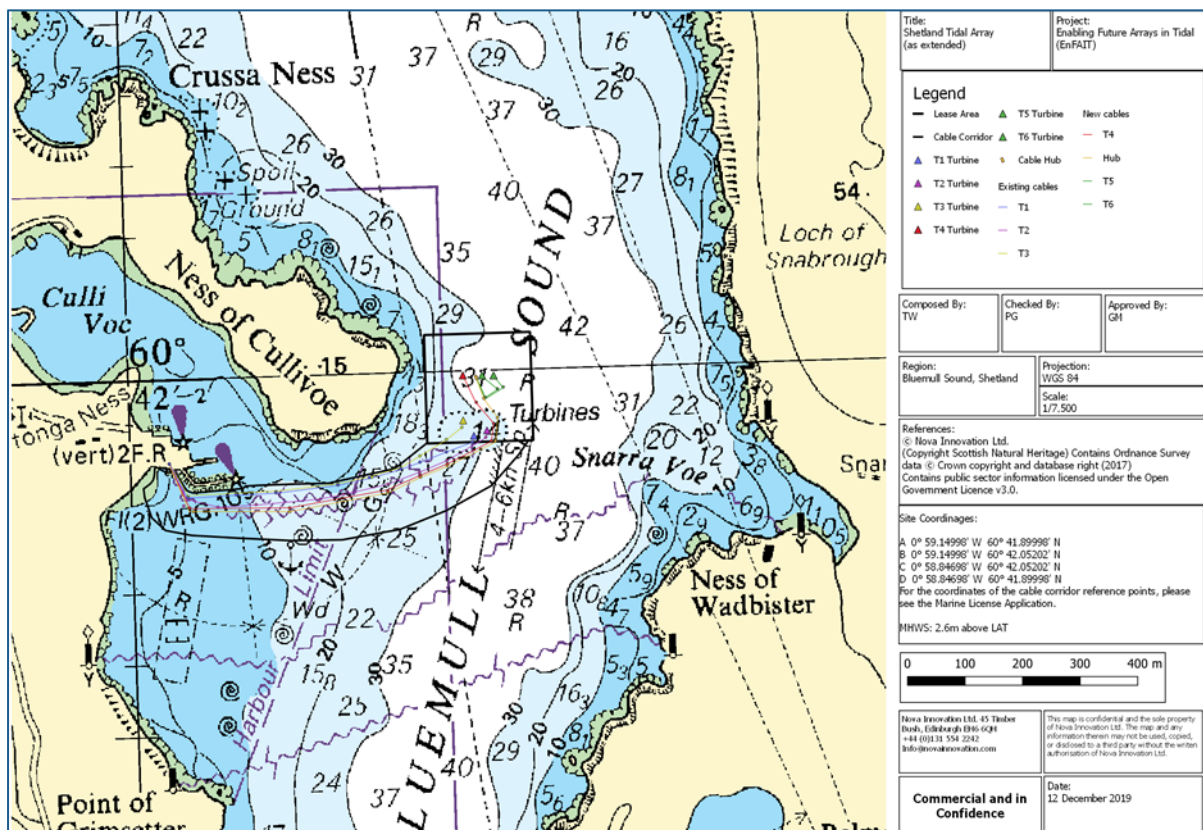


Figure 3-3 Admiralty chart showing the Shetland Tidal Array layout including turbines, hub and cables.

Source: Nova Innovation 2020 © Crown Copyright

3.3 Project environmental good practice measures

Nova is committed to best environmental practice and avoiding adverse environmental effects in all aspects of its business. Nova takes a hierarchical approach to prioritising actions to manage environmental risk, as follows:

1. Eliminate risks to the environment where possible, for example by design changes, elimination of an operation, or selection of a different working methodology.
2. Reduce the potential impact of those risks to the environment that cannot be eliminated.
3. Reduce the likelihood of those risks to the environment happening that cannot be eliminated.

Table 3-1 sets out all of the environmental mitigation and good practice measures which Nova follows to manage environmental risk for the Shetland Tidal Array, based on this hierarchical approach. Cross-references to relevant licence conditions are provided in the table.

Table 3-1 Environmental mitigation and good practice management measures for the Shetland Tidal Array.

Mitigation or good practice measure	Responsible person	Corresponding licence condition(S)
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 minimise 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 condition 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 condition 3 & 11

Mitigation or good practice measure	Responsible person	Corresponding licence condition(S)
Any collision events observed in subsea video footage to be reported immediately to Marine Scotland and Shetland Islands Council.	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
Operators used for marine operations to follow biosecurity good practice and have ISO 14001:2015 environmental management systems accreditation	Tom Wills	Marine Licence condition 3.1.10 Works Licence condition 9

Mitigation or good practice measure	Responsible person	Corresponding licence condition(S)
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

This table is held alongside all Project consent documentation in site files at Cullivoe and in Nova's offices and included in the operational documentation provided to offshore contractors working on behalf of Nova. All relevant operational procedures relating to environmental protection and best practice are included as standard in site briefings for Nova personnel and sub-contractors.

4 Principles and objectives of environmental monitoring

4.1 Monitoring principles

To ensure that the environmental monitoring carried out at the Shetland Tidal Array is fit for purpose, with clear objectives, a series of monitoring principles have been agreed with Marine Scotland and Shetland Islands Council in consultation with Scottish Natural Heritage⁵:

- a. Monitoring will acknowledge and account for the challenges of gathering information at a small, high energy tidal site such as Bluemull Sound.
- b. Monitoring will be iterative, informed by ongoing analyses of data collected. This evaluation and feedback will inform decisions about the continuing need for monitoring its purpose, objectives and methodologies.
- c. Monitoring will be proportionate, appropriately targeted and achievable, with clearly defined objectives.
- d. Monitoring will be focussed on the key issues identified in the assessment of the environmental effects of the Project and in Project licences⁶.
- e. Monitoring will seek to reduce uncertainty about the environmental effects of the Shetland Tidal Array, with a view to ultimately 'retiring' issues and impacts.
- f. Monitoring will be designed to ensure that the data gathered are appropriate to the defined objectives and of sufficient statistical power to be fit for purpose.

4.2 Monitoring aim and objectives

Pre-installation drop-down video survey will continue to be used to inform micro-siting of turbines and infrastructure to avoid horse mussel reef, maerl and other sensitive seabed habitats and species, as a precautionary measure. None of these habitats or species has been detected in the Project site during surveys to date. This monitoring is required under conditions of SIC Works Licence (2018/021/WL) but is not a specific requirement of Marine Licence 00009110.

In accordance with the principles above and previous consultation with MS-LOT, SIC and NatureScot, ongoing environmental monitoring of the Shetland Tidal Array will focus on near-field interactions between marine wildlife and the turbines to improve understanding for collision risk (the main impact pathway of concern identified in the environmental assessment for the Project⁶).

The objectives for environmental monitoring of the Shetland Tidal Array focus on gathering data to improve the evidence base on the likely nature and consequences of any near-field interactions between marine mammals and diving birds with the operating turbines, as follows:

- a. Refine understanding for and gather information on the nature and frequency of near-field interactions between marine mammals, diving birds, fish and the turbines.
- b. Refine understanding for how near-field interactions vary with turbine operation/non-operation or rotation speed (and therefore risk of collision with rotating blades).
- c. Refine understanding for (and where possible quantify) evasion behaviour of marine wildlife around the operating turbines.
- d. Identify factors influencing encounter and collision risk for marine mammals and diving birds, including:
 - i. Behaviour of mammals and birds in the array area and around the turbines.

⁵ As set out in Nova Innovation (2018). Shetland Tidal Array Project Environmental Monitoring Programme (PEMP) Scoping Document, pp28.

⁶ Nova Innovation (2018). Shetland Tidal Array Extension – Environmental Assessment Report, pp30.

- ii. Key factors underlying marine wildlife occupancy patterns in the array area and around the turbines.
- e. Validate Collision Risk Modelling (CRM) predictions in the environmental assessment and improve understanding for actual (versus predicted) collision risk.
- f. Gather data to proactively manage any unpredicted collision risk for marine mammals and birds, by:
 - i. Identifying any collision or near-miss events.
 - ii. Gathering information to establish the nature and need for additional mitigation measures.

Details of the monitoring methods and techniques that will be used to meet these objectives are detailed in the following sections.

5 Pre-installation drop-down video survey

5.1 Objectives

- a. To inform micro-siting of turbines and offshore infrastructure to avoid impacts to any horse mussel reef, maerl, or other sensitive habitats and species in Bluemull Sound, including Annex I reef habitat (protected under the Habitats Directive).
- b. To meet the general requirement of condition 3.1.10 of Marine Licence ML 00009110 (*Take all reasonable, appropriate and practicable steps to avoid or minimise any damage to the Scottish marine area caused as a result of the licensed activities*).
- c. To meet the specific requirement of condition 4 of Works Licence 2018/021/WL (*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*) and condition 7 (*Benthic survey to identify benthic habitats or species on the recommended Priority Marine Features list prior to commencement of works to identify micro-siting of device foundations and final turbine layout/location of all infrastructure*).

5.2 Methodology

Pre-installation drop-down video surveys will be carried out in all areas proposed for turbine and offshore infrastructure siting. Drop-down video cameras will be deployed on an umbilical from a surface vessel during high water slack tides (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, with survey tracks separated by 5-10m. Closer or additional tracks will be used if required to achieve sufficient coverage.

5.3 Data analysis and interpretation

Drop-down video will be interpreted in real-time. Laminated identification reference cards (provided in Annex B) are held on site at Cullivoe to assist staff carrying out the surveys in identifying any horse mussel (*Modiolus modiolus*) reef, maerl beds or other priority marine features, including Annex I reef habitat. These will be included in all pre-survey briefings.

Video will also be recorded to enable further detailed analysis and scrutiny of footage by suitably qualified experts able to identify species or habitats to the appropriate biotope, if necessary. Should priority marine feature habitats be identified during surveys, micro-siting of turbines and infrastructure will be used to avoid them. During all previous surveys, no horse mussel reef, maerl beds or other sensitive seabed habitats or species have been recorded within the Project area.

Nova has not previously been required to submit formal reports on the pre-installation drop-down video surveys to Shetland Islands Council or MS-LOT. However, in future a section on these video surveys, where they have been carried out within the reporting period, will be included in Nova's formal monitoring reports (see Section 9 for further details).

6 Land-based vantage point surveys

6.1 Objectives

- a. To gather information on the presence and abundance of diving birds and marine mammals in the immediate array area, as a key factor influencing collision risk for the Project.
- b. To gather information on the fine-scale movements and behaviour of diving birds and marine mammals within the immediate array area, as a key factor influencing collision risk for the Project.
- c. To gather information to better understand the relationship between surface and subsea wildlife observations and to inform a stratified sampling protocol for analysis of underwater video footage.
- d. To meet the requirements of condition 3.2.1.1 of Marine Licence ML 00009110 (*The PEMP must cover, but not be limited to, the following matters: pre-construction, construction, operation and maintenance monitoring or data collection as relevant in terms of the environmental assessment report and any subsequent monitoring or data collection for marine mammals and birds; Monitoring may also verify predictions in the Application*).
- e. To meet the requirements of conditions 3 and 11 of Works Licence 2018/021/WL (*During the lifespan of this works licence the sea area around the array should be monitored to assess the effect of the device if any on movements of seabirds and marine mammals. The survey methodology should be agreed with Shetland Islands Council under advisement from SNH; Monitoring will be used to identify risk factors for key impacts such as collision risk*).

6.2 Methodology

6.2.1 Overview of previous vantage point methodology

Nova has been conducting land-based vantage point surveys for marine mammals and birds in Bluemull Sound continuously since November 2010, covering pre-installation, construction and operational phases of the Shetland Tidal Array. The original methodology utilised monthly scan-based surveys to gather information on the spatio-temporal distribution and behaviour of marine mammals and birds in the immediate Project site and the wider central section of Bluemull Sound. These surveys provide a long-term dataset, based on 'snapshot scans' of birds and mammals in the survey area. The resulting data have enabled an exploration of how the presence and abundance of diving birds and mammals in Bluemull Sound changes over space and time, and with covariates such as season, time of day and tidal state⁷. This analysis has provided an indication of the likelihood (probability) of birds or animals occurring in close proximity to turbines (encounter risk).

The survey area was defined to provide good coverage of the immediate Project site (the array area or Zone 1) and the wider central section of Bluemull Sound (Zone 2). Zone 2 is further subdivided into four areas A, B, C and D to enable further spatial delineation of observations. The outer boundaries of the survey area are defined by sightlines to land-markers on Unst.

Figure 6-1 (over) shows the survey area (delineated by green lines), with the dashed green line illustrating the trajectory of the marking point for the survey boundary. The vantage point on the Ness of Cullivoe is indicated by the blue dot. The four subdivisions (A, B, C, D) of Zone 2 are indicated by purple dashed lines, marked out on the ground using transit sticks from the vantage

⁷ Nova Innovation (2020a). Shetland Tidal Array environmental monitoring: vantage point surveys. EnFAIT-0363.

point and sightlines to a further land-marker on Unst. Figure 6-1 also indicates the array area, or Zone 1 (green circle). The pink square indicates The Crown Estate seabed lease area. The position of the vantage point is located at 60.69949°N, -0.97091°W and is approximately 10 m above sea level.

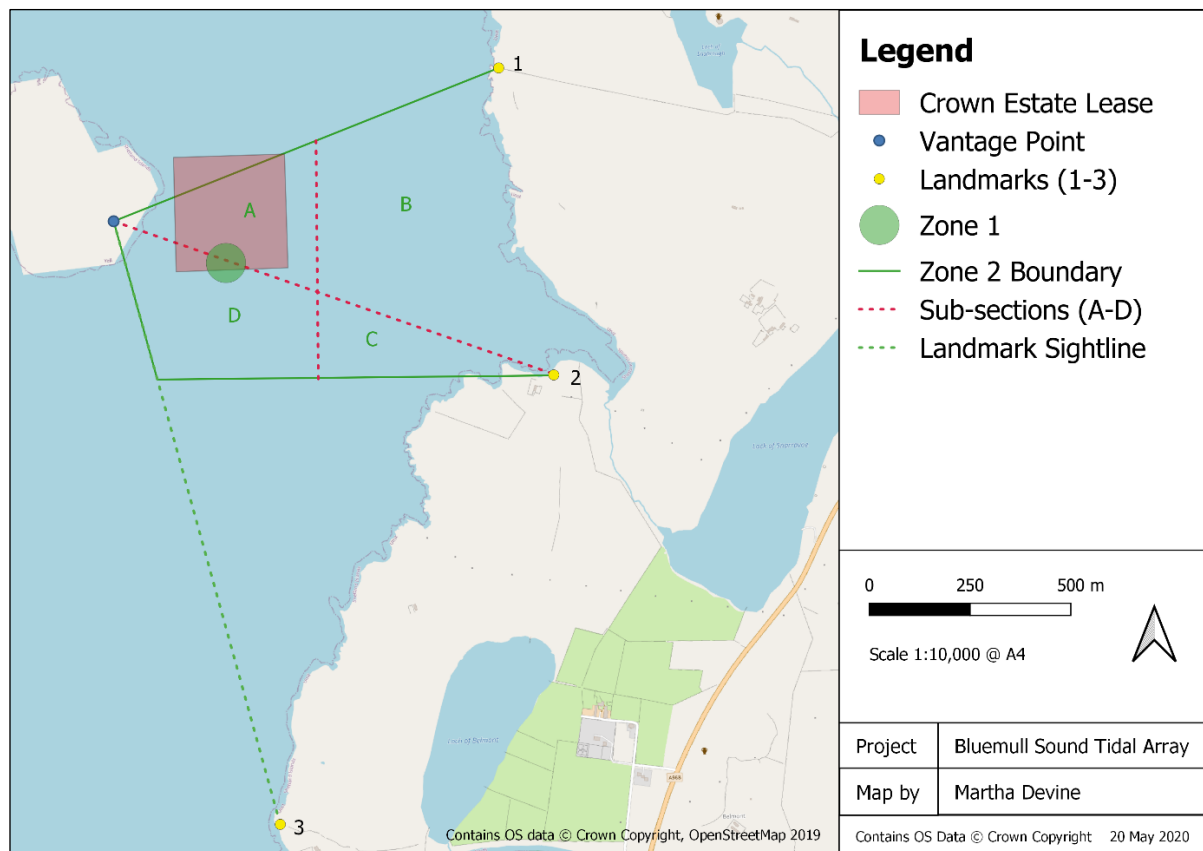


Figure 6-1 Previous vantage point survey area in Bluemull Sound, showing Zone 1 (the array area) and four sub-divisions (A, B, C, D) of Zone 2.

A full description of the previous vantage point methodology along with the results of analyses the data is detailed in a report submitted to MS-LOT and Shetland Islands Council in May 2020⁸. Based on the previous methodology, 10-20% of survey effort (minutes spent scanning) focussed on the immediate array area (i.e., the area of sea occupied by the turbines, represented by the green circle in Figure 6-1), covering a sea surface area of approximately 0.01 km². 80-90% of effort was focussed on the wider survey area in the central section of Bluemull Sound, delineated by the green lines in Figure 6-1 and covering an area of approximately 0.58 km².

6.2.2 Survey re-design process

As set out in a scoping document for the Shetland Tidal Array PEMP⁹, the key potential impact on which future Project monitoring will focus is collision risk. When considering the re-design of the vantage point surveys, key to refining understanding for collision risk is gathering information to better understand the occupancy patterns and fine-scale movements of diving birds and marine mammals within the area of sea in which the turbines are located. Surveys will be used to gather data to understand the probability of diving bird and marine animal 'near-field encounters' with turbines. Collisions are only possible if a bird or animal uses the area immediately around the

⁸ Nova Innovation (2020a). Shetland Tidal Array monitoring report: Vantage point survey. EnFAIT-0347. Version 2.0.

⁹ Nova Innovation (2018). Shetland Tidal Array Project Environmental Monitoring Programme scoping document and subsequent consultation responses from MS-LOT and SNH.

turbine. This likelihood increases again if the bird or animal dives in the area around the turbine, though this factor is only measurable from vantage point surveys for birds.

A revised vantage point methodology has been designed which aligns with the high-level monitoring principles and objectives set out in Section 4 and the specific objectives in Section 6.1. The revised methodology has drawn on Scottish draft guidance on survey and monitoring for marine renewables deployments in Scotland¹⁰. The development and refinement of the survey design has been based on input and advice from Dr James Waggitt at Bangor University and informed by site visits and discussions with SNH (now NatureScot), as described in Section 2.3.

Field trials of revised vantage point survey methods were undertaken by Nova's field surveyor between November 2019 and Spring 2020¹¹. Following these trials and feedback from Marine Scotland and SNH on the proposed design¹², the methodology has been further refined to optimise the survey design to address issues identified during field trials and raised by Marine Scotland and SNH. A summary of the field trials and data gathered to date is presented in Annex C, which also provides some further rationale and narrative on the evolution of the new methodology.

The new methodology seeks to address some of the long-recognised limitations of more traditional bird and mammal survey approaches, and limitations in their ability to gather detailed information on the fine-scale movements and functional use of small tidal stream development sites by marine wildlife. The new method has already been used successfully in Bluemull Sound as part of a PhD study into seabird ecology in tidal energy environments¹³ and in research carried out by Dr Waggitt in north Wales (in press¹⁴). The methodology will continue to be kept under review, as part of the PEMP review process set out in Section 10 to ensure it meets the objectives set out in Section 6.1.

6.2.3 New vantage point and survey area

The existing vantage point on the Ness of Cullivoe has been identified as the most appropriate for the new survey methodology, since it provides uninterrupted views of the survey area. The position of the vantage point is 60.69949°N, -0.97091°W, approximately 10 m above sea level. Trials of the new methodology have confirmed that this vantage point provides good coverage of the existing and expanded array areas, while avoiding disturbance to otters on the shoreline of the Ness of Cullivoe. Use of an alternative vantage point on Unst was considered, but constraints due to reliance on the Yell-Unst ferry, as well as surveyor welfare precluded its use.

At their nearest point, the additional turbines in the expanded Shetland Tidal Array (T4, T5 and T6) will be located around 130 m from the first three turbines (T1, T2 and T3). The new survey area encompasses this entire area, along with a buffer. Figure 6-2 (over) shows the revised vantage point survey area in relation to the three-turbine Shetland Tidal Array (T1 to T3) and the expanded array (T4 to T6). The new sightlines to landmarks on Unst, used by the surveyor to demarcate the survey area are shown. The total area of the new survey area is approximately 0.19 km². For comparison, Figure 6-3 (over) shows the old and new survey areas overlaid.

¹⁰ Jackson D and Whitfield P (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 4. Birds. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.

¹¹ Survey work ceased in March 2020 due to Covid-19 restrictions on movements in Shetland.

¹² Detailed in advice provided on 17 April 2020.

¹³ Robbins AMC (2017). Seabird ecology in high-energy environments: approaches to assessing impacts of marine renewables.

¹⁴ Paper currently in review at Bird Study, the Journal of the British Trust for Ornithology.

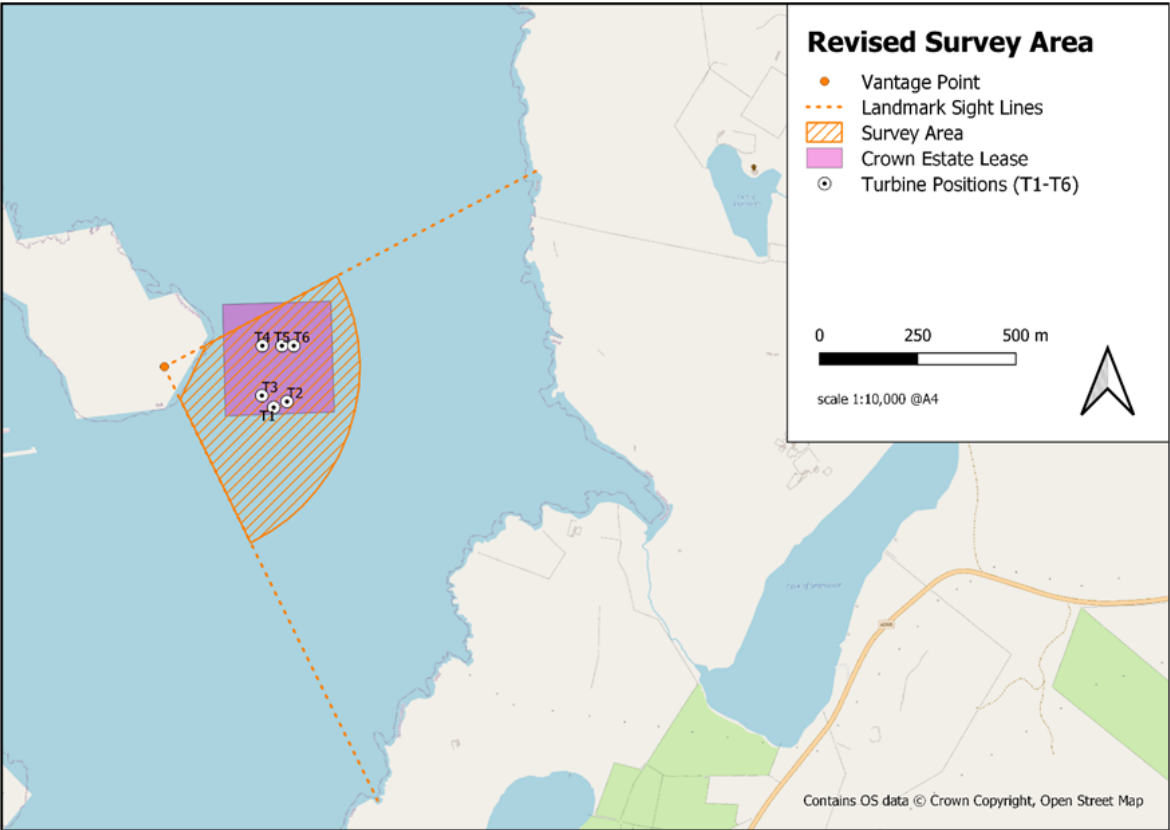


Figure 6-2 New vantage point survey area in Bluemull Sound, showing first three turbines (T1 to T3) and turbines in the expanded array (T4 to T6).

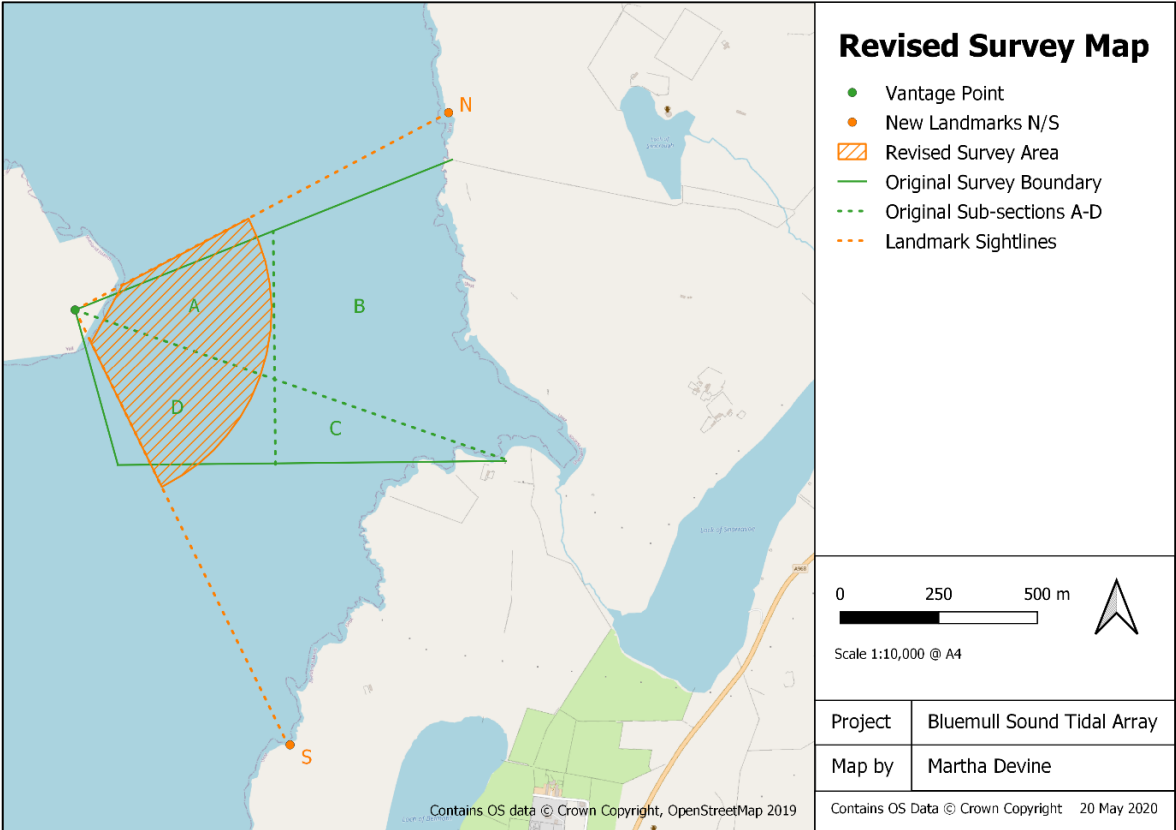


Figure 6-3 New vantage point survey area in Bluemull Sound, with original survey area overlaid in green).

Demarcation of the northern and southern limits of the survey area are based on trajectory lines to landmarks on Unst and the near boundary is the shoreline. The curved boundary area reduces the problem of delineation of the survey area far boundary, as it follows a constant distance from the observer. The maximum distance from the surveyor to the edge of the revised survey area (i.e., to the perimeter of the curved boundary in Figures 6-2 and 6-3) is 500 m, while the turbines are all located within 300 m of the surveyor. An arrangement of posts, as suggested by SNH in advice dated 3 June 2019 will be used to further assist delineation of the far boundary.

Surface count data can be subject to availability bias since species are not visible continuously on the surface. If the data gathered are used to estimate absolute abundance, this will need to be accounted for and a correction applied to the data. However, in the analyses set out in Section 6.3, using the data to calculate absolute density of birds or mammals is not proposed. Instead, the probability of encounters will be the key metric for assessing collision risk. Any availability bias will be consistent within each species, and therefore no bias will be present in the analyses. Further, the use of focal watches to understand behaviour within the survey area, in addition to 'snapshot' counts of birds and mammals (detailed in Section 6.2.4) will reduce the likelihood that species that spend little time on the surface will be under-represented in the overall dataset.

Surface count data gathered from a land-based vantage point can also be subject to bias caused by reduced detectability with increasing distance from the observer. SNH guidance on survey and monitoring for marine renewables deployments in Scotland¹⁵ indicates that detections using binoculars of marine birds will fall off markedly beyond about 700m. All of the survey area is within 500m of the vantage point, so detection decay is unlikely to be a significant issue.

6.2.4 Survey design

Surveys will only be carried out in sea state 2 or less and during periods of good visibility, to ensure confidence in the resulting data. Any changes in weather conditions during a survey will be recorded, so if there are doubts about visibility affecting bird and mammal detectability or data quality, corresponding data can be excluded during the data processing and quality assurance process.

Surveys will be carried out across the full tidal cycle, which will be stratified into six 2-hour periods, as follows:

1. Increasing flood
2. Maximum flood
3. Decreasing flood
4. Increasing ebb
5. Maximum ebb
6. Decreasing ebb

These tidal periods detailed above have been defined according to local conditions in Bluemull Sound derived from Nova's tidal model and are set out Figure 6-4 (over).

¹⁵ Jackson D and Whitfield P (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 4. Birds. Unpublished draft report to Scottish Natural Heritage and Marine Scotland.

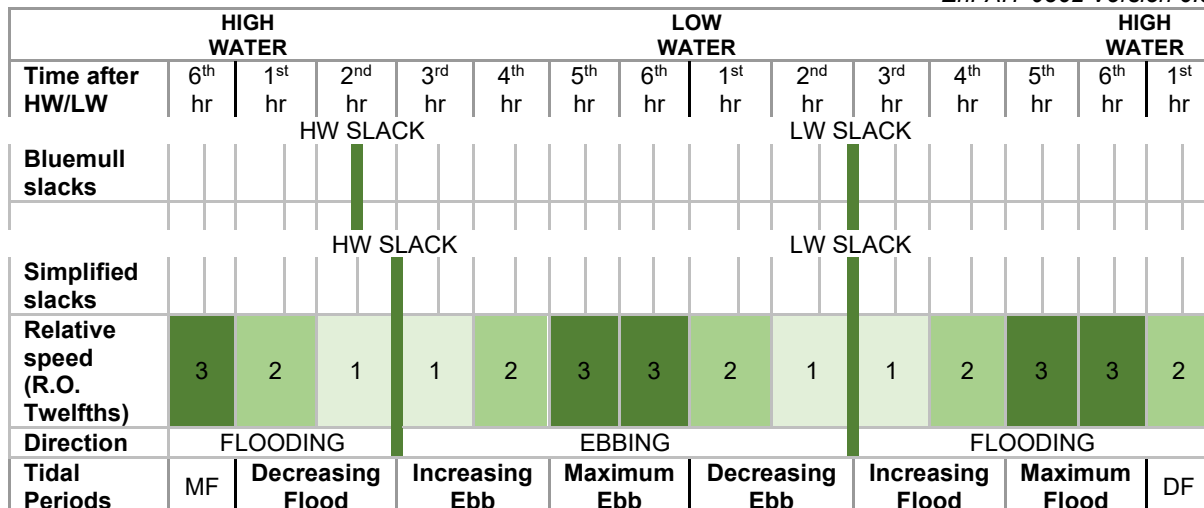


Figure 6-4 The six tidal periods within the tidal cycle during which surveys will be undertaken.

The survey design will ensure equal overall effort for each 2-hour tidal period. Tidal periods may be surveyed in sequential surveys (e.g., two tidal periods over a 4-hour survey), or across separate days or tidal cycles. This will be determined according to site conditions, daylight hours and surveyor welfare.

The survey design will be further stratified to take account of key annual stages in breeding cycles of diving birds and cetaceans¹⁶ and moulting and breeding periods of harbour and grey seals. The year will be divided into four annual periods, detailed in Table 6-1. Sampling frequency across the four annual periods will be asymmetric, with less effort throughout winter when the limited daylight hours in Shetland would make carrying out surveys across two complete tidal cycles logistically challenging (as informed by November and December 2019 field trials). The frequency of sampling across the four annual periods is detailed in Table 6-1.

Table 6-1 The four annual periods during which surveys will be undertaken.

Annual period and key stage for birds & mammals	Details	Survey frequency within period
1: Breeding season (birds), harbour seal pupping, grey seal moulting, harbour porpoise birth period.	April to July	Two complete tidal cycle (12 x 2 hr surveys)
2: Post-breeding/moult (birds, harbour seal), harbour porpoise breeding season, gannet fledging.	August to mid-September	Two complete tidal cycle (12 x 2 hr surveys)
3: Autumn (start of grey seal pupping).	Mid-September to October	Two complete tidal cycles (12 x 2 hr surveys)
4: Winter (grey seal pupping).	November to March	One complete tidal cycle (6 x 2 hr surveys)

While the annual periods set out above are predominantly based on knowledge relating to birds, they will also ensure annual stratification throughout the year for marine mammals, approximately aligning with key life history stages, such as breeding and moulting, as indicated in the table.

¹⁶ Key stages for harbour porpoise included, as the most common cetacean recorded in surveys to date.

6.2.5 Survey protocol

Each 2-hour survey will be divided into two 60-minute survey periods, with a 10-minute break midway (at 25 minutes) in each survey period to ensure surveyor welfare and maintenance of concentration and data quality. Within each 60-minute survey period, ten snapshot counts of all diving birds and mammals will be carried out, at 0, 5, 10, 15, 20, 35, 40, 45, 50 and 55 minutes interspersed with focal watches or follows of individual birds or mammals. A 10-minute break will be taken at 25 minutes. This protocol will be repeated for both 60-minute survey periods.

6.2.6 Snapshot counts

In each of the ten snapshot counts within the 60-minute survey period, individual diving birds and mammals will be identified to species level and counted. If the tide is running, scans will be carried out against the tide, to minimise double counting.

Birds will only be recorded as sightings if they are on the water or diving in the survey area or hovering above the survey area. Birds transiting through the survey area (flying) will not be counted. The following bird behaviours will be recorded:

1. On the water: either making progress or stationary at the surface
2. Hovering: Searching/foraging above the survey area
3. Diving from flight: One or more birds diving underwater from a hovering or flying position
4. Diving from water: One or more birds diving underwater from a position on the water surface

All mammals occurring within the survey area will be recorded as sightings. The following mammal behaviours will be recorded, taking account knowledge of foraging and use of tidal sites (e.g., in Onoufriou and Thomson, 2015¹⁷):

- Localised foraging: evidence of foraging within array area (e.g., repeated diving and resurfacing behaviour within array area)
- Transient foraging: evidence of foraging whilst transiting through the array area
- Transiting: no evidence of foraging (movement on a trajectory through the array area)

Effort will be made to spread the ten counts evenly throughout the 60-minute survey period, at 0 mins, 5 mins, 10 mins, 15 mins, 20 mins, 35 mins, 40 mins, 45 mins, 50 mins, 55 mins (with 10-minute break at 25 mins). However, due to the varying length of focal watches (see below), it may not be possible to carry out the counts at precise intervals. This will not affect the relevance or value of the resulting data. Initial surveys carried out using this revised methodology indicate that it is possible to carry out ten relatively evenly spaced counts during each 60-minute survey, while also carrying out focal watches, so the combined approach does not compromise the data.

6.2.7 Focal watches

Interspersed between the snapshot counts of diving birds and marine mammals in each of the two 60-minute survey periods, focal watches of individual diving birds and mammals will be carried out.

During each focal watch, an individual diving bird or marine mammal within the survey area will be selected and followed with binoculars. Every 5 seconds, a record will be made of whether the individual is on the surface (S) or below the surface/diving (D). These focal watch observations will

¹⁷ Onoufriou, J. & Thompson, D. (2015). Collision Risk: a brief review of available information on behaviour of mammals and birds in high tidal energy areas. Sea Mammal Research Unit, University of St Andrews, Report to Scottish Government, no. MR 7.2.1., St Andrews, 9pp.

be recorded in the field as tallies, using a stopwatch with an audible alarm and Dictaphone, enabling totals to be easily calculated afterwards. Individuals will be watched until they leave the survey area from the surface or until they resurface outside the survey area. If an individual is not observed re-surfacing after 60 seconds it will be assumed it has moved on unobserved.

This method will result in focal watches that vary in length from only a few seconds if the tide is running quickly, possibly up to several minutes. It also means that there will be a different number of focal watches within each of the 60-minute surveys.

To ensure that focal watches provide a robust record of diving bird and mammal behaviour within the survey area, the following 'rules' will be followed:

1. Mammals will be selected for focal watches if present, otherwise a bird will be selected. This is because mammal sightings have been relatively rare events in monitoring to date.
2. Individual birds will be selected for focal watches, rather than those that are part of large groups, since these individuals will be easier to follow. Data gathered to date in Bluemull Sound suggest that large groups of birds are rare at the site¹⁸.
3. The bird / mammal nearest the surveyor, but within the survey area will be selected to watch.
4. If multiple species are present, an attempt will be made to carry out focal watches for at least one individual of each species present within the 60-minute survey.
5. If no birds or mammals are present in the survey area, focal watches will not be carried out, but the absence of any individuals within the survey area will be recorded.
6. When the tide is running north to south, if possible, individuals at the north end of the survey area will be selected for focal watches. When the tide is running south to north, individuals in the south end will be selected. This will maximise the chance that the watch will take the individual past the turbine area, rather than immediately out of the survey area. When tide is running individuals approaching the survey area may be observed, but they will not be recorded until they enter the survey area.

Whilst a potential weakness in the focal watch methodology may be that the same birds or mammals might be unknowingly followed multiple times, the replication of watches over time will increase the sample size and confidence that data are representative of the occupancy patterns and behaviour of each of the species observed.

6.2.8 Equipment

Surveys will be carried out using Swarovski EL 8.5 x 42 binoculars. A Swarovski ATS 65 HD 25-50 zoom spotting scope is used for confirming species identification, if necessary. A stopwatch with audible alarm and Dictaphone will be used during focal watches, to ensure accuracy of recording in the field. Results will later be transcribed to a spreadsheet.

6.2.9 Data recording

Data recording / entry will be on paper forms (counts) or using a Dictaphone (focal watches) in the field and later transcribed to electronic forms in Excel. Data will be entered into an Excel database. The environmental variables detailed in Table 6-2 will be recorded, using standardised categories and formats. An example field survey form is provided in Annex D.

¹⁸ Nova Innovation (2020a). Shetland Tidal Array monitoring report: vantage point surveys. EnFAIT-0363.

Table 6-2 Environmental variables recorded during vantage point surveys.

Variable	Description
Survey start time	00:00 GMT
Survey end time	00:00 GMT
Annual period	1 to 4 (see Table 6-2)
Tidal period	1 to 6 (see Table 6-1)
Sea state	Integer, using Beaufort scale descriptions
Wind direction	N, S, E, W, NE, NW, SE, SW
Wind strength	Integer, using Beaufort scale descriptions
Cloud cover	Recorded as a percentage
Precipitation	Dry, rain, snow, hail or sleet
Time of high tide	00:00 GMT
Height of high water	0.00 m

6.3 Data analysis

The objectives of the vantage point surveys are to gather information on the presence, abundance and fine-scale movements and behaviour of diving birds and marine mammals around the turbines, to improve knowledge on occupancy patterns at the Project sites and understand how this might influence collision risk.

In analysing monitoring data gathered to date from the Shetland Tidal Array, Nova has found it useful to take an exploratory, iterative approach, informed by discussion and feedback from Marine Scotland and NatureScot. Nova is fully committed to an engagement strategy for the Shetland Tidal Array which ensures that the data gathered through monitoring activities and the analyses carried out fully meet the requirements of the Project licences issued by MS-LOT and SIC. This approach is detailed further in Sections 9 and 10, but an outline of the proposed approach to analysis of vantage point data is set out below.

Counts of animals and birds within the survey area will be used to understand the probability of encounters with turbines in the Shetland Tidal Array. Collisions are only possible if a bird or animal uses the area immediately around the turbine. This likelihood increases again if the bird or animal dives in the area around the turbine, though this factor is only measurable from vantage point surveys for birds.

Counts of animals and birds within the survey area will also be used to understand whether the probability of encounters varies with covariates including tidal state and month. A combination of descriptive approaches and statistical modelling will be used to explore and analyse the data. A GEE-GLM (Generalised Linear Model with Generalised Estimating Equations) with a binomial distribution will be used to generate the encounter probabilities, with month and tidal state, included as categorical explanatory variables and species' counts or presence/absence as the response variables. The use of a Generalized Additive Model (GAM) with a binomial distribution, in which explanatory variables are non-linear and cyclical, may also be explored, for example to understand whether probability of encounter varies with current speed. Depending on the nature and spread of count data from scans, species counts may require presence/absence transformation, since vantage point data gathered at the site are known to be 'zero' and 'one' dominated.

Focal watches will provide a combination of dive and search intensity data for birds and mammals, both of which are key factors influencing collision risk. Data will enable an assessment of % time underwater, dive frequency, dive length and diving intensity of individuals followed. Descriptive statistics and probability modelling will be used for these analyses.

It is not proposed to use the count data to calculate absolute density of birds or mammals. Instead, the probability of encounters will be the key metric for assessing collision risk. There is no published literature on dive times in tidal energy habitats, which is likely to be quite different to that in other habitats. Provisional data (Waggitt, unpublished, pers. comm.) suggests dive times are shorter and shallower dives in areas of faster currents, so availability bias is less likely to be an issue in habitats like Bluemull Sound. The focal watches will provide data on dive times and other key information to help understand the degree of possible availability bias in the data, to determine whether the calculation of absolute densities might therefore be possible.

Analysis of the vantage point data may also inform a stratified sampling strategy for analysing the subsea video footage, for example, through the identification of 'higher risk' times corresponding to high dive frequencies or intensities.

All analyses will be carried out in R version 3.6.2 (or more recent version, as appropriate).

7 Subsea video monitoring

7.1 Objectives

- a. To gather information on the nature and frequency of near-field interactions between marine mammals, diving birds and fish and the turbines to improve understanding for encounter and collision risk.
- b. To gather information to improve knowledge on fine-scale bird and mammal movement around the turbines.
- c. To gather information on any evasive behaviour of marine mammals, birds and fish around the turbines to enable refinement of modelled collision risk for the Project.
- d. To identify any individuals interacting with turbines to species level (where possible) to refine understanding for collision risk.
- e. To gather information to understand whether near-field interactions between marine wildlife and the turbines is different when the turbines are operational (blades rotating) and non-operational.
- f. To gather information to understand whether near-field interactions between marine wildlife and the turbines vary with season, tidal state, flow speed and time of day.
- g. To gather information for co-analysis with vantage point data to better understand the relationship between surface and subsea wildlife observations and, ultimately, collision risk.
- h. To meet the requirements of condition 3.2.1.1 of Marine Licence ML 00009110 (*The PEMP must cover, but not be limited to, the following matters: pre-construction, construction, operation and maintenance monitoring or data collection as relevant in terms of the environmental assessment report and any subsequent monitoring or data collection for marine mammals and birds; Monitoring may also verify predictions in the Application*).
- i. To meet the requirements of conditions 3 and 11 of Works Licence 2018/021/WL (*During the lifespan of this works licence the sea area around the array should be monitored to assess the effect of the device if any on movements of seabirds and marine mammals. The survey methodology should be agreed with Shetland Islands Council under advisement from SNH; Monitoring will be used to identify risk factors for key impacts such as collision risk. Central to the PEMP will be video monitoring to observe underwater interactions of wildlife with turbines*).

7.2 Methodology

7.2.1 Turbines 1 to 3

Subsea video has been used successfully throughout the operational phase of the Shetland Tidal Array. Water clarity in Bluemull Sound makes this a relatively simple, cost-effective and reliable method for monitoring near-field interactions between marine wildlife and the turbines. To date it has also enabled identification of species observed in footage with very high confidence¹⁹.

Three high-definition, motion-triggered cameras are attached to each of T1, T2 and T3. One camera is attached to the side of the nacelle looking towards the blades; one is attached to the top of the nacelle looking towards the blades and a third is attached on the bottom of the nacelle directed towards the seabed. Figure 7-1 (over) provides an indicative illustration of the location and field of view of each of these cameras.

¹⁹ Nova Innovation (2020b). Shetland Tidal Array monitoring report: Subsea video monitoring. EnFAIT-0364.

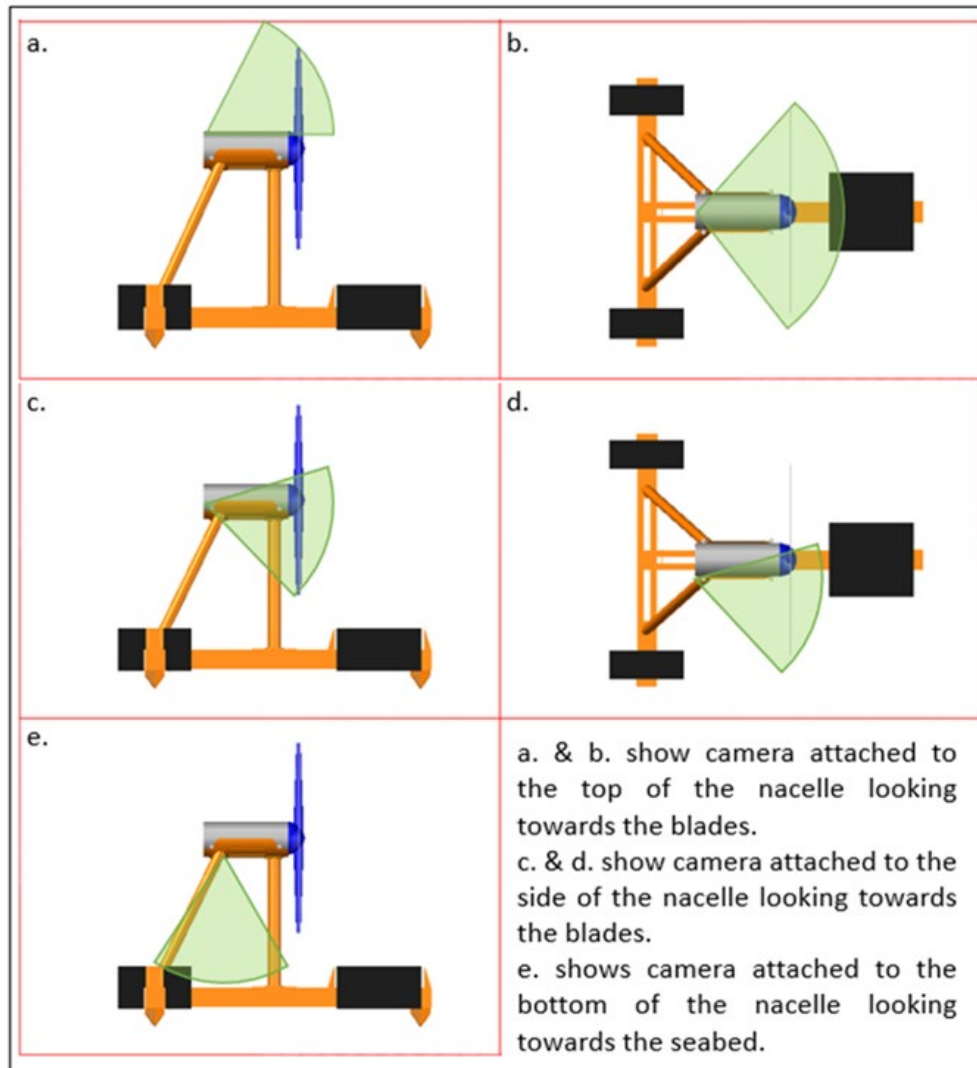


Figure 7-1 Subsea camera system for T1, T2 and T3 in the Shetland Tidal Array. Camera positions and fields of view are indicative only, for illustrative purposes. Cameras are attached to the turbine nacelles.

The nine cameras currently utilized for T1, T2 and T3 have a horizontal field of view in water of 70°, a sensitivity LUX rating of 0.001 and a resolution of 750 TV lines (TVL). Combined, the two cameras facing the turbine blades cover 60-65% of the rotor swept area, as estimated from combined images of the two fields of view using Computer-Aided Design (CAD) software.

Cameras are triggered by a standard CCTV motion detection system. The trigger system looks for changes in contrast between successive video images. The sensitivity of the trigger and the depth of range depends on light conditions, water quality and the degree of biofouling. The motion trigger system is also sensitive to movements of the blades when turbines are operational. Video is recorded from a few seconds before the trigger for a minimum of ten seconds, or until motion is no longer observed, up to a maximum of 15 minutes, at which point the trigger is reset. The cameras operate 24 hours a day, though are only generally effective during periods of sufficient light conditions. Triggering during hours of complete darkness is generally limited to that caused by bioluminescent organisms.

This three-camera motion-triggered system will continue to be utilized for monitoring near-field interactions of wildlife with T1, T2 and T3 in the Shetland Tidal Array. The downward-facing camera

has proved valuable in providing additional contextual information on the vertical distribution and movements of prey species (fish) around the turbines, so will be retained.

7.2.2 Turbines 4 to 6

A single high-definition camera is attached to T4 and will be used on each of T5 and T6 to monitor near-field interactions of marine wildlife with the turbine rotors. The cameras have a wider horizontal field of view in water than those on T1 to T3, higher sensitivity and superior resolution, as detailed below:

- High-definition colour images
- High resolution (1000 TV lines)
- Fixed focus wide angle lens, with 65° diagonal and 90° horizontal field of view in water
- Light level sensitivity (0.1 lux colour)
- Focus distance from 10cm (min)

The same motion-trigger and footage retention system will be used, as has proved successful for cameras on T1 to T3. Each camera on T4 to T6 will be mounted to the nacelle, facing the turbine blades, as indicated in Figure 7-2.

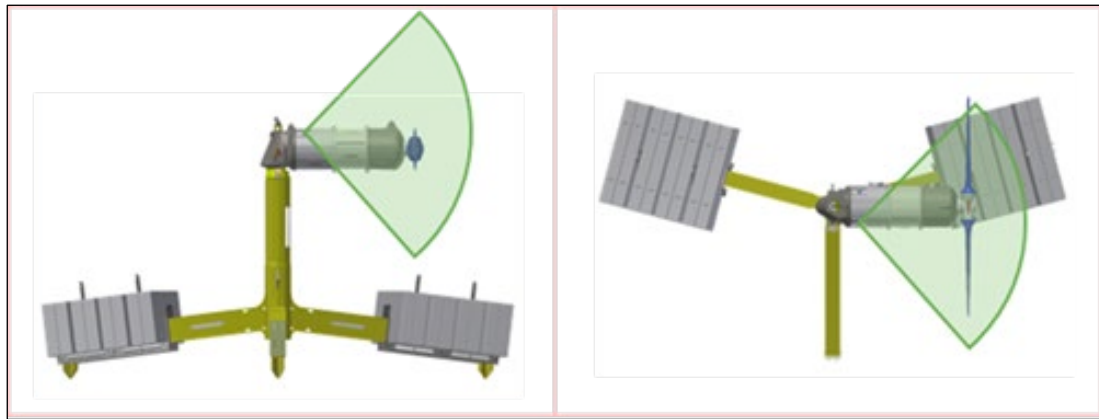


Figure 7-2 Subsea camera system for T4, T5 and T6 in the Shetland Tidal Array. Camera positions and fields of views are indicative only, for illustrative purposes. Cameras are attached to the turbine nacelle.

The rotor swept area that will be within the field of view of the cameras on T4 to T6, based on CAD modelling, is indicated in Figure 7-3, estimated to be 30-35% of the rotor swept area.

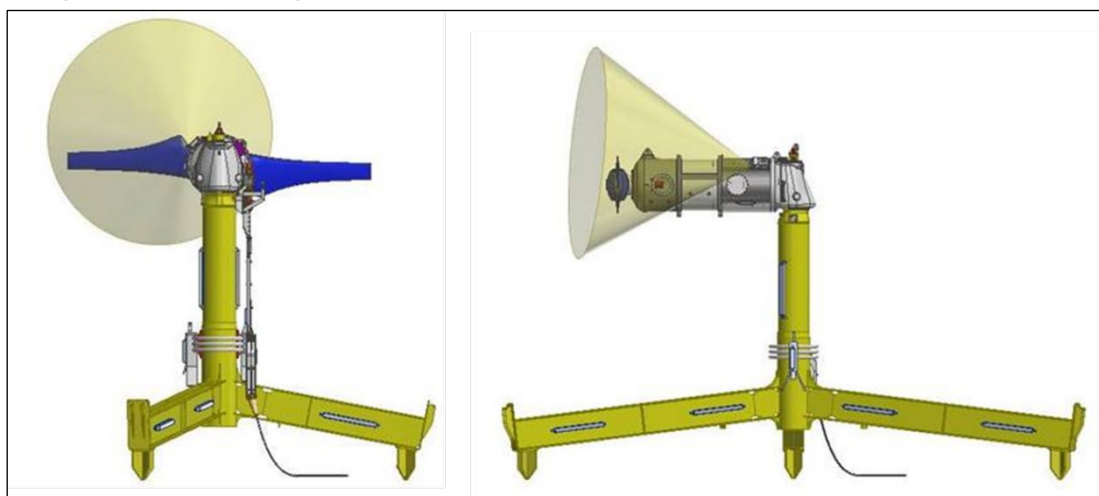


Figure 7-3 Subsea camera system for T4, T5 and T6 in the Shetland Tidal Array, showing field of view.

7.2.3 Video data processing and storage

Nova is developing a Video Management System for footage gathered from the Shetland Tidal Array to facilitate improved processing and storage and easier access to footage for analysis. The system has been designed to support a series of video storage, indexing, labelling, analysis and reporting functions that are expected to grow over time, as Nova seeks to move towards automated rather than manual “event” detection.

The key features of this system are:

- Long-term, secure storage of video data – both historic and current: to include design and implementation of system to automatically store and transfer video data from turbine sites to secure data storage
- Secure, online access to stored video from multiple remote locations to provide a foundation for analysis.
- Organisation and indexing the video data to provide straightforward operator access to any camera and time-period to assist with manual analysis of the data and links to operational and other environmental data.
- Support for multiple real-time viewing of video streams, without over-burdening the limited network bandwidth at the Shetland Tidal Array sites.

This system will facilitate improved access to video footage to provide a foundation for data analysis and reporting.

7.3 Data analysis and interpretation

Video footage from the Shetland Tidal Array will continue to be processed manually, while the development of software for automated “event” detection²⁰ is being investigated. Nova is investigating the feasibility of developing such automated analysis tools, using machine learning and algorithms. In the first instance, this may focus on automatic screening out footage that has been triggered by the movements of turbine blades, since this accounts for a high proportion of triggered footage.

In analysing monitoring data gathered to date from the Shetland Tidal Array, Nova has found it useful to take an exploratory, iterative approach, informed by discussion and feedback from Marine Scotland and NatureScot. Nova is fully committed to an engagement strategy for the Shetland Tidal Array which ensures that the data gathered through monitoring activities and the analyses carried out fully meet the requirements of the Project licences issued by MS-LOT and SIC. This approach is detailed further in Sections 9 and 10, but an outline of the proposed approach to analysis of subsea video data is set out below.

To date, Nova has utilized a combination of random and stratified sampling approaches to analyse video footage²¹. The sampling strategy will continue to be developed and will evolve as storage and processing systems improve, alongside the development of tools to assist automated analysis and processing. It will also be informed by the ongoing development of guidelines, protocols and good practice in sampling subsea video footage gathered around turbines. In the meantime, options for sampling strategies to select video footage for detailed analysis is proposed, based on a combination of semi-stratified and stratified approaches, detailed in Table 7-1 (over).

²⁰ An “event” is defined as a marine animal occurring in the camera field of view.

²¹ Nova Innovation (2020b). Shetland Tidal Array monitoring report: Subsea video monitoring. EnFAIT-0364.

The sampling protocol for footage gathered from cameras on T1 to T3 and those on T4 to T6 will take account of the different coverage of rotor swept area and the availability of downward-facing footage from cameras on T1 to T3, which has proved valuable in providing additional contextual information on the vertical distribution and movements of prey species (fish) around the turbines. The final approach for each reporting event (see Section 9) will be discussed and agreed with NatureScot and MS-LOT, to ensure it is based on current best practice and available guidance on sampling and analysis protocols.

Table 7-1 Proposed sampling strategy for selecting video footage from the Shetland Tidal Array for detailed analysis.

Sampling approach	Details
Semi-stratified by co-variables	<p>A sub-sample (defined by % or minutes) of video footage will be selected for each day of turbine operation for which footage has been recorded. Samples will be selected to vary across the following co-variables:</p> <ul style="list-style-type: none"> - tidal period (see Table 6-1) - annual period (see Table 6-2) - time of day <p>An additional option for this approach would be to only select footage when turbine blades are moving (blade RPM > 0).</p>
Stratified by vantage point data	Time-stamped video footage samples will be selected for analysis, based on observed presence of diving birds and mammals within the array area and times of high dive frequency or intensity, as recorded during vantage point surveys.

The selected samples of video footage will be analysed as follows:

- Quantification of events versus non-events in the sampled footage.
- Identification of individuals observed in sampled footage to species level where possible, but otherwise to the lowest taxonomic level.
- Quantification of numbers of individual diving birds and marine mammals observed in sampled footage.
- Description of the behaviour of animals in sampled footage and where possible determination of whether evasion behaviour has been clearly observed.
- Noting and quantification of any observed collisions or near misses between turbine blades and marine animals in the sampled footage.
- Noting of any obvious consequences of any observed collisions (mortality, injury) in the observed footage.
- Cross-validation between occurrence of diving birds and marine mammals in the sampled footage and in vantage point surveys.

The final point g. above will enable understanding for the value of ongoing surface observations for understanding collision risk and the degree to which “events” underwater correspond to surface observations of diving birds and mammals in the array area and vice versa.

Any observed occurrences of marine wildlife in video footage will be further analysed to explore the nature of any relationships with turbine operational data, including rotation speeds and environmental covariates such as tidal state, time of day and season.

In addition to the detailed analysis set out above, metadata on the video footage will be collated each quarter to report on:

- The number of hours of video recorded.
- The number of hours of video analysed.

8 Additional monitoring activity

As part of its wider research and development programme, Nova will be carrying out experimental monitoring and data gathering activities around the Shetland Tidal Array, detailed in this section. These activities are not part of the mandatory monitoring required under Marine Licence 00009110 and Works Licence 2018/021/WL. However, outputs may be incorporated into monitoring reports required under this PEMP, where it adds value to information gathered through mandatory monitoring activity.

8.1 Flow regime monitoring

As part of the of the multi-partner EU Horizon 2020 EnFAIT (Enabling Future Arrays in Tidal) project²², monitoring will be carried out on turbine performance and reliability to understand array interactions and optimisation for the Shetland Tidal Array. An instrumentation skid has been developed to provide a platform for stand-alone instrumentation such as ADCPs with their associated battery packs and data loggers, illustrated in Figure 8-1.

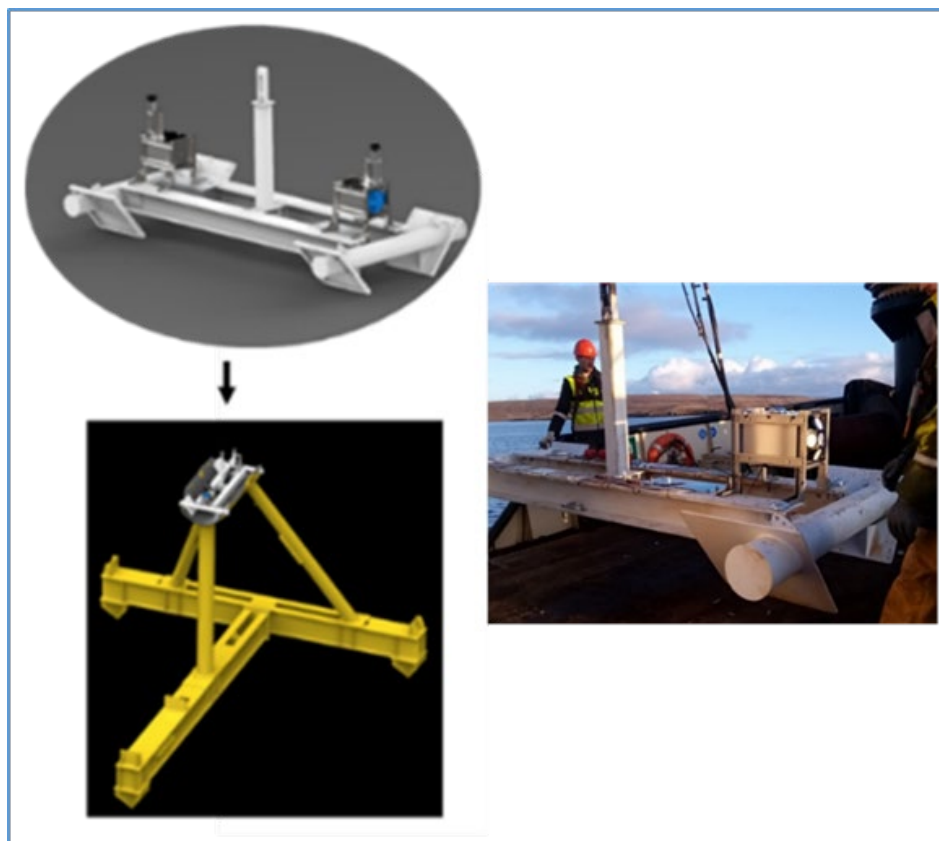


Figure 8-1 Instrument skid providing platform for standalone instrumentation at the Shetland Tidal Array. Skid has been designed to slot into docking station on turbine substructures, as indicated.

The skid has been designed to be deployed on existing turbine substructures while the turbine nacelle is away for maintenance. The instrumentation deployed on the skid will gather data on the flow regime in and around the array. It is anticipated that this will provide further data to understand how the presence and behaviour of marine wildlife in the Project area varies with current speed and other hydrodynamic factors.

²² See <https://www.enfait.eu/>

9 Reporting strategy

9.1 Data analysis

In analysing monitoring data gathered to date from the Shetland Tidal Array, Nova has found it useful to take an exploratory, iterative approach, informed by discussion and feedback from Marine Scotland and NatureScot (previously SNH). Nova is fully committed to an engagement strategy for the Shetland Tidal Array which ensures that the data gathered through monitoring activities and the analyses carried out fully meet the requirements of the Project licences issued by MS-LOT and SIC. This is detailed further in Sections 9.3 and 10, but an overview of the principles that will guide the data analysis is set out below.

The monitoring programme for the Shetland Tidal Array will gather information to enable further exploration of key factors underlying marine wildlife occupancy patterns and behaviour in the sea area occupied by turbines in Bluemull Sound and around the turbines themselves. This information will be used to refine understanding for collision risk. The analyses that will be carried out on the data gathered through the vantage point and subsea video monitoring datasets to achieve this are set out in the corresponding sections of this document.

The features of the following protected sites and species will be a particular focus for detailed data analysis and reporting:

- Yell Sound Special Area of Conservation (SAC): harbour seal (*Phoca vitulina*).
- Hermaness, Saxa Vord and Valla Field Special Protection Area (SPA): gannet (*Morus bassanus*), European shag (*Phalacrocorax aristotelis*), guillemot (*Uria aalge*) and puffin (*Fratercula arctica*).
- Bluemull and Cosgrave Sounds potential Special Protection Area (SPA): red throated diver (*Gavia stellata*).
- All cetaceans, as species subject to strict protection ("European Protected Species" – EPS), as described in Annex IV to Council Directive 92/43/EEC.

Detailed analyses will also be carried out for black guillemot (*Cepphus grylle*), as the most frequently observed and abundant bird species during the surveys carried out in Bluemull Sound since November 2010. Analysis for this species could provide valuable insights into general Project collision risk and key influencing factors.

9.2 Monitoring reports

The two monitoring reports submitted to MS-LOT and Shetland Islands Council in 2020^{23, 24} have been finalised and are available on the Marine Scotland Information website. The next formal monitoring report will be submitted to Marine Scotland and Shetland Islands Council in October 2022, providing a report on the results from the ongoing monitoring of T1 to T3, as well as T4 which was installed in November 2020. Following this, monitoring reports will be submitted to Marine Scotland and Shetland Islands Council at 12-month intervals (every October), throughout the operation of the Shetland Tidal Array. To ensure data analysis and monitoring reporting is fit for purpose, Nova will submit an outline scope for each monitoring report at least 3 months in advance of the report due date, for consultation discussion and agreement with MS-LOT, NatureScot and others as necessary.

²³ Nova Innovation (2020a). Shetland Tidal Array monitoring report: Vantage point surveys. EnFAIT-0347.

²⁴ Nova Innovation (2020b). Shetland Tidal Array monitoring report: Subsea video monitoring. EnFAIT-0364.

Reports will detail the results from monitoring and data analysis (vantage point surveys, subsea video monitoring of turbines and pre-installation drop-down video surveys) carried out within each reporting period. They will detail the key findings in relation to knowledge gained about interactions between marine wildlife and the Shetland Tidal Array, with an emphasis on collision risk. Any issues or challenges experienced in carrying out the monitoring will be set out and if deemed necessary, justifications for the need to amend or adjust monitoring activity presented.

In analysing and reporting on monitoring data gathered to date from the Shetland Tidal Array, Nova has found it useful to take an exploratory, iterative approach, informed by discussion and feedback from Marine Scotland and NatureScot. Nova is fully committed to an engagement strategy for the Shetland Tidal Array which ensures that the data gathered through monitoring activities and the analyses carried out fully meet the requirements of the Project licences issued by MS-LOT and SIC. Nova will submit an outline scope for each monitoring report at least 3 months in advance of the report due date and organise annual/biannual meetings with MS-LOT, SIC, Marine Scotland Science and NatureScot (as appropriate) to discuss and agree data analysis and reporting. In addition, any required amendments to the PEMP, which is an iterative document, can be discussed and agreed, as set out in Section 10.

9.3 Reporting on compliance with other environmental licence conditions

Nova has established an Excel-based register on the status of licence conditions for the Shetland Tidal Array, to record all actions relating to compliance with conditions of Marine Licence 00009110 and Works Licence 2018/021/WL. Copies of this register will continue to be shared with MS-LOT and Shetland Islands Council at 6-monthly intervals, to report on progress and compliance with licence conditions, including those of relevance to the PEMP and wider measures to safeguard the environment.

This simple reporting system will enable Nova, Marine Scotland and Shetland Islands Council to identify any potential areas of concern in relation to commitments under the Project licences or discharge of consent conditions. This audit trail will therefore form an important element of the environmental reporting strategy for the Project and Nova's commitment to follow environmental good practice throughout the project.

10 PEMP review process

The PEMP is an iterative, live document which will be kept under review throughout the lifetime of the Shetland Tidal Array to ensure it remains fit for purpose. As knowledge and the evidence base grows on the environmental effects of the Shetland Tidal Array and tidal stream energy more generally, the focus of monitoring may evolve and change over time.

Conditions within Marine Licence 00009110 and Works Licence 2018/021/WL require that the PEMP be regularly reviewed by the Licensing Authorities, to identify the appropriateness of ongoing monitoring. As data from the environmental monitoring are gathered, analysed and reported to the regulatory and advisory bodies, decisions may be taken to retire elements of the monitoring programme, introduce new measures or to adjust methodologies and approaches to gathering and analysing data. This iterative review process for the PEMP is set out in Figure 10-1.

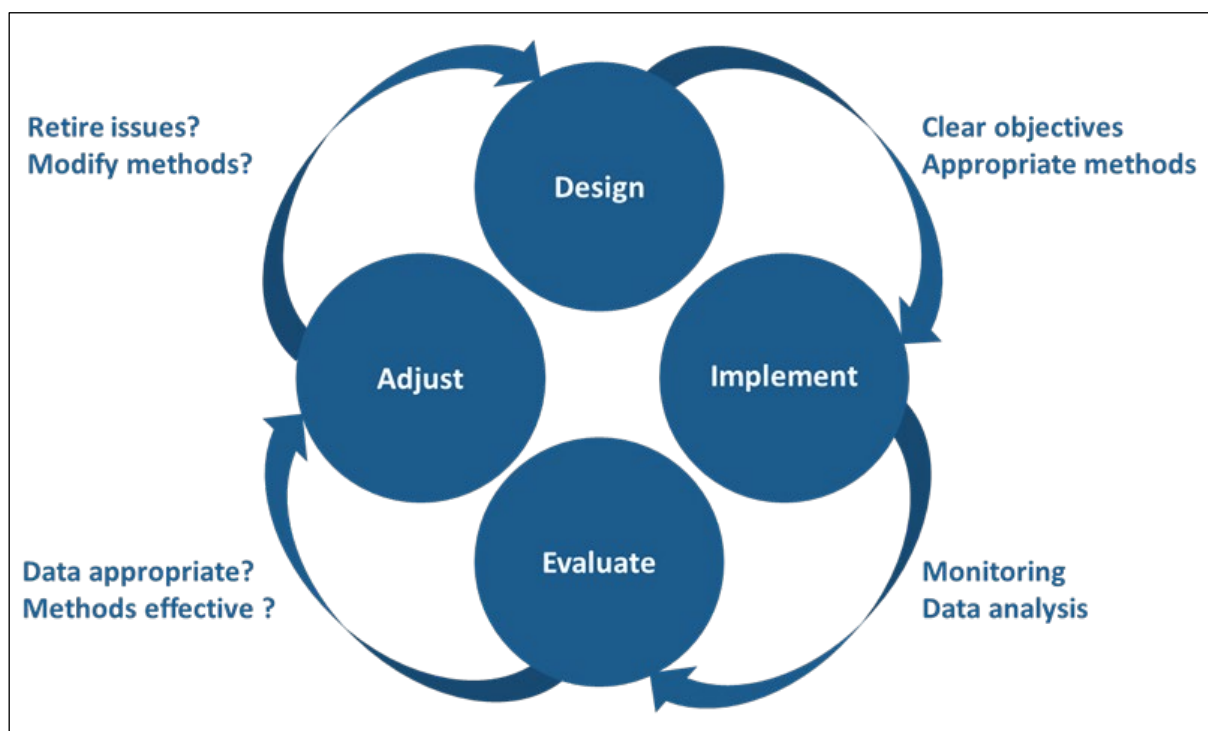


Figure 10-1 Schematic of PEMP iterative review process. The PEMP is a live document and will be kept under constant review.

Nova is fully committed to an engagement strategy for the Shetland Tidal Array which ensures that the PEMP and the data gathered through monitoring activities and the analyses carried out fully meet the requirements of the Project licences issued by MS-LOT and SIC. As part of this, Nova will organise annual/biannual meetings (as appropriate) with MS-LOT, SIC, Marine Scotland Science and NatureScot to discuss and agree data analysis and reporting, as well as any amendments required to the PEMP.

Annex A Shetland Tidal Array Biosecurity Plan

Summary of Biosecurity Risk of Shetland Tidal Array

- a. This Biosecurity Plan for Nova Innovation's Shetland Tidal Array has assessed the risk of introducing non-native species from outside of the Shetland regional area as very low. This is because:
 - all vessels used in operations are local to the Northern Isles;
 - vessels not based in Shetland are operated by reputable companies with their own environmental policy statements and good practice procedures;
 - turbines and sub-structures are transported to Shetland overland;
 - measures are in place to minimise biofouling of epibiota on turbines and substructures.
- b. The overall risk of activities contributing to the further spread of non-native species already present in Shetland has been assessed as low. This is because:
 - although the turbines and substructures within the array provide an artificial habitat for colonisation, significant similar habitat is already present in Bluemull Sound due to aquaculture sites;
 - the tide-swept nature of the Shetland Tidal Array site is likely to limit the settlement of non-native species larvae.
- c. This plan has identified a series of mitigation measures, mostly relating to monitoring and surveillance and good biofouling management to ensure that the overall biosecurity risk of the Shetland Tidal Array is low.

A.1 Introduction

A.1.1 Development name

Shetland Tidal Array, Bluemull Sound, Shetland.

A.1.2 Description of operation

At full build-out the current phase of the Shetland Tidal Array will comprise six 100kW Nova M100 turbines. During 2019/2020, three additional turbines will be added to the existing three-turbine array. A subsea cable hub will be deployed, along with inter-array cabling between the three new turbines and an additional export cable from the subsea hub to Cullivoe Pier. Following a period of operation, the three additional turbines within the array will be reconfigured to inform the sector's understanding for optimal array design and turbine layout as part of the Horizon 2020 EnFAIT project.

A.1.3 Site location

The Shetland Tidal Array is situated in Bluemull Sound, between the islands of Unst and Yell, indicated in Figure B1. The Project is located in a water depth of 30 to 40m offshore from the west coast of the Ness of Cullivoe, a narrow 1 km long headland to the north-east of Yell.



Figure B1 Location of the Shetland Tidal Array (indicated by yellow star).

Bluemull Sound is an active channel for shipping and the Shetland Tidal Array site is located less than 1km from a busy, multiuse harbour at Cullivoe, comprising a pier and small boat marina. In 2017, Cullivoe was the 12th largest whitefish landing port in the UK ²⁵. It is also used as a base by a number of aquaculture operators (mussels and salmon). The small marina currently provides berthing facilities for 14 boats, with plans to expand these facilities along with those at Cullivoe Pier.

A.1.4 Biosecurity plan period

The Biosecurity Plan covers the period 1 May 2019 to 2035 (anticipated decommissioning), with biannual reviews (described in Section 9). This Site Biosecurity Plan will be supplemented with Operation Biosecurity Plans, as necessary, for any specific activities that fall out with those considered within this plan. None are currently anticipated but this will be kept under review.

A.1.5 Responsible persons for biosecurity management

- a. Management of Biosecurity Plan and overview of biosecurity: Kate Smith, Nova Environmental Manager.
- b. Management of biosecurity operations on site: Tom Wills, Nova Offshore Manager (or delegated operations manager for a particular task).

A.2 Environmental factors affecting biosecurity

A.2.1 Salinity and environmental conditions

Bluemull Sound is a fully saline site. A number of small burns and land run-off enter the Sound but tidal currents and mixing mean that any effects on salinity are very localized and unlikely to extend beyond the intertidal zone.

²⁵ Napier I (2017). Shetland Fisheries Statistics 2017. Report produced by the University of the Highlands and Islands, pp35.

A.2.2 Seabed habitat

The seabed in Bluemull Sound at the Shetland Tidal Array site is rocky with little overlying sediment due to tidal scour. The array is located in an area of strong tidal streams which can reach velocities exceeding 3 m/s. This habitat typically supports a community of foliose seaweeds and encrusting animals typical of such tide-swept conditions, with sparse faunal communities dominating in the deeper, most tide-swept parts of the site.

A.2.3 Artificial habitat and biofouling

Although the Shetland Tidal Array provides artificial habitat for potential colonisation by non-native species, significant similar habitat is already present in Bluemull Sound due to aquaculture sites. The species and taxa most commonly observed to colonize the surfaces of structures in the Shetland Tidal Array are mussels, barnacles and kelp²⁶.

A.2.4 Non-native species present in Shetland

The northerly location of Shetland and lower water temperatures compared to the mainland UK may inhibit the spread of certain non-native species from the south. Despite this, a number of marine non-native species have been recorded around Shetland, detailed in Table B1, compiled from a variety of sources^{27 28 29}. The known locations of these species in Shetland are detailed, along with an indication of the likelihood that the Shetland Tidal Array could contribute to their spread within Shetland.

Table B1 Non-native species already recorded in Shetland and relevant to the Shetland Tidal Array.

Species	Records in Shetland	Habitat details and relevance to Shetland Tidal Array
Fragile green sponge fingers, <i>Codium fragile</i> ssp. <i>Fragile</i>	Throughout Shetland	Occurs on rock from the mid to lower shore and shallow subtidal. Not relevant to STA, depth and tide-swept nature of site make colonisation unlikely.
Japanese weed, <i>Dasysiphonia japonica</i>	Throughout Shetland	Lower intertidal species. Not relevant to STA, depth and tide-swept nature of site make colonisation unlikely.
Hook weed, <i>Bonnemaisonia hamifera</i>	Throughout Shetland	Not relevant to STA, already widespread throughout Shetland. GBNNS consider environmental & economic threat is low.
Harpoon weed, <i>Asparagopsis armata</i>	Throughout Shetland	Not relevant to STA, already widespread throughout Shetland. GBNNS consider environmental & economic threat is low.
Wireweed, <i>Sargassum muticum</i>	West coast of mainland	Occurs on rock, cobbles and boulders from the mid to lower shore and shallow subtidal. Not relevant to STA, depth makes colonisation unlikely.

²⁶ Vezza R (2019). An anti-biofouling strategy for operators: A systems approach for the tidal energy industry. Ph.D. thesis, University of Edinburgh, University of Exeter and University of Strathclyde.

²⁷ Collin SB, MacIver K & Shucksmith R. (2015). A Biosecurity Plan for the Shetland Islands, pp66.

²⁸ Collin SB, Tweddle JF & Shucksmith RJ (2015). Rapid assessment of marine non-native species in the Shetland Islands, Scotland. *BiolInvasions Records* 4: 147-155.

²⁹ Shelmerdine RL, Mount B & Shucksmith RJ (2017). The most northerly record of feral Pacific oyster *Crassostrea gigas* (Thunberg, 1793) in the British Isles. *BiolInvasions Records* 6(1): 57-60.

Species	Records in Shetland	Habitat details and relevance to Shetland Tidal Array
Orange-tipped sea squirt, <i>Corella eumyota</i>	Yell	Occurs in shallow waters in harbours, marinas and on manmade structures. Could colonise structures of STA, maintain surveillance.
Bryozoan, <i>Schizoporella japonica</i>	Throughout Shetland	Widespread throughout Shetland on manmade structures Not relevant to STA, already widespread. GBNNS consider environmental & economic threat is low.
Bryozoan, <i>Fenestrulina delicia</i>	Sullom Voe	Only a single record in Shetland. Unlikely to colonise STA. GBNNS consider environmental & economic threat is low.
Bryozoan, <i>Bugula simplex</i>	Lerwick	Colonises marinas, harbours and boat hulls. Could colonise structures of STA, maintain surveillance. GBNNS consider environmental & economic threat is low.
Orange-striped anemone, <i>Diadumene lineata</i>	The Vadills, Mainland	Only a single historical record in Shetland Vadills (coastal lagoons) from 2003. Unlikely to colonise STA.
Darwin barnacle, <i>Austrominius modestus</i>	Throughout Shetland	Not relevant to STA, already widespread throughout Shetland. GBNNS consider environmental & economic threat is low.
Japanese skeleton shrimp, <i>Caprella mutica</i>	Throughout Shetland	Found in areas of human activity on natural and artificial substrata. Limited dispersal potential. Could colonise structures of STA, maintain surveillance.
Pacific oyster, <i>Crassostrea gigas</i>	Sandsound Voe, Mainland	Only two specimens found in Shetland in 2016, on mussel lines. Unlikely to colonise STA due to tide-swept conditions.

A number of other non-native species could potentially be present in the waters around Shetland, without having been formally recorded. Of likely pertinence are those species recorded in Orkney since the spread in distribution of non-native species generally follows a south to north pattern. A number of non-natives not yet recorded in Shetland were recorded in a recent rapid assessment survey of Orkney in 2017. As with species detailed in the table above, not all of these non-native species will be of environmental or economic concern, but it is good practice to maintain watching brief over these and other non-native species not yet record in Shetland.

A.3 Vessels using the site and engaged in operations

Local multi-category ('multicat') workboat vessels of the type shown in Figure B2, and small workboats are utilised for all operations associated with the Shetland Tidal Array, including deployments, retrievals and maintenance.

All vessels used in operations are based in the Northern Isles. Those not based in Shetland itself are operated by reputable companies with sound environmental policies and good practice procedures. Turbines and substructures are shipped to site overland via lorry and northern isles freight service.



Figure B2 Representative vessel utilised for Shetland Tidal Array operations. *Source Leask Marine.*

A.4 Site activities which risk introducing or spreading non-native species

The nature of biosecurity risks for the Shetland Tidal Array, associated activities and mitigation measures are detailed in Table B2.

Table B2 Activities associated with the Shetland Tidal Array, biosecurity risk and mitigation measures.

Activity and nature of risk	Mitigation measures	Risk level
Use of vessels for site operations: Risk of introducing or spreading non-native species	<ul style="list-style-type: none"> - Turbines and substructures are shipped to Shetland by road. - Northern Isles-based vessels used for marine operations. - The operators used for provision of multicat vessels follow their own biosecurity good practice, under an environmental policy statement³⁰. - An 'Operations Biosecurity Plan' will be produced for use of any vessels not based in Northern Isles (not currently anticipated). 	Very low to low
Installation of turbines, substructures, cables and offshore hub: Risk of introducing or spreading species, provision of artificial habitat for colonisation	<ul style="list-style-type: none"> - Turbines, substructures, cables and hub not previously deployed subsea elsewhere. - Temporary moorings (e.g., chains) used during deployment will be sourced from Shetland or pressure washed / air dried prior to use in Bluemull Sound. - An anti-fouling strategy is in place involving use of anti-fouling coatings on turbines, substructures and hub. - Visual inspections when turbines or substructures removed from water - contingency action will be taken if necessary. 	Low to medium

As detailed in Table B2, the introduction of artificial habitat to Bluemull Sound could provide new habitat for colonisation by non-native species. However, the risk that this would contribute significantly to the further spread of species already present in Shetland is considered low, for a number of reasons:

³⁰ Leask Marine (2019). Environmental Policy Statement. See <https://www.leaskmarine.com/about/company-policy-statements/>

- a. In general, the sheltered habitats of marinas, ports and harbours seems to favour the establishment of non-native species, over habitats in more wave or tide-exposed conditions such as Bluemull Sound.
- b. In a recent rapid assessment of non-native species in Orkney, whilst a number of non-natives species were found to be colonising structures in harbour and marinas, none were found on marine renewable energy devices sampled.
- c. Devices are periodically removed from the water for maintenance, during which any biofouling is removed.
- d. Additional mitigation and good biosecurity measures will be applied to the STA, detailed in the next section.

The biosecurity risk for the Shetland Tidal Array is likely to be considerably lower than that associated with other activities in the area such as national and international shipping, marinas, recreational boating and aquaculture. The use of local vessels means the risk of introducing non-native species from outside of Shetland is minimal, though they could contribute to the spread of species already present in Shetland. The presence of turbines and substructures in the Sound creates artificial habitat for potential colonisation by non-native species already present in Shetland. However, similar habitat is available on nearby aquaculture installations.

A.5 Biosecurity control measures

The full range of biosecurity control measures to reduce the risk of the Shetland Tidal Array contributing to the spread or introduction of non-native species are listed below:

- a. The Site Biosecurity Plan will be reviewed on any changes being made to the Construction Method Statement to ensure its conclusions remain valid.
- b. An 'Operations Biosecurity Plan' will be produced, as necessary, for any specific activities that fall outside those described within this plan. None are currently anticipated but this will be kept under review.
- c. The Site Biosecurity Plan will be kept under review and updated, as necessary.
- d. None of the turbines, substructures, cables or subsea hub will previously be deployed subsea elsewhere.
- e. Turbines and substructures are shipped to Shetland by road.
- f. Northern Isles-based vessels used for marine operations.
- g. The operators used for provision of multicat vessels follow their own biosecurity good practice, under an environmental policy statement¹⁴.
- h. Any temporary moorings (e.g., chains) used during deployment will either be sourced from Shetland, or pressure washed or air dried prior to use in Bluemull Sound.
- i. An anti-fouling strategy is in place for the project, which includes use of anti-fouling coatings on turbines, substructures and offshore hub.
- j. Turbines and substructures will undergo visual inspections when removed from the water. Contingency action will be taken if necessary (see Section A.7).

A.6 Site surveillance and reporting procedures

Turbines and substructures will undergo visual inspections when removed from Bluemull Sound. Any non-native species identified will be reported to Shetland Islands Council, Marine Scotland and Scottish Natural Heritage in the first instance. Records of inspections and any instances of non-native species

will be kept within the site biosecurity logbook, maintained and managed by Nova's Environmental Manager. A hard copy of the biosecurity logbook will be kept on-site at Nova's site office at Cullivoe.

A.7 Contingency plan

Visual inspections will be carried out following removal of turbines or sub-structures from Bluemull Sound. Inspections will take place at either Cullivoe or Belmont Pier. Laminated 'pest ID cards', held on site at Cullivoe will assist staff carrying out the inspections in identifying particularly invasive non-natives. Not all non-native species will require further action, since many are already well-established in Shetland, or have minimal likely environmental or economic impacts.

If visual inspections of turbines and substructures indicate the presence of a non-native species, this will be reported to Shetland Islands Council, Marine Scotland and Scottish Natural Heritage in the first instance, for discussion on whether further action is required.

Biological material is removed as standard when turbines or sub-structures are removed from Bluemull Sound, for health and safety reasons, to avoid dangerous handling conditions. This takes place *in situ* at Belmont or Cullivoe pier usually by pressure washing. If inspections have suggested that invasive non-native species may be present, care will be taken during pressure washing to avoid contaminated material entering the marine environment.

Any contingency action taken will be recorded in the site biosecurity logbook kept in Nova's site office at Cullivoe Pier.

A.8 Location of biosecurity logbook

The Shetland Tidal Array biosecurity logbook will be maintained and managed by Nova Innovation's Environmental Manager. A hard copy will be kept on-site in Nova's Cullivoe office.

A.9 Biosecurity plan review process

This Site Biosecurity Plan will be reviewed and updated if necessary; for example, if the Construction Method Statement is amended at any point (not anticipated). The Plan will be reviewed in May 2021 followed by every two years, or sooner if required. More frequent reviews may be triggered by an identified higher risk, such as change in vessel use or record of an invasive non-native species elsewhere in Shetland, for which containment may be required.

Annex B Priority habitat reference cards

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


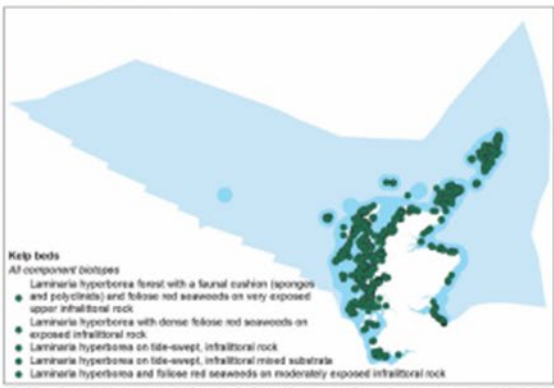
TERRITORIAL WATERS	
Broad habitat	
HORSE MUSSEL BEDS	
Image	Distribution
	
<p>Image: Rob Cook</p> <p>Feature description</p> <p>Characteristics - The horse mussel <i>Modiolus modiolus</i> occurs in scattered clumps, thin layers or dense raised beds, which can extend up to several hectares in size. Raised 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.</p> <p>Environmental preferences - Weak to strong water movement on a variety of mixed substrata. Found at depths of 5-220m.</p> <p>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.</p> <p>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.</p> <p>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.</p>	
Natural heritage importance	Information sources
EC Habitats Directive Annex I OSPAR T&D Scottish Biodiversity List UK BAP	MarLIN OSPAR Case Report UK BAP Habitat Definitions UK Marine SACs Overview
Component biotopes in Scottish waters	
<p><i>Modiolus modiolus</i> beds with hydroids and red seaweeds on tide-swept circalittoral mixed substrata - SS.SBR.SMus.ModT.</p> <p><i>Modiolus modiolus</i> beds on open coast circalittoral mixed sediment - SS.SBR.SMus.ModMx.</p> <p><i>Modiolus modiolus</i> beds with fine hydroids and large solitary ascidians on very sheltered circalittoral mixed substrata - SS.SBR.SMus.ModHAs.</p> <p><i>Modiolus modiolus</i> beds with <i>Chlamys varia</i>, sponges, hydroids and bryozoans on slightly tide-swept very sheltered circalittoral mixed substrata - SS.SBR.SMus.ModCvar.</p>	

TERRITORIAL WATERS	
Component biotope name	
MODIOLUS MODIOLUS BEDS ON OPEN COAST CIRCALITTORAL MIXED SEDIMENT (SS.SBR.SMus.ModMx)	
Image	Distribution
 <p>Image: Richard Shucksmith</p>	 <p>Horse mussel beds Component biotope ● Modiolus modiolus beds on open coast circalittoral mixed sediment</p> <p><small>Map © Crown Copyright. UK Limits provided by (UKHO) Line of the Sea Division. All rights reserved. Ordnance Survey Licence number 100017908. 2015</small></p>
Feature description	
<p>Characteristics - Beds of horse mussels (<i>Modiolus modiolus</i>) 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.</p> <p>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.</p> <p>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.</p> <p>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 <i>M. modiolus</i> off Norway, in the Kattegat Sea and off the west coast of France may represent examples of this biotope.</p> <p>Feature status - <i>M. modiolus</i> 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.</p>	
Natural heritage importance	Information sources
EC Habitats Directive Annex I (Reefs) 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 HYDROIDS AND RED SEAWEEDS ON TIDE-SWEPT CIRCALITTORAL MIXED SUBSTRATA (SS.SBR.SMus.ModT)	
Image	Distribution
 <p>Image: Keith Hiscock / JNCC</p>	 <p>Horse mussel beds Component biotope Modiolus modiolus beds with hydroids and red seaweeds on tide-swept circalittoral mixed substrata</p> <p>Map © Crown Copyright. UK. Data provided by 2010 Use of the Sea Division. All rights reserved. Ordnance Survey Licence number 1001100017000. 2010.</p>
Feature description	
<p>Characteristics - In strong currents or tide-swept conditions, the horse mussel (<i>Modiolus modiolus</i>) 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.</p> <p>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.</p> <p>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).</p> <p>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).</p> <p>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.</p>	
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
 <p>Image: SNH</p>	 <p>Horse mussel beds Component biotope Modiolus modiolus beds with Chlamys varia, sponges, hydroids and bryozoans on slightly tide-swept very sheltered circalittoral mixed substrata</p> <p><small>Map © Crown Copyright. UK. Levels provided by OS/DfE. Use of the Sea Domain. All rights reserved. Ordnance Survey Licence number 100017968. 2015</small></p>
Feature description	
<p>Characteristics - Beds of horse mussels (<i>Modiolus modiolus</i>) 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 (<i>Chlamys varia</i>) 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.</p> <p>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.</p> <p>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.</p> <p>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).</p> <p>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 <i>M. modiolus</i> beds.</p>	
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 FINE HYDROIDS AND LARGE SOLITARY ASCIDIANS ON VERY SHELTERED CIRCALITTORAL MIXED SUBSTRATA (SS.SBR.SMus.ModHAs)	
Image	Distribution
 <p>Image: Sue Scott / JNCC</p>	 <p>Horse mussel beds Component biotope Modiolus modiolus beds with fine hydroids and large solitary ascidians on very sheltered circalittoral mixed substrata</p> <p>Map © Crown Copyright. UK Licence provided by Ordnance Survey of the Sea Domain. All rights reserved. Ordnance Survey Licence number 100017908. 2015</p>
Feature description	
<p>Characteristics - In wave sheltered areas, the horse mussel (<i>Modiolus modiolus</i>) 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 fans, 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.</p> <p>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.</p> <p>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).</p> <p>Wider distribution - This biotope is only recorded in Scotland.</p> <p>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 <i>M. modiolus</i> beds.</p>	
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
 <p>Image: Richard Shucksmith</p>	 <p>Kelp beds All component biotopes <ul style="list-style-type: none"> Laminaria hyperborea forest with a faunal cushion (sponges and polychaetes) and foliose red seaweeds on very exposed upper infralittoral rock Laminaria hyperborea with dense foliose red seaweeds on exposed infralittoral rock Laminaria hyperborea on tide-swept, infralittoral rock Laminaria hyperborea on tide-swept, infralittoral mixed substrate Laminaria hyperborea and foliose red seaweeds on moderately exposed infralittoral rock </p> <p><small>Map © Crown Copyright. UK (Lands provided by UKHO) Use of the Sea Domain. All rights reserved. Ordnance Survey Licence number 100017008. 10/11</small></p>
Feature description	
<p>Characteristics – Beds of the kelp <i>Laminaria hyperborea</i> 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 fans 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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	
Natural heritage importance	Information sources
<p>EC Habitats Directive Annex I (Reefs)</p> <p>Scottish Biodiversity List (IR.MIR.KR.LhypT & IR.MIR.KR.LhypTX only)</p> <p>UK BAP (IR.MIR.KR.LhypT & IR.MIR.KR.LhypTX only)</p>	<p>JNCC Marine Habitat Classification</p> <p>MarLIN</p>
Component biotopes in Scottish waters	
<p><i>Laminaria hyperborea</i> forest with a faunal cushion (sponges and polychaetes) and foliose red seaweeds on very exposed upper infralittoral rock - IR.HIR.KFaR.LhypFa.</p> <p><i>Laminaria hyperborea</i> with dense foliose red seaweeds on exposed infralittoral rock - IR.HIR.KFaR.LhypR, including: IR.HIR.KFaR.LhypR.Ft & IR.HIR.KFaR.LhypR.Pk.</p> <p><i>Laminaria hyperborea</i> on tide-swept, infralittoral rock - IR.MIR.KR.LhypT, including: IR.MIR.KR.LhypT.Ft & IR.MIR.KR.LhypT.Pk.</p> <p><i>Laminaria hyperborea</i> on tide-swept infralittoral mixed substrata - IR.MIR.KR.LhypTX, including: IR.MIR.KR.LhypTX.Ft & IR.MIR.KR.LhypTX.Pk.</p> <p><i>Laminaria hyperborea</i> 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.</p>	

TERRITORIAL WATERS	
Broad habitat	
MAERL BEDS	
Image	Distribution
 <p>Image: Marine Scotland</p>	 <p>Maerl beds Component biotope Maerl beds</p>
Feature description	
<p>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.</p> <p>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.</p> <p>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).</p> <p>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.</p> <p>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).</p>	
Natural heritage importance	Information sources
EC Habitats Directive Annex I (Subtidal sandbanks) OSPAR T&D Scottish Biodiversity List UK BAP	JNCC Marine Habitat Classification OSPAR Case Report UK BAP Habitat Definitions 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
 <p>Image: SNH</p>	 <p>Maerl or coarse shell gravel with burrowing sea cucumbers Component biotope a. <i>Neopentadactyla mixta</i> in circalittoral shell gravel or coarse sand</p> <p><small>Map © Crown Copyright. UK Limits provided by UKHO. Use of the Sea-View. All rights reserved. Ordnance Survey Licence number 100017908. 2015.</small></p>
Feature description	
<p>Characteristics - Gravel, maerl gravel (dead maerl) or coarse sands with high densities of the gravel sea cucumber, <i>Neopentadactyla mixta</i>. 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.</p> <p>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.</p> <p>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).</p> <p>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.</p> <p>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).</p>	
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	
<i>Neopentadactyla mixta</i> in circalittoral shell gravel or coarse sand - SS.SCS.CCS.Nmix.	

Annex C Summary of revised vantage point methodology trials

The new method has been tested in the field and subsequently modified twice with tests during October/November 2019 and March 2020. Modifications were made to address issues relating to the quality and quantity of data collected, as detailed below.

C.1 Revised method 1

Revised method 1 was trialled between 30 October and 18 November 2019. Five 2-hour surveys were conducted. The method involved continuous recording of seabird and sea mammal presence within the survey area. The survey area (see Figure 1) was identified in QGIS using a 50m buffer around turbines T1, T2 and T3, resulting in a slightly bigger area than Zone 1 of the old survey method. The north-south boundary was identified using landmarks on the Unst shoreline. The near and far boundaries were estimated by using a set of marked canes. The irregular, curved shape of the survey area proved somewhat difficult to identify in the field. Individuals within the boxed, survey area buffer (indicated on maps 1 with hatching) were counted as being in the survey area.

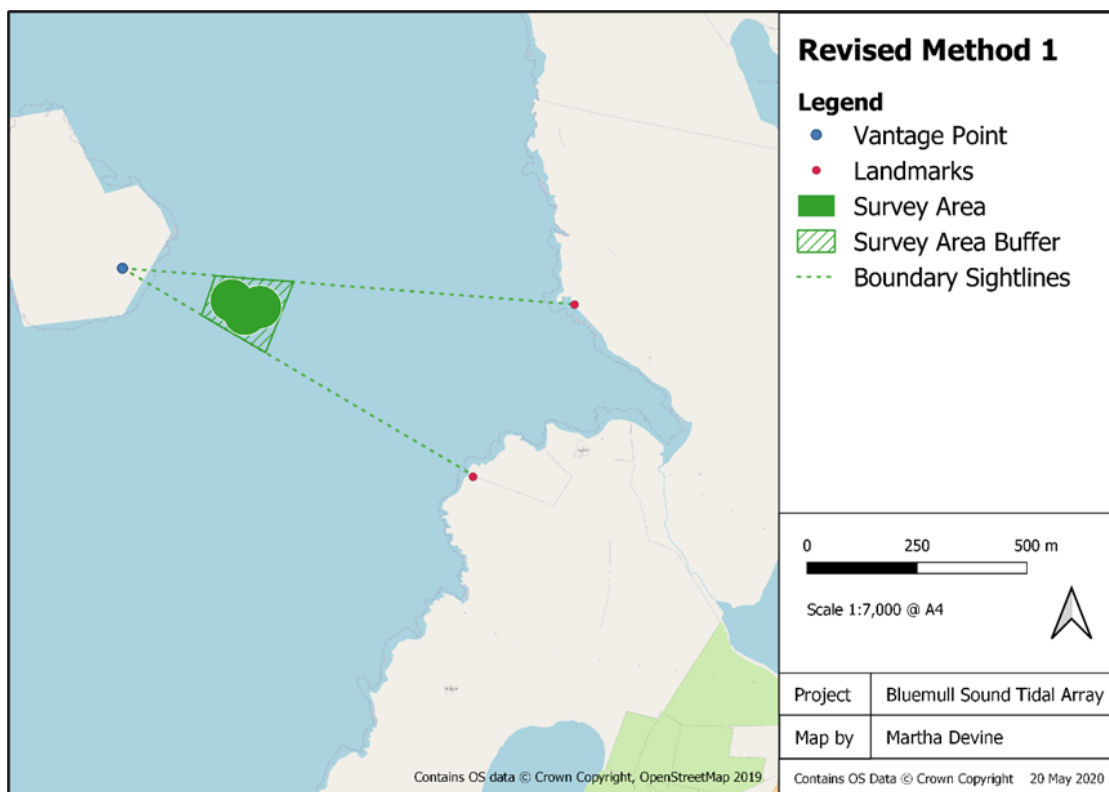


Figure C1 Revised method survey area 1, trialled October/November 2019, showing vantage point, sightlines and survey area buffer.

Surveys were scheduled to include the whole range of tidal conditions. Behavioural activities of all observed individuals were recorded.

Issues identified during trials of this method were:

1. The small survey area resulted in a limited number of records per survey.
2. It did not include the second array of turbines T4-T6.
3. The behavioural activity of individuals was recorded but it was not feasible to time the behaviour of more than one individual at a time.

C.2 Revised method 2

This method was designed to address the issues identified during trials of 'revised method 1'. Turbines T4-T6 were added to the survey map in QGIS (See Figure C2). When mapped, T1-T3 and T4-T6 appear to be two distinct arrays. It seemed sensible therefore to treat them as two distinct survey zones within the design. The method was trialled between 04 March and 25 March 2020 (following this Covid-19 prevented fieldwork). Four 2-hour surveys were conducted. The first hour of each survey covered Array 1 (T1-T3) and was referred to as Survey Area A. The second hour covered Array 2 (T4-T6) and was referred to as Survey Area B. Survey Area B was identified in the same way as A, using a 50m buffer around turbines T4, T5 and T6 in QGIS. Again, the irregular, curved shape of the survey area proved somewhat difficult to identify in the field. Individuals within the boxed, survey buffer areas (indicated on maps 2 with hatching) were counted as being in the survey area.

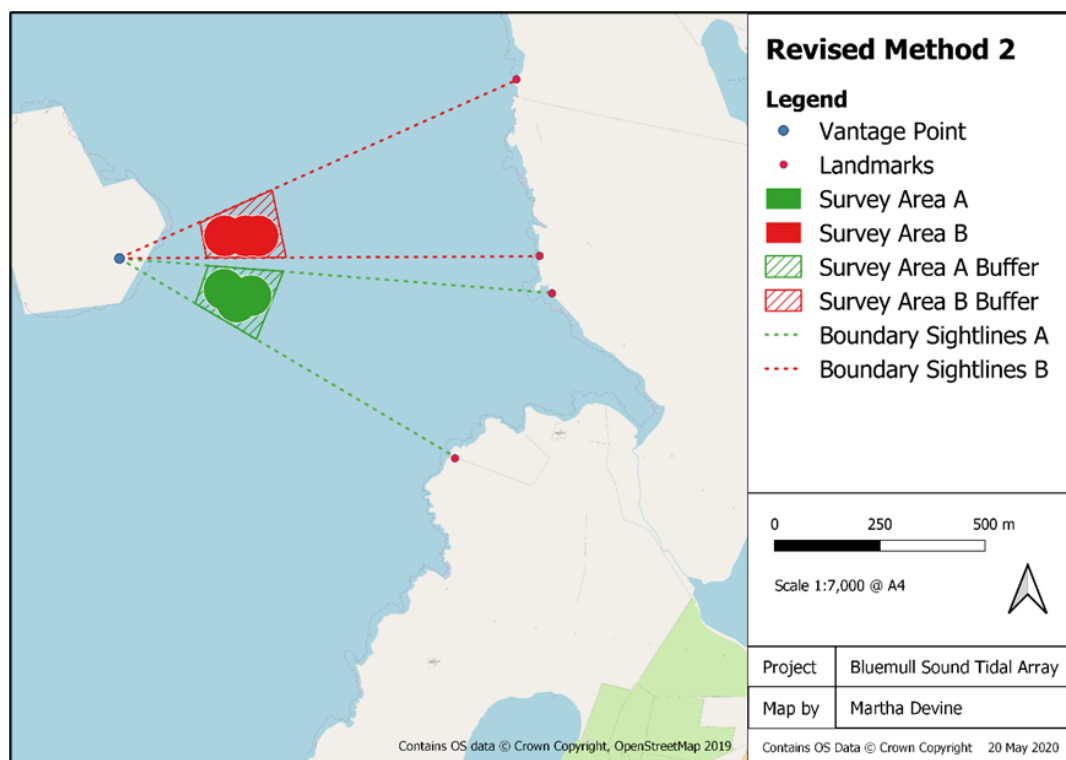


Figure C2 Revised method survey area 2, trialled March 2020, showing vantage point, Survey Area A (T1-T3), Survey Area B (T4-T6), survey area buffers and sightlines.

This method used timed counts in which the number of birds/mammals within plots was recorded approximately every 5 minutes. It also used focal watches in which an individual bird or mammal was followed whilst in the survey plot and any activity (e.g., diving) was timed and recorded.

This method was an improvement on 'Revised method 1'. Timed counts were more easily conducted than the continuous counts in 'Revised method 1'. Timed focal watches of individuals were manageable and could gather more useful, timed behavioural data. The size and shape of the survey area still presented problems, however.

Issues identified during trials of this method were:

1. Still a limited number of records within counts and many "nil-records" due to small survey area.
2. Several "incomplete" dives recorded within focal watches, where birds were observed diving, but not seen resurfacing within the survey area.
3. Conversely, the opportunity to record individuals was missed when they dived outside the area but surfaced within the area.

4. Initially, it had seemed sensible to handle arrays T1-T3 and T4-T6 as two distinct Survey Areas. The areas proved too small, however. Treating them as one array over a larger area, would improve the quality and quantity of data.

C.3 Revised Method 3

This method has been designed to address the issues described above for 'Revised Method 2'. The survey area covers both the area occupied by the existing three deployed turbines, as well as the area where turbines 4, 5 and 6 will be deployed (see Figure C3). The larger size of the survey area will increase the quantity and quality of data as individual birds/mammals will be within the plot for a longer period. Whilst the above methods aimed to focus more on the array areas than the old method (used until October 2019), test results have shown that the focus was too great to gather meaningful data.

The revised shape will be easier to visualise, requiring using only two landmark reference points on the Unst shoreline. It is anticipated that the curved eastern boundary will be easier for surveyors to visualise as there are no sharp corners and it represents a constant distance from the vantage point.

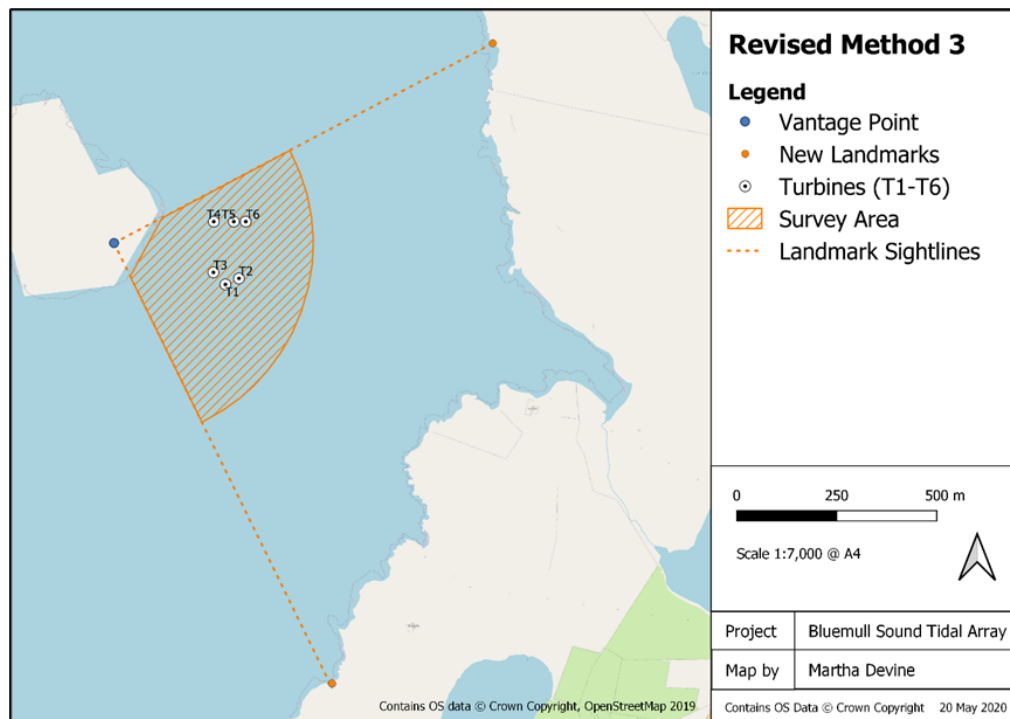


Figure C3 Revised method survey area 3, showing vantage point, Survey Area (T1-T6) and sightlines.

Other advantages of the revised survey boundary are:

1. The current array T1-T3 is central within the area.
2. It is anticipated that any future movement in position of T4-T6 is likely to be slightly south, towards T1-T3 so will still be within the survey area and more central.
3. It is comparable with the combined zones A and D of the old method.
4. It shares the same near boundary of the old method, which is easily identified, being the near shore.

Annex D Sample vantage point survey recording form

Date:	dd/mm/yr	Annual period:	1 to 4	Precipitation:	
Array Area:	A or B	Tidal Period:	1 to 6	Cloud cover%:	0-100
Start time:	00:00	Sea state:	0-3	Time of HW:	00:00
End time:	00:00	Wind direction/strength:		Height of HW:	0.00 m

Timed count

Species	Number	Time		Activity*	Notes
		Start	Finish		
				1-4 (birds)	
				1-3 (mammals)	

* For bird and mammal activity codes see Section 6.2.6

Focal watch

Time of focal watch start: 00:00

Time of focal watch finish: 00:00

Species	Time on surface	Time diving	Notes

Annex E Copies of Marine Licence 00009110 and Shetland Islands Council Works Licence
2018/021/WL.

MARINE SCOTLAND ACT 2010, PART 4 MARINE LICENSING

LICENCE TO CONSTRUCT, ALTER OR IMPROVE WORKS AND DEPOSIT ANY SUBSTANCE OR OBJECT IN THE SCOTTISH MARINE AREA

Licence Number: **MS-00009110**

The Scottish Ministers (hereinafter referred to as "the Licensing Authority") hereby grant a marine licence authorising:

Nova Innovation Ltd
45 Timber Bush,
Edinburgh
EH6 6QH

Under the Marine (Scotland) Act 2010,

- 1) To deposit any substance or object (except for dredge spoil) within the Scottish marine area, either in the sea or on or under the seabed;
- 2) To deposit any substance or object (except for dredge spoil) in the sea or on or under the seabed from a vessel which was loaded with the substance or object either in Scotland or in the Scottish marine area; and
- 3) To construct any works within the Scottish marine area either in or over the sea, or under the seabed,

required in the execution of the works (including construction, operation and maintenance) described in Part 2 of the Schedule attached to this licence. The issue of this licence is subject to conditions as set out in Part 3 of the Schedule.

This licence remains in force from 09 February 2021 to 1 April 2038 or until the Works have been decommissioned in accordance with an approved Decommissioning Programme prior to this date, and for which a separate marine licence is required.

This licence replaces licence numbers 04859/15/0, 04859/15/1, 06642/18/0, 06642/20/0.

Signed:
Giulia Agnisola

For and on behalf of the Licensing

Authority Date of issue 12 February, 2021

1. PART 1 - GENERAL

1.1 Interpretation

In the licence, unless otherwise stated, terms are as defined in Section 1, 64 and 157 of the Marine Scotland Act 2010, and,

- a) **“the Application”** means the application for a marine licence, the Environmental Assessment Report, the extension schedule and the method statement submitted to the Licensing Authority, by the Licensee on 19 February 2018;
- b) **“Commencement of the Works”** means the date on which the first vessel arrives on the Site to begin carrying on any Licensed Activity in connection with the construction of the Works (including the deployment of single turbines, deployment of associated infrastructure and the movement and redeployment of turbines and associated infrastructure), as described in Part 2 of this licence. ;
- c) **“Completion of the Works”** means the date on which the Works (including the deployment of single turbines, deployment of associated infrastructure and the movement and redeployment of turbines and associated infrastructure) have been installed, or the Works have been deemed complete by the Licensing Authority, whichever occurs first;
- d) **“Construction Method Statement”** means the Construction Method Statement submitted within the Schedule and Method Statement in the Application;
- e) **“Decommissioning of the Works”** includes removal of the Works from the seabed, demolishing the Works or dismantling the Works;
- f) **“Decommissioning Programme”** means the programme for decommissioning the Works, to be submitted by the Licensee to the appropriate authority under section 105(2) of the Energy Act 2004 (as amended);
- g) **“Final Deployment of the Works”** means the date on which the movement and redeployment of turbines and associated infrastructure is concluded, or is deemed complete by the Licensing Authority, whichever occurs first;
- h) **“the 2010 Act”** means the Marine (Scotland) Act 2010;
- i) **“LAT”** means lowest astronomical tide;
- j) **“Licensable Marine Activity”** means the activities listed in section 21 of the 2010 Act;
- k) **“Licensed Activities”** means any activity or activities listed in section 21 of the 2010 Act which is, or are authorised under this licence;
- l) **“Licensee”** means Nova Innovations Ltd having its registered offices at 45 Timber Bush, Edinburgh EH6 6QH and registered in Scotland having its registered number as SC358996;
- m) **“MHWS”** means mean high water spring tide;
- n) **“the Licensing Authority”** means the Scottish Ministers;
- o) **“the Site”** means the area outlined in the figure 1 contained in Part 4 of this licence; and
- p) **“the Works”** means the Shetland Tidal Array (as extended), as described in Part 2 of this licence, including the deployment of single turbines, deployment of associated infrastructure, the movement and redeployment of turbines and associated infrastructure, operations and maintenance activities.

All geographical co-ordinates contained within the licence are in WGS84 format (latitude and longitude degrees and minutes to three decimal places) unless otherwise stated.

1.2 Contacts

All correspondence or communications relating to the licence should be addressed to:

Marine Scotland
Licensing Operations Team
Marine Laboratory
375 Victoria Road
Aberdeen
AB11 9DB
[Email: MS.MarineRenewables@gov.scot](mailto:MS.MarineRenewables@gov.scot)

1.3 Other authorisations and consents

The Licensee is deemed to have satisfied itself that there are no barriers or restrictions, legal or otherwise, to the carrying on of the Licensed Activities in connection with the licensed activity. The issuing of the licence does not absolve the Licensee from obtaining such other authorisations and consents, which may be required under statute.

1.4 Variation, suspension, revocation and transfer

Under section 30 (1) of the 2010 Act the Licensing Authority may by notice vary, suspend or revoke the licence granted by them if it appears to the Licensing Authority that there has been a breach of any of its provisions. For any such other reason that appears to be relevant to the Licensing Authority under section 30(2) or (3) of the 2010 Act. Under the 2010 Act variations, suspensions, revocations and transfers of licences are subject to the procedures set out in section 31 of the Act.

Under section 30 (7) of the 2010 Act, on an application made by a licensee, the Licensing Authority may vary a licence if satisfied that the variation being applied for is not material.

Under section 30 (8) of the 2010 Act, on an application made by the licensee, the Licensing Authority may transfer the licence from the Licensee to another person.

1.5 Breach of requirement for, or conditions of, licence

Under section 39 of the 2010 Act it is an offence to carry on a Licensable Marine Activity without a marine licence and it is also an offence to fail to comply with any condition of a marine licence.

1.6 Defences: actions taken in an emergency

Under section 40 of the 2010 Act it is a defence for a person charged with an offence under section 39(1) of the 2010 Act in relation to any activity to prove that –

- a) the activity was carried out for the purpose of saving life, or for the purpose of securing the safety of a vessel, aircraft or marine structure ('force majeure'), and
- b) that the person took steps within a reasonable time to inform the Licensing Authority as set out in section 40(2) of the 2010 Act.

1.7 Offences relating to information

Under section 42 of the 2010 Act it is an offence for a person to make a statement which is false or misleading in a material way, knowing the statement to be false or misleading or being reckless as to whether the statement is false or misleading, or to intentionally fail to disclose any material information for the purpose of procuring the issue, variation or transfer of a marine licence or for the purpose of complying with, or purporting to comply with, any obligation imposed by either Part 4 of the 2010 Act or the provisions of this licence.

2. PART 2 – PARTICULARS

2.1 Title of the Works

The title of the Works to which this licence relates to is the 'Shetland Tidal Array (as extended)'.

2.2 Description of the Works

An offshore tidal array, known as the Shetland Tidal Array, consisting of six bottom mounted, gravity anchored, non-yawing horizontal axis turbines (Nova M100 device) of 100 kW capacity each. Each tidal turbine comprises a cylindrical nacelle unit, rotor and gravity base to secure it to the seabed. Associated infrastructure, including subsea hub, inter-array cabling and a 1.2 km export cable connecting the Site to Cullivoe Pier.

As of the date of issue, three tidal turbines and three export cables have been deployed. Turbines 4, 5, 6, subsea hub and cable deployment are scheduled to take place in 2020. Reconfiguration of the array, including redeployment of turbines and associated infrastructure within the Site, will take place during 2021.

A configuration of the consented turbines, and associated infrastructure, is included at Part 4 of this Schedule.

2.3 Location of the Works

Located in the Bluemull Sound, Shetland within the Scottish marine area, near Cullivoe Harbour, within the area bounded by joining the following points:

60° 41.900' N 00° 59.150' W

60° 42.052' N 00° 58.847' W

60° 41.900' N 00° 58.847' W

60° 42.052' N 00° 59.150' W

Cable Landing Point:

60° 41.883' N 00° 59.933' W

2.4 Descriptions of the materials to be used during Licensed Activity and substances or objects to be deposited

This licence authorises the deposit of the undernoted substances and objects required in connection with the Works, subject to the maximum amounts as specified below:

TEMPORARY DEPOSITS*

Nova M100 Turbines

x6

Comprising of:

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Steel/Iron
Plastic/Synthetic
Concrete

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50 tonnes x 6 = 300 tonnes
30 m² x 6 = 180 m²
50 m³ x 6 = 300 m³

Cables	x7
Turbine 1 export cable	1,007m
Turbine 2 export cable	1,085m
Turbine 3 export cable	971m
Turbine 4 export cable	1,341m
Subsea hub export cable	1,351m
Turbine 5 jumper cable	110m
Turbine 6 jumper cable	110m
Subsea hub (sealed steel box containing electrical equipment)	1 tonne
Subsea Sensor Frames	4 x 500kg
Nortek Signature 500 Acoustic Doppler Current Profilers	x4

Less any deposits used under licence 04859/15/0, 04859/15/1, 06642/18/0 and 06642/20/0.

**indicative only*

2.5 Contractor and Vessel Details

The operators, vessels and vehicles engaging in the Works must be notified to the Licensing Authority under condition 3.1.2 prior to their engagement in the Works:

Name of Vessel or Vehicle Registration	Operator	Type(s)
C-Odyssey	Leask Marine	Multicat workboat
C-Fenna (relief vessel)	Leask Marine	Multicat workboat
BK Marjorie	BK Marine	Small multicat workboat
Aurora (relief vessel)	Aurora Marine	Small workboat
Aurora Quest (relief vessel)	Aurora Marine	Small workboat
Moder Dy (relief vessel)	NAFC	Small survey boat
Voe Jarl (relief vessel)	Delta Marine	Multicat workboat
Voe Vanguard (relief vessel)	Delta Marine	Multicat workboat
Aurora Venture (relief vessel)	Ocean Farm Services	Workboat
Brenda (relief vessel)	Malakoff	Workboat
Uskmoor (relief vessel)	Leask Marine	Workboat
Ruby May	Ocean Kinetics	Small survey boat
Compass Rose	Compass Rose Charters	Small survey boat
Oberon	Oberon Boat Charters	Small survey boat

2.6 Contractor and Vessel Details

The name and address of any agents, contractors or sub-contractors appointed to carry out any part, or all, of the Works must be notified to the Licensing Authority under condition 3.1.2 prior to their engagement in the Works:

Role	Company Name	Address	Contact Name
To be confirmed	To be confirmed	To be confirmed	To be confirmed

3. PART 3 – CONDITIONS

3.1 General Conditions

3.1.1 Compliance with the Application and approved plans

The Licensee must at all times construct, operate and maintain the Works in accordance with this Licence, the Application and supporting documentation submitted with the Application.

Reason: To ensure compliance with the marine licence, the application for the marine licence and the supporting information.

3.1.2 Licence conditions binding other parties

All conditions attached to this licence bind any person who for the time being owns, occupies or enjoys any use of the Works for which this licence has been granted in relation to those licensed activities authorised under item 5 in section 21(1) of the 2010 Act whether or not this licence has been transferred to that person.

Reason: To safeguard the obligations of the licence, in accordance with s.29(5) of the Marine (Scotland) Act 2010.

3.1.3 Vessels, vehicles agents, contractors and sub-contractors

The Licensee must provide, as soon as reasonably practicable in advance of their engagement in the Works authorised under this licence, the name and function of any vessel, vehicle, agent, contractor or sub-contractor appointed to engage in the Works to the Licensing Authority. Where applicable the notification must include the vessel type, vessel IMO number and vessel owner or operating company.

The Licensee must ensure that any changes to the supplied details must be notified to the Licensing Authority, in writing, 14 days prior to any vessel, vehicle, agent, contractor or subcontractor engaging in the Works.

The Licensee must ensure that only those vessels, vehicles, operators, agents, contractors or sub-contractors notified to the Licensing Authority are permitted to carry out any part of the Works.

The above details must be recorded in section 2.5 and 2.6 of this licence, if not provided at application these details and any subsequent changes will require a variation to the licence to update section 2.5 and 2.6 prior to engagement in the Works.

The Licensee must satisfy themselves that any masters of vessels or vehicle operators, agents, contractors or sub-contractors are aware of the extent of the Works for which this licence has been granted, the activity which is licensed and the terms of the conditions attached to this licence. All masters of vessels or vehicle operators, agents, contractors and sub-contractors permitted to engage in the Works must abide by the conditions set out in this licence.

The Licensee must give a copy of this licence, and any subsequent variations made to this licence in accordance with section 30 of the 2010 Act, to the masters of any vessels, vehicle operators, agents, contractors or sub-contractors permitted to engage in the Works and must ensure that the licence and any such variations are read and understood by those persons.

Reason: To ensure all parties involved in the Works are aware of the licence and its conditions to reduce the risk of a breach of the licence, in accordance with s.39(1)(b) of the 2010 Act.

3.1.4 Force Majeure

Should the Licensee or any of their agents, contractors or sub-contractors, by any reason of force majeure deposit anywhere in the marine environment any substance or object, then the Licensee must notify the Licensing Authority of the full details of the circumstances of the deposit within 48 hours of the incident occurring (failing which as soon as reasonably practicable after that period of 48 hours has elapsed). Force majeure may be deemed to apply when, due to stress of weather or any other cause, the master of a vessel or vehicle operator determines that it is necessary to deposit the substance or object other than at the Site because the safety of human life or, as the case may be, the vessel, vehicle or marine structure is threatened. Under Annex II, Article 7 of the Convention for the Protection of the Marine Environment of the

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North-east Atlantic, the Licensing Authority is obliged to immediately report force majeure incidents to the Convention Commission.

Reason: To provide a defence for the Master to protect himself and his crew in bad weather conditions, in accordance with s.29(2)(b) of the 2010 Act.

3.1.5 Material alterations to the licence application

The Licensee must, where any information upon which the granting of this licence was based has after the granting of the licence altered in any material respect, notify the Licensing Authority of this fact, in writing, as soon as is practicable.

Reason: To ensure that the Works are carried out in accordance with the Application documentation, in accordance with s.29(2)(a) of the 2010 Act.

3.1.6 Submission of plans and specification of studies and surveys to the Licensing Authority

The Licensee must submit plans and the details and specifications of all studies and surveys that are required to be undertaken under this licence in relation to the Works, in writing, to the Licensing Authority for their written approval. Commencement of the studies or surveys and implementation of plans must not occur until the Licensing Authority has given its written approval to the Licensee.

Plans or the specification of studies and surveys prepared pursuant to another consent or licence relating to the Works by the Licensee or by a third party may also be used to satisfy the requirements of this licence.

Reason: To ensure that the Licensing Authority is kept informed of the progress of the Works, in accordance with s.29(3)(c) of the 2010 Act.

3.1.7 Submission of reports and notifications to the Licensing Authority

The Licensee must submit all reports and notifications to the Licensing Authority, in writing, as are required under this licence within the time periods specified in this licence. Where it would appear to the Licensee that there may be a delay in the submission of the reports or notifications to the Licensing Authority, then the Licensee must advise the Licensing Authority of this fact as soon as is practicable and no later than the time by which those reports or notifications ought to have been submitted to the Licensing Authority under the terms of this licence.

The reports must include executive summaries, assessments and conclusions and any data will, subject to any rules permitting non-disclosure, be made publically available by the Licensing Authority or by any such party appointed at their discretion.

Reports prepared pursuant to another consent or licence relating to the Works by the Licensee or by a third party may also be used to satisfy the requirements of this licence.

Such reports will include, but not be limited to, Transportation Audit Reports and annual reports as stipulated with the PEMP.

Reason: To ensure that all reports and notifications are submitted within a reasonable timescale after the licence is granted, in accordance with s.29(3)(c) of the 2010 Act.

3.1.8 Chemical usage

The Licensee must ensure that all chemicals which are to be utilised in the Works have been approved prior to use. All chemicals which are to be utilised in the Works must be selected from the List of Notified Chemicals assessed for use by the offshore oil and gas industry under the Offshore Chemicals Regulations 2002 (as amended) or as exempted for sealed units. The Licensee must submit a report of all chemicals and quantities to be used (e.g. oils and fluorinated gases) during the construction and operation of the works to the Licensing Authority no later than one calendar month prior to the Commencement of the Works. Any changes to the types of chemicals which are proposed to be utilised must be consulted on with the Licensing Authority before the Commencement of the Works or; as the case may be, after the Commencement of the Works but prior to their utilisation.

Reason: To minimise the environmental impact in the event of a release through the use of authorised chemicals in the interest of protecting the environment, in accordance with s.29(2)(b) of the 2010 Act.

3.1.9 Fluorinated greenhouse gases

The Licensee must ensure that all equipment to be utilised in the Works that contains fluorinated greenhouse gases (hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and other greenhouse gases that contain fluorine, listed in Annex I of Regulation (EU) 517/2014 and The Fluorinated Greenhouse Gases Regulations 2015 (the Regulations), or mixtures containing any of those substances) must take precautions to prevent the unintentional release ('leakage') of those gases. They must take all measures which are technically and economically feasible to minimise leakage of fluorinated greenhouse gases.

Where a leakage of fluorinated greenhouse gases is detected, the Licensee must ensure that the equipment is repaired without undue delay.

The Licensee must ensure that all equipment to be utilised in the Works that contains fluorinated greenhouse gases in quantities of 5 tonnes of CO₂ equivalent or more and not contained in foams must ensure that the equipment is checked for leaks in accordance with Annex 4 of the Regulations. Records of leak checks must be kept in accordance with Annex 6 of the Regulations. These records must be submitted to the Licensing Authority annually, and immediately in the event of discovery of any leak.

Where the equipment is subject to leak checks under Article 4(1) of the Regulations, and a leak in the equipment has been repaired, the Licensee must ensure that the equipment is checked by a certified person within one calendar month after the repair to verify that the repair has been effective. In such event, the Licensing Authority must be informed of the date of discovery, date of repair and date of inspection.

Reason: to ensure compliance of the Works with Regulation (EU) 517/2014 and The Fluorinated Greenhouse Gases Regulations 2015, in accordance with s.29(2)(b) of the 2010 Act.

3.1.10 Environmental protection

The Licensee must ensure that all reasonable, appropriate and practicable steps are taken at all times to avoid or minimise any damage to the Scottish marine area caused as a result of the undertaking of the licensed activities.

The Licensee must ensure that all personnel adhere to the Scottish Marine Wildlife Watching Code (SMWWC; www.marinecode.org) where appropriate during all installation, operation and maintenance activities authorised under this licence.

The Licensee must ensure that any debris or waste material placed below MHWS during the construction of the Works are removed from the Site, as soon as is reasonably practicable, for disposal at a location above the MHWS approved by the Scottish Environment Protection Agency ("SEPA").

The Licensee must ensure that all substances and objects deposited during the execution of the Works are inert (or appropriately coated or protected so as to be rendered inert) and do not contain toxic elements which may be harmful to the marine environment, the living resources which it supports or human health.

The Licensee must ensure that the risk of transferring marine non-native species to and from the Site is kept to a minimum by ensuring appropriate bio-fouling management practices are implemented during the Works.

The Licensee must ensure that if oil based drilling muds are utilised they must be contained within a zero discharge system. Any drill cuttings associated with the use of water-based drilling muds situated within Site of the Works need not be removed from the seabed.

Reason: To ensure environmental impacts are minimised, in accordance with s.29(2)(b) of the 2010 Act.

3.1.11 Availability of the licence for inspection

The Licensee must ensure that copies of this licence and any subsequent amendments or variations are available for inspection at any reasonable time by any authorised by the Licensing Authority at:

- a) the premises of the Licensee;
- b) the premises of any agent, contractor or sub-contractor acting on behalf of the Licensee;
- c) any onshore premises directly associated with the Works; and
- d) aboard any vessels permitted to engage in the Works.

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Reason: To ensure the licence is available for the purpose of inspection, in accordance with s.29(2)(b) of the 2010 Act.

3.1.12 Inspection of the Works

Any persons authorised by the Licensing Authority, must be permitted to inspect the Works at any reasonable time. The Licensee must, as far as reasonably practicable, on being given reasonable notice by the Licensing Authority (of at least 72 hours), provide transportation to and from the Site for any persons authorised by the Licensing Authority to inspect the Site/Works.

Reason: To ensure access to the Site for the purpose of inspection, in accordance with s.29(2)(b) of the 2010 Act.

3.1.13 Emergencies

If the assistance of a Government Department (to include departments of Administrations other than the Scottish Government) is required to deal with any emergency arising from:

- a) the failure to mark and light the Works as required by this licence;
- b) the maintenance of the Works; or
- c) the drifting or wreck of the Works, to include the broadcast of navigational warnings, then the Licensee is liable for any expenses incurred in securing such assistance.

Reason: To ensure licensee is aware of financial liabilities, in accordance with s.29(2)(b) of the 2010 Act.

3.2.1 Conditions applicable to all phases of the Works

3.2.1.1 Project Environmental Monitoring Programme ("PEMP")

The Licensee must, within three months of the issue date of this licence, unless otherwise agreed with the Licensing Authority, submit a Project Environmental Monitoring Programme ("PEMP"), in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with Scottish Natural Heritage ("SNH"), Shetland Islands Council ("SIC") and Whale and Dolphin Conservation ("WDC"), and any other ecological advisors or organisations as required at the discretion of the Licensing Authority. The PEMP must be in accordance with the Application as it relates to environmental monitoring.

The PEMP must set out measures by which the Licensee must monitor the environmental impacts of the Works. Monitoring is required throughout the lifespan of the tidal array where this is deemed necessary by the Licensing Authority. Lifespan in this context includes preconstruction, construction, maintenance and operational phases.

The Licensing Authority must approve all initial methodologies for the above monitoring, in writing and, where appropriate, in consultation with SNH, SIC and WDC.

Monitoring must be done in such a way so as to ensure that the data which is collected allows useful and valid comparisons between different phases of the Works.

Monitoring may also serve the purpose of verifying key predictions in the Application. In the event that further potential adverse environmental effects are identified, for which no predictions were made in the Application, the Licensing Authority may require the Licensee to undertake additional monitoring.

The PEMP must cover, but not be limited to, the following matters:

a. pre-construction, construction, operation and maintenance monitoring or data collection as relevant in terms of the environmental assessment report and any subsequent monitoring or data collection for:

- 1. Marine mammals
- 2. Birds

The PEMP is a live document and must be regularly reviewed by the Licensing Authority, at timescales to be determined by them to identify the appropriateness of ongoing monitoring. Following such reviews, the Licensing Authority may require the licensee to amend the PEMP and submit such an amended PEMP, in writing, to the Licensing Authority, for their written approval. Such approval may only be granted following consultation with SNH,

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WDC and SIC, and any other ecological, or such other advisors as may be required at the discretion of the Licensing Authority.

The Licensee must submit monitoring reports detailing bird and marine mammal observations, as well as associated raw data of said monitoring or data collection, to the Licensing Authority at timescales to be determined by them. Subject to any legal restrictions regarding the treatment of the information, the results are to be made publicly available by the Licensing Authority, or by such other party appointed at their discretion. Where it would appear to the Licensee that there may be a delay in the submission of the reports or notifications to the Licensing Authority, then the Licensee must advise the Licensing Authority of this fact as soon as is reasonably practicable, and no later than the time by which those reports or notifications ought to have been submitted to the Licensing Authority under the terms of the licence or the reporting strategy contained within the PEMP.

Where appropriate and reasonable, the PEMP must also take account of, and implement recommendations from, the Construction Method Statement ("CMS") and any other such plans required by the terms of this licence.

The Licensing Authority may agree, in writing, that monitoring may be reduced or ceased before the end of the lifespan of the Works.

Reason: To ensure that appropriate and effective monitoring of the impacts of the Works is undertaken, in accordance with s.29(3)(c) of the 2010 Act.

3.2.1.2 Incident Reporting

In the event of any breach of health and safety or environmental obligations relating to the Works during the period of this licence, the Licensee must provide written notification of the nature and timing of the incident to the Licensing Authority, including confirmation of remedial measures taken and/ or to be taken to rectify the breach, within 24 hours of the incident occurring.

Reason: To keep the Licensing Authority informed of any such incidents which may be in the public interest, in accordance with s.29(3)(c) of 2010 Act.

3.2.1.3 Bunding and storage facilities

The Licensee must ensure suitable bunding and storage facilities are employed to prevent the release of fuel oils and lubricating fluids associated with the plant and equipment into the marine environment

Reason: To ensure pollution prevention is undertaken, in accordance with s.29(2)(b) of the 2010 Act.

3.2.1.4 Restoration of the Site to its original condition

The Licensee must take all reasonable, appropriate and practicable steps 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, in accordance with the Project Environmental Monitoring Plan ("PEMP") and the Decommissioning Programme ("DP") to the satisfaction of the Licensing Authority. Should the Works be discontinued prior to expiry date of this marine licence, the Licensee must inform the Licensing Authority in writing of the discontinuation of the Works. A marine licence application will be required for the removal of Works.

Reason: To mitigate the effects of the activity on the Site, in accordance with s.29(3)(e) of the 2010 Act.

3.2.1.5 Emergency Response Co-operation Plans ("ERCoP")

The Licensee must, in discussion with the Maritime and Coastguard Agency's ("MCA") Search and Rescue Branch, complete an Emergency Response Co-operation Plan ("ERCoP") for the construction and operation phases. The ERCoP must include full details for the construction and operation phases of the authorised scheme in accordance with MCA recommendations contained within Marine Guidance Notice ("MGN") 543 (or subsequent updates). A copy of the final plan must be submitted to the Licensing Authority no later than 3 Calendar months, or at such a time as agreed with the Licensing Authority, prior to the Commencement of the Works.

Reason: To ensure the Licensing Authority is aware of the ERCoP, in accordance with s.29(3)(c) of the 2010 Act.

3.2.2 Prior to the commencement of the Works (including deployment of single turbines or associated infrastructure and the movement and redeployment of turbines and associated infrastructure)

3.2.2.1 Commencement date of the Works

The Licensee must, prior to and no less than 1 calendar month before the Commencement of the Works, notify the Licensing Authority, in writing, of the date of deployment authorised under this Licence.

Reason: To inform the Licensing Authority of the commencement date of the Works, in accordance with s.29(3)(c) of the 2010 Act.

3.2.2.2 Decommissioning

Where the appropriate authority has, following consultation with the Licensing Authority, given notice requiring the Licensee to submit to the appropriate authority a Decommissioning Programme ("DP"), pursuant to section 105(2) and (5) of the Energy Act 2004, then construction of the Works may not begin until after the Licensee has submitted to the appropriate authority a DP in compliance with that notice.

Reason: To ensure the decommissioning and removal of the works in an appropriate and environmentally acceptable manner, and in the interests of safety and environmental protection in accordance with s.29(3)(d) of the 2010 Act.

3.2.2.3 Construction Method Statement

The Works must, at all times, be constructed in accordance with the Construction Method Statement ("CMS") as submitted at Application within the Schedule and Method Statement. Any updates or amendments made to the submitted CMS must be submitted, in writing, to the Licensing Authority for their prior written approval.

Reason: To ensure that the Works are carried out in accordance with the Application, in accordance with s.29(3)(a) of the 2010 Act.

3.2.2.4 Cable Plan

The Licensee must, within three months of the issue date of this licence, submit a Cable Plan ("CaP") (to include Cable Protection Risk Assessment) in writing, to the Licensing Authority for their written approval. Such approval may only be granted following consultation by the Licensing Authority with SNH and any such other advisors or organisations as may be required at the discretion of the Licensing Authority. The CaP must be in accordance with the Environmental Assessment Report.

Any consented cable protection works must ensure existing and future safe navigation is not compromised. The Licensing Authority will accept a maximum of 5% reduction in surrounding depth referenced to Chart Datum.

3.2.2.5 Noise Registry

The licensee must complete and submit a Proposed Activity Form in the online Marine Noise Registry for all aspects of the Works that will produce loud, low to medium frequency (10Hz-10kHz) impulsive noise no later than 7 days prior to Commencement of the Works. If any aspects of the Works differ from the Proposed Activity Form in the online Marine Noise Registry, the licensee must complete and submit a new Proposed Activity Form no later than 7 days prior to Commencement of Works.

Reason: To ensure compliance with reporting requirements on marine noise, in accordance with s.29(3)(c) of the 2010 Act.

3.2.2.6 Navigation and Charting

The Licensee must, no later than 1 month prior to Commencement of the Works, notify the UK Hydrographic Office ("UKHO") of the proposed works to facilitate the promulgation of maritime safety information and updating of Admiralty Chart 3292 and publications through the national Notice to Mariners system.

The Licensee must, no later than 1 calendar month prior to Commencement of the Works, ensure that local mariners, fishermen's organisations and HM Coastguard, in this case The National Maritime Operations Centre (nmcontroller@hmcg.gov.uk), are made fully aware of the Works through local Notice to Mariners or by any other appropriate means, in consultation with Shetland Ports and Harbours.

The Licensee must ensure that details of the Works are promulgated in the Kingfisher Fortnightly Bulletin, no later than 1 calendar month prior to the Commencement of the Works to inform the Sea Fish Industry of the vessel

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routes, the timings and the location of the Works and of the relevant operations.

The Licensee must, no later than **8** weeks prior to the Commencement of the Works, complete an "Application for Statutory Sanction to Alter / Exhibit" form and submit this to the Northern Lighthouse Board ("NLB") for the necessary sanction to be granted.

The Licensee must, no later than **3** months prior to the Commencement of the Works, submit a Navigational Risk Assessment for approval by the Licensing Authority, in consultation with the NLB and MCA and any other such advisors as required at the discretion of the Licensing Authority. The Licensee must ensure that the Works are carried out in accordance with the agreed Navigational Risk Assessment.

The Licensee must gain the approval/agreement of the responsible local navigation authority or the Harbour Authority/Commissioners/Council prior to the Commencement of the Works. If deemed necessary, the responsible local navigation authority or Harbour Authority/Commissioners/Council may require the issue of local warnings to alert those navigating in the vicinity to the presence of the Works.

The Licensee must, no later than **1** calendar month prior to the Commencement of the Works, ensure that the details of these Works are made available for inclusion in the Clyde Cruising Club Sailing Directions and Anchorages, if necessary.

Reason: To reduce the navigational risk to other legitimate users of the sea, in accordance with s.29(2)(b) of the 2010 Act.

3.2.2.7 Third Party Certification or Verification

The Licensee must, no later than **3** calendar months prior to the Commencement of the Works, provide the Licensing Authority with Third Party Certification or Verification ("TPC" or "TPV") (or a suitable alternative as agreed in writing with the Licensing Authority) e.g. of the basis of design of the device and turbine base.

Reason: To provide independent certification or verification of the technology, materials or equipment, in accordance with s.29(2)(b) of the 2010 Act.

3.2.3 During the Construction of the Works (including deployment of turbines and associated infrastructure and the redeployment or movement of turbines and associated infrastructure)

3.2.3.1 Transportation audit sheet

The Licensee must submit to the Licensing Authority a detailed transportation audit sheet for each calendar month during the period when construction of the Works is actively undertaken. This sheet must be submitted within 14 days of the end of each calendar month. It must cover all aspects of the construction of the Works. The transportation audit sheet must include, but not be limited to, information on the loading facility, vessels, equipment, shipment routes, schedules and all materials deposited (as described in Part 2 of this licence) in that calendar month. Where, following the submission of a transportation audit sheet to the Licensing Authority, any alteration is made to the component parts of the transportation audit sheet, the Licensee must notify the Licensing Authority of the alteration in the following month's transportation audit sheet. Where appropriate, nil returns must be provided.

If the Licensee becomes aware of any substances or objects on the transportation audit sheet that are missing, or becomes aware that an accidental deposit has occurred, the Licensee must contact the Licensing Authority as soon as practicable after becoming aware, for advice on the appropriate remedial action (which may include requiring charts to be amended to show such deposits). Should the Licensing Authority deem it necessary, the Licensee must undertake a side scan sonar survey in grid lines (within operational and safety constraints) across the area of the Works, to include cable routes and vessel access routes from local service port(s) to the Site to locate the substances or objects. If the Licensing Authority is of the view that any accidental deposits associated with the construction of the works are present, then the deposits must be removed by the Licensee as soon as is practicable following the giving of such a view by the Licensing Authority, and at the Licensee's expense.

Reason: To confirm that the deposits made were in accordance with the application documentation, and that any accidental deposits are recovered or charted appropriately in accordance with s.29(3)(c) of the 2010 Act.

3.2.3.2 Nature and quantity of deposited substances and objects

The Licensee must, in addition to the transportation audit sheets which are required to be submitted to the Licensing Authority under condition 3.2.3.1 following the Commencement of the Works, submit audit reports, in writing, to the

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Licensing Authority, stating the nature and quantity of all substances and objects deposited below MHWS under the authority of this licence. Such audit reports must be submitted by the Licensee at six-monthly intervals, with the first such report being required to be submitted on a date no later than 1 month following the Commencement of the Works. Where appropriate, nil returns must be provided.

Reason: To confirm that the deposits made were in accordance with the application documentation, in accordance with s.29(3)(c) of the 2010 Act.

3.2.3.3 Navigational Safety

The Licensee must notify the UKHO of the progress of the Works to facilitate the promulgation of maritime safety information and updating of Admiralty Chart 3292 and publications through the national Notice to Mariners system.

The Licensee must notify local mariners, fishermen's organisations and HM Coastguard, in this case The National Maritime Operations Centre (nmcontroller@hmcg.gov.uk), on a weekly basis of the progress of Construction of the Works through local Notice to Mariners or any other appropriate means in consultation with Shetland Ports and Harbours.

The Licensee must in the case of damage to, or destruction or decay of, the Works, notify the Licensing Authority, in writing, as soon as reasonably practicable, following such damage, destruction or decay. The Licensee must carry out any remedial action as required by the Licensing Authority, and intimated to the Licensee in writing, which may include any requirement to display aids to navigation, following consultation with the MCA, the NLB or any such advisers as required by the Licensing Authority.

The Licensee must ensure that any vessels permitted to engage in the Works are marked in accordance with the International Rules for the Prevention of Collisions at Sea whilst under way, and in accordance with the UK Standard Marking Schedule for Offshore Installations if the vessel is secured to the seabed.

The Licensee must ensure that no radio beacon or radar beacon operating in the marine frequency bands is installed or used on the Works without the prior written approval of the Office of Communications ("OfCom").

The Licensee must ensure that navigable depth is not altered by more than 5% referenced to Chart Datum unless otherwise agreed, in writing, with the Licensing Authority in consultation with the MCA and NLB. Under no circumstances will the depth reduction compromise safe navigation.

The Licensee must ensure that all turbines are installed at a depth to ensure 15 meters minimum clearance above the turbine blades relative to LAT.

The Licensee must ensure that the works do not encroach on any recognised anchorage, either charted or noted in nautical publications, within the consented area.

Reason: To reduce the navigational risk to other legitimate users of the sea, in accordance with s.29(2)(b) of the 2010 Act.

3.2.3.4 Markings, lighting and signals of the Works

The Licensee must ensure that the Works are marked and lit in accordance with the requirements of the NLB at all times and such markings and/or lighting must be continued unless and until such time as the Licensing Authority, by notice, relevantly varies this licence under section 30(3)(c) of the 2010 Act.

The Licensee must not display any marks and lights additional to those required by virtue of this licence without the written approval of the Licensing Authority following consultation with the NLB and MCA.

Reason: To ensure safe appropriate marking and lighting of the offshore Works, in accordance with s.29(2)(b) of the Marine (Scotland) Act 2010.

3.2.4 Conditions upon Completion of the Works (including deployment of turbines and associated infrastructure and redeployment or movement of turbines and associated infrastructure)

3.2.4.1 Date of Completion of the Works

The Licensee must, no later than **1** calendar month following the deployment of single turbines and associated infrastructure and the movement or redeployment of turbines and associated infrastructure notify the Licensing Authority, in writing, of the date of Completion.

The Licensee must, no later than **1** calendar month following the Final Deployment of the Works, notify the Licensing Authority, in writing.

Reason: To inform the Licensing Authority of the completion of the works, in accordance with s.29(3)(c) of the 2010 Act.

3.2.4.2 Nature and quantity of deposited substances and objects

The Licensee must, no later than **1** calendar month following the Completion of the Works and the Final Deployment of the Works submit a final audit report, in writing, to the Licensing Authority stating the nature and quantity of all substances and objects deposited below MHWS within the Scottish marine area under the authority of this licence. Where appropriate, nil returns must be provided.

Reason: To confirm that the deposits made were in accordance with the Application, in accordance with s.29(3)(c) of the 2010 Act.

3.2.4.3 Noise Registry Close Out

The licensee must complete and submit a Close-out Report for all aspects of the Works that produced loud, low to medium frequency (10Hz-10kHz) impulsive noise in the online Marine Noise Registry no later than 12 weeks following the Final Deployment of the Works.

Reason: To ensure compliance with reporting requirements on marine noise, in accordance with s.29(3)(c) of the 2010 Act.

3.2.4.4 Navigational Safety

The Licensee must notify the UKHO of the deployment of each turbine and associated infrastructure, the movement and redeployment of turbines and associated infrastructure and of the Final Deployment of the Works to facilitate the promulgation of maritime safety information and updating of Admiralty Chart 3292 and publications through the national Notice to Mariners system.

The Licensee must, within 1 month of deployment of each turbine, and following the movement and redeployment of the turbines and associated infrastructure and the Final Deployment of the Works, provide the “as-installed” or “as-reconfigured” turbine location(s) and associated infrastructure and minimum water depth to the UKHO for nautical charting purposes.

The Licensee must ensure that local mariners, fishermen’s organisations, Shetland Ports and Harbours and HM Coastguard, in this case The National Maritime Coastguard Centre (nmcontroller@hmcg.gov.uk), are made fully aware of the deployment of each turbine, reconfiguration of the turbine array and Final Deployment of the Works.

The Licensee must ensure that the deployment of each turbine and associated infrastructure, movement and redeployment of the turbines and the associated infrastructure, and the Final Deployment of the Works is promulgated in the Kingfisher Fortnightly Bulletin to inform the Sea Fish Industry.

The Licensee must, where any damage, destruction or decay is caused to the Works, notify the Licensing Authority, in writing, of such damage, destruction or decay as soon as reasonably practicable following such damage, destruction or decay. The Licensee must carry out any remedial action which the Licensing Authority advises the Licensee, in writing, as requiring to be taken, which may include a requirement to display aids to navigation, following consultation by the Licensing Authority with the MCA, the NLB or any such advisers as required.

The Licensee must ensure that the devices are actively monitored during the Operation and Maintenance phases. The Licensee must ensure that a contingency plan is in place to respond to any reported catastrophic failures which may result in the devices, or part(s) of the device(s), breaking loose and becoming a buoyant hazard. This contingency plan should include the transmission of local Radio Navigation Warnings.

The Licensee must ensure that no radio beacon or radar beacon operating in the marine frequency bands is installed or used on the Works without the prior written approval of the Office of Communications (“Ofcom”).

The Licensee must not exhibit, alter or discontinue navigational lighting of the Works without the Statutory

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Sanction of the Commissioners of Northern Lighthouses An 'Application for Statutory Sanction to Exhibit/Discontinue' form must be completed by the Licensee as fully as possible and returned to the Northern Lighthouse Board via e-mail to navigation@nlb.org.uk for the necessary sanction to be granted prior to exhibiting, altering or discontinuing navigational lighting.

Reason: To reduce the navigational risk to other legitimate users of the sea, in accordance with s.29(2)(b) of the 2010 Act.

3.2.4.5 Markings, lighting and signals of the Works

The Licensee must ensure that if it is desired to display any marks or lights not required by this licence then details shall be submitted to the NLB and their ruling complied with. The display of unauthorised marks or lights is prohibited.

Reason: To ensure safe appropriate marking and lighting of the offshore Works, in accordance with s.29(2)(b) of the 2010 Act.

3.2.4.6 Operation and Maintenance of the Works

The Licensee must operate and maintain the Works in accordance with the submitted Method Statement and Schedule, as supplied at Application. Any updates or amendments made to submitted Method Statement and Schedule must be submitted, in writing, to the Licensing Authority for their prior written approval.

The Licensee must ensure that the Communications Strategy, submitted within the Schedule and Method Statement at Application, is implemented during pre-operation and postoperation. Any updates or amendments made to the submitted Communication Strategy must be submitted, in writing, to the Licensing Authority for their prior written approval.

The Licensing Authority must be notified at least 1 calendar month in advance of the movement and redeployment of the turbines and associated infrastructure or of any maintenance of the Works. In the event that these works are not covered by the licence and are considered by the Licensing Authority as being material and being licensable marine activities then the works will require a new Marine Licence.

The Licensee must ensure that the devices are actively monitored during the Operation and Maintenance phases. The Licensee must ensure that a contingency plan is in place to respond to any reported catastrophic failures which may result in the devices, or part(s) of the device(s), breaking loose and becoming a buoyant hazard. This contingency plan should include the transmission of local Radio Navigation Warnings.

Reason: To ensure compliance with the approved OMP to prevent decay of the Works and to ensure that any maintenance work is carried out under an appropriate licence in accordance with s.29(3)(b) of the 2010 Act.

3.3 Removal of the Works

This licence does not permit the Removal of the Works, for which a separate marine licence is required. The Licensee must, no later than 3 months prior to any proposed removal works, submit a plan for the Removal of the Works, in writing, to the Licensing Authority, along with a marine licence application for the Removal of the Works. Removal of the Works must not occur until the Licensing Authority has given its prior written approval to the plan and issued a marine licence.

Reason: To ensure that removal of works is carried out under an appropriate licence, in accordance with s.29(3)(a) of the 2010 Act.

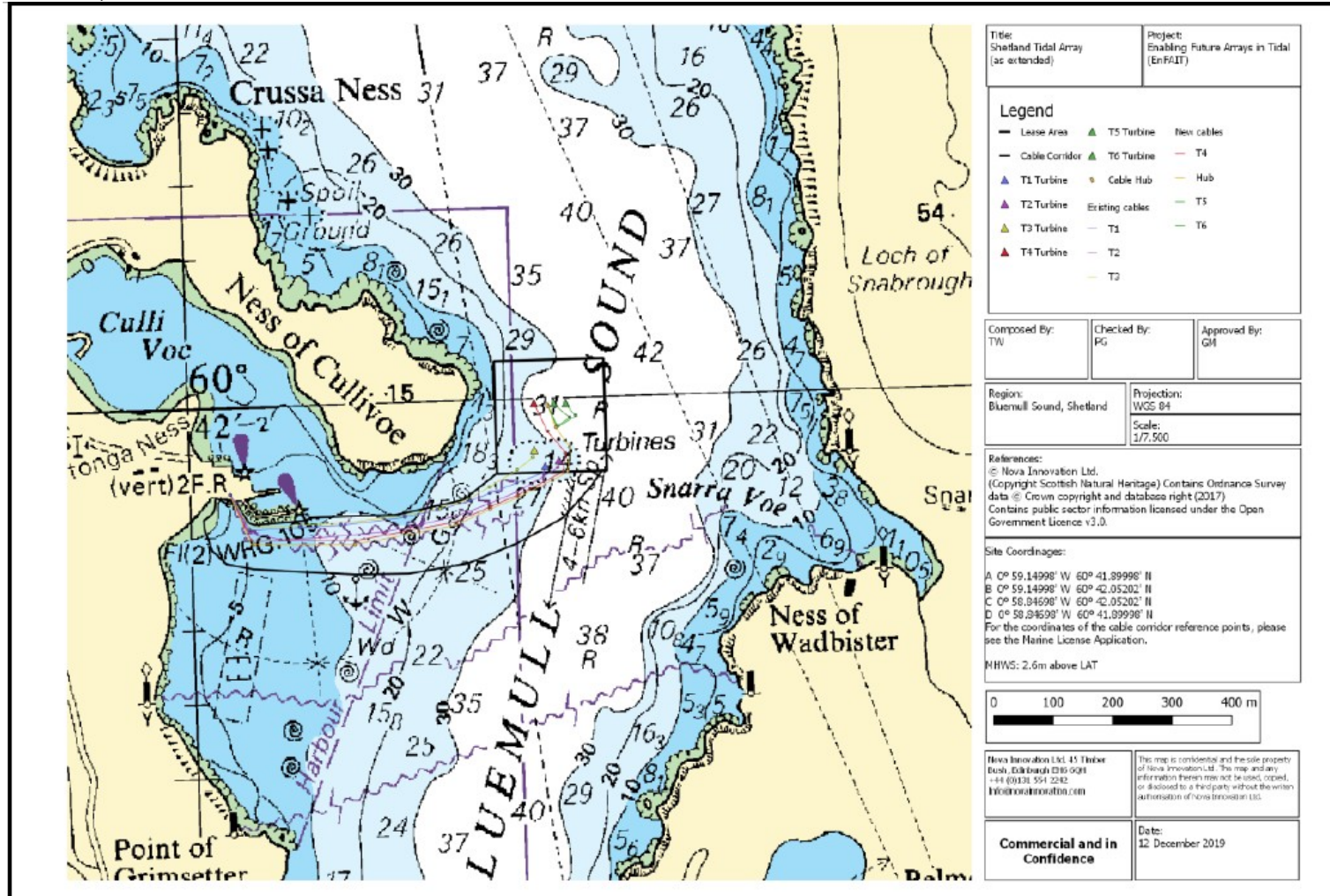
3.4 Decommissioning

This licence does not permit the Decommissioning of the Works, for which a separate marine licence is required.

Reason: To ensure that decommissioning is carried out according to the approved decommissioning programme under an appropriate licence, in accordance with s.29(3)(d) of the 2010 Act.

NOTES

1. You are deemed to have satisfied yourself that there are no barriers, legal or otherwise, to the carrying out of the licensed activity. The issue of the licence does not absolve the licensee from obtaining such authorisations, consents etc which may be required under any other legislation.
2. In the event that the licensee wishes any of the particulars set down in the Schedule to be altered, the licensing authority must be immediately notified of the alterations. It should be noted that changes can invalidate a licence, and that an application for a new licence may be necessary.

4. PART 4 – PROJECT LOCATION**Figure 1 – Nova Innovations Ltd Project Location showing Licence Boundary and Turbine Layout at the Shetland Tidal Array Site, Bluemull Sound, Shetland**

Source: Copyright © Nova Innovation 2020



SHETLAND ISLANDS COUNCIL

Zetland County Council Act 1974

With reference to the application for a **Works Licence** (described below) under the above Act, the Shetland Islands Council in exercise of these powers hereby **GRANT a Works Licence** for the development, in accordance with the particulars given in, and the plans accompanying the application as are identified; subject to the site specific conditions and the standard terms and conditions specified below. The Licence takes effect from the date of this decision (the "Effective Date"), notwithstanding the date of the signing of the Licence.

Applicant

Nova Innovation Ltd
45 Timber Bush
Leith
Edinburgh
EH6 6QH

Reference Number: 2018/021/WL

Development: To vary an existing works licence 2018/002/WL by changing condition number 12 by changing the distance allowed to deploy turbines of the array from existing cables from 250m to 200m

Location: Cullivoe, , Bluemull Sound, Yell

Effective Date: 26th August 2013

Expiry Date: 26th August 2022

Development Services
Shetland Islands Council
8 North Ness Business Park
Lerwick
Shetland
ZE1 0LZ

<p>PLEASE LOOK AT THE IMPORTANT INFORMATION ON THE BACK OF THIS SHEET AND ON THE ATTACHED SHEET</p>
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IMPORTANT INFORMATION

In terms of Section 13 of the Zetland County Council Act 1974, any applicant who is aggrieved by any terms or conditions subject to which the Licence is granted or any modifications required by the Council in the plans, sections and particulars submitted with the application, may, within 28 days of notification of the decision appeal to the Scottish Ministers. Such an appeal shall be made by notice in writing, stating the grounds of the appeal, and be sent to the following address:

Scottish Government Directorate for the Built Environmental
Planning Decisions North
Area 2-H (South)
Victoria Quay
Edinburgh
EH6 6QQ

Tel: 0131 244 7072

A Copy of the notice should also be sent to the Coastal Zone Manager at the address shown overleaf.

Details of Approved Plans and Drawings:

- Proposed Layout 01 Stamped Received 24.09.2018
- Cable Location Plan 02 Stamped Received 24.09.2018
- Cable Waypoints 03 Stamped Received 24.09.2018
- Tidal Array, Tidal Turbine 04 Stamped Received 24.09.2018

Reasons for Council's decision:

- (1.) Although contrary to policies MSP ACBP1 and MSP CBP1 of Supplementary Guidance Shetland Islands' Marine Spatial Plan (Fourth Edition 2015), in this case there will be no interference between the turbines and existing/proposed cables at a reduced distance of 200m and this has been agreed with the relevant cables owners. Thus it is acceptable for policies MSP ACBP1 and MSP CBP1 to be set aside in this instance and site-specific condition no. 12 of existing works licence 2018/002/WL can be modified, with the distance of the tidal turbines from cables being reduced from 250m to 200m.

Site Specific Conditions:

- (1) The development hereby permitted shall not be carried out other than wholly in accordance with the approved plans and details (as may be amended and/or expanded upon by a listed document following afterward) unless previously approved in writing by the Planning Authority.

Reason: For the avoidance of doubt as to what is being authorised by this permission.

- (2) All turbines must be installed at a depth to ensure at least 15 metres minimum clearance above the turbine blades relative to lowest astronomical tide (LAT).

During all phases of work adequate notice should be given to the mariner in consultation with Shetland Ports and Harbours. Any Notices to Mariners or Local Radio Navigation Warnings should clearly state the nature and duration of the works.

Whilst the devices are in their operation/maintenance phase, the condition of the devices should be actively monitored, and a contingency plan put in place to respond to any reported catastrophic failure events which could see the devices or parts of the devices breaking loose and coming to the surface as a buoyant hazard. This should include the transmission of local Radio Navigation Warnings.

Reason: To ensure safe navigation.

- (3) During the lifespan of this works licence the sea area around the array should be monitored to assess the effect of the device, if any, on the movements of seabirds and marine mammals. The survey methodology should be agreed with Shetland Islands Council under advisement from Scottish Natural Heritage.

The developer must submit before installation of the sixth turbine or movement of the existing turbines a Project Environmental Monitoring Programme (PEMP) detailing the activities that will be carried out to improve the evidence based on the environmental impacts of the array on the environment, which in turn will inform the ongoing management of the project. Monitoring will be used to identify risk factors for key impacts such as collision risk. Central to the PEMP will be the use of video monitoring to observe underwater interactions of wildlife with the turbines.

The PEMP will be developed and agreed in writing by Shetland Islands Council with guidance from Marine Scotland and Scottish Natural Heritage.

Reason: To mitigate the risk of injury or death for diving marine birds and mammals.

- (4) Siting of turbines and associated cables should be undertaken utilising some form of visual feedback system, such as a camera or ROV, so that they are not placed in or on maerl or horse mussel beds.

Reason: To protect maerl and horse mussel beds.

- (5) For the tidal array the Construction Method Statement (CMS) provided to Shetland Islands Council under Works Licence 2013/001/WL will be adhered to. This includes details of commencement dates, duration and phasing of key elements of construction, final geo-locational details for the device foundations and associated infrastructure, vessel management plan (VMP) and pollution prevention measures, and should be cross-referenced with the Environmental Management and Mitigation Plan (EMMP). The purpose of the construction method statement should also be clear, and the inter-relationship with the Project Environmental Management Plan fully explained.

Any redeployment of any of the devices or associated cables will only be within the applied for mooring box area as approved and must be submitted to Shetland Islands Council for approval before redeployment.

Reason: To fully inform the deployment location of the devices and to prevent any impact on the environment.

- (6) For the tidal array the Project Environmental Monitoring Plan (PEMP) provided under Works Licence 2013/001/WL will be adhered to. This iterative document accounts for final details within the CMS. The PEMP will take account of the CMS, phased approach and operation and maintenance aspects and provide detailed information on how environmental interests are being considered.

Reason: To protect the environment and ensure best practice is followed.

- (7) For the tidal array a benthic survey to identify the location and extent of any benthic habitat or species on the recommended Priority Marine Features list should be submitted and agreed with Shetland Islands Council prior to commencement of works. This information should be used to identify any micro-siting of device foundations and final turbine layout/location of all infrastructure. Details should be within the PEMP and cross referenced with the CMS as appropriate.

Reason: To avoid unnecessary impacts upon sensitive features of the benthic environment and to ensure consent is based on a known design envelope.

- (8) During all marine and coastal works, adherence to the good practice guidelines associated with the Scottish Marine Wildlife Watching Code SMWWC (www.marinecode.org) is required.

Reason: To reduce or avoid any unnecessary disturbance impacts upon wildlife.

- (9) To minimise the introduction and spread of marine non-native species good practice measures should be used, as per the following guidance: Scottish Government Code of Practice: (www.scotland.gov.uk/Resource/0039/00393567.pdf) and International Maritime Organisation guidelines: (www.mardep.gov.hk/en/msnote/pdf/msin1136anx1.pdf).

Reason: To minimise the risk of introducing or supporting the settlement of non-native species.

- (10) In the event of the works falling into disrepair or becoming damaged, adrift, stranded, abandoned or sunk in such a manner as to cause an obstruction or danger to navigation, the developer shall carry out or make suitable arrangements for the carrying out of all measures necessary for lighting, buoying, raising, repairing, moving or destroying, as appropriate, the whole or any part of the equipment so as to remove the obstruction or danger to navigation.

Reason: In the interest of navigational safety.

- (11) The developer must submit before installation of the sixth turbine or movement of the existing turbines a Project Environmental Monitoring Programme (PEMP) detailing the activities that will be carried out to improve the evidence based on the environmental impacts of the array on the environment, which in turn will inform the ongoing management of the project. Monitoring will be used to identify risk factors for key impacts such as collision risk. Central to the PEMP will be the use of video monitoring to observe underwater interactions of wildlife with the turbines.

The PEMP will be developed and agreed in writing by Shetland Islands Council with guidance from Marine Scotland and Scottish Natural Heritage.

Reason: For the avoidance of doubt as to what is being authorised by this permission, to ensure the development will not adversely affect the integrity and conservation objectives of Bluemull and Colgrave Sounds proposed Special Protection Area, Hermaness, Saxa Vord and Valla Field Special Protection Area and Yell Sound Coast Special Area of Conservation, and to protect wildlife in general.

- (12) None of the turbines of the array may be deployed within 200m of any existing marine cables without written permission by Shetland Islands Council and the cables owner.

Reason: To provide safe access to existing cables.

Standard Terms and Conditions:

(1) The Works Licence (and all rights in connection with the Licence) shall be forfeit if:

- the works are not commenced within three years from the Effective Date; or
- the works are not used, or the operations connected cease, for a continuous period of three years; or
- the Licensee is in breach of any of the terms, provisions and conditions of the Licence or fails to comply with any directions thereunder.

(2) The works shall be operated in compliance with the Council's terms and conditions. Licensees must comply with all relevant statutory controls currently in force or which come into force during the period in which their works licence remains valid. A failure to comply with any relevant statutory control, or a breach of any condition of the works licence which is brought to the Council's attention will be investigated and may, if the circumstances warrant it and the Council consider it expedient to do so, result in the works licence being revoked.

(3) In the event of environmental pollution causing a nuisance, either on land or ashore or in the sea, in connection with the operations on, in, about or in connection with the Works, the Licensee shall carry out or make arrangements for the carrying out of all measures considered reasonably necessary for the clearance and removal of any such pollution. The Licensee shall ensure that any damage caused as a result is made good. If, after due notice, the Licensee fails to take the required measures, the Council may carry out the required measures and shall have the power to recover the costs directly from the Licensee.

(4) In the event of the works falling into disrepair or becoming damaged, the Licensee shall carry out or make suitable arrangements for the carrying out of all measures considered to be necessary for repairing the whole or any part of the Works. If, after due notice, the Licensee fails to take the required measures within a reasonable period of time, the Council shall carry out the required measures and notify the appropriate Government departments or statutory bodies in order that appropriate action may be taken. The Council shall have the power to recover the costs of any such measures taken by them or on their behalf directly from the Licensee.

(5) The Council shall have the right to inspect the works, plans and specifications prior to the siting of the works and at all reasonable times thereafter.

(6) The Works Licence is granted on condition that:

- the Licensee shall not damage or injuriously affect or interfere with any submarine cable maintained by the relevant statutory undertakers or code system operators without their consent;
- the Licensee shall meet in full all actions, proceedings and claims that may be raised against the Council by third parties in connection with the works and shall indemnify the Council against all expenses, costs and losses ensuing;

- all clients, agents, suppliers, contractors and sub-contractors employed in connection with the works or any part thereof are bound in a like manner.
- (7) Nothing in the Licence shall exempt the Licensee from compliance with the provision of any Enactment, Statutory Instrument, Bye-law or Licence, nor obviate any requirement to obtain such consents, approvals as may be required to enable the Licensee to construct and operate the works.
- (8) No interest (in whole or in part) in the Licence or authorised works shall be transferred to any person without the prior written consent of the Council.
- (9) On the bankruptcy of the Licensee the Works Licence will not automatically be revoked, but any Trustees in Sequestration, Liquidator, Receiver or Administrator must write to the Council applying for consent to continue the works in order to enable the full realisation of the Licensee's committed assets. The person responsible for the affairs of the bankruptcy will not have any rights of transfer in the Works Licence without the prior written consent of the Council. If the Council's consent to the continuation of the Works Licence is not sought within one month of the date of sequestration, liquidation or administration then the Works Licence shall be automatically revoked.
- (10) In the case of any dispute arising out of the terms of the Licence or any directions made or approvals required, the decision of the Council shall be final.

Notes to Licensee:

Seabed Lease

Under the terms of the Crown Estate Act 1961, a seabed lease may be required for the development hereby permitted. To obtain or update a seabed lease you are advised to contact Crown Estate Scotland as follows: Crown Estate Scotland, 6 Bell's Brae, Edinburgh EH4 3BJ. Tel: 0131 260 6070.

Marine Licensing

Under the Marine (Scotland) Act 2010, a Marine Licence may be required for the development hereby permitted from Marine Scotland - Licensing Operations Team (MS-LOT). To ensure compliance, you are advised to contact MS-LOT as follows: Marine Scotland Licensing Operations Team, Marine Laboratory, PO Box 101, 375 Victoria Road, Aberdeen, AB11 9DB. Tel: 01224 295579; Email: MS.MarineLicensing@scotland.gsi.gov.uk

Notification of deployment of equipment

Once the equipment and navigational marks have been established, the Northern Lighthouse Board has requested that you inform them by letter or email at navigation@nlb.org.uk quoting the following reference number: GB/OPS/ML/O8_03_257.

The UK Hydrographic Office should also be notified and all information regarding site positions forwarded in order that Chart for the area can be correctly updated.

European Protected Species Licence

The applicant should contact Scottish Natural Heritage for any European Protected Species licence that may be needed before any works have taken place. Advice can be found at the following website: <https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/licensing/european-protected-species-licensing>

7 December 2018

Executive Manager - Planning