NORTHERN LIGHTHOUSE BOARD

INSPECTION/AUDIT OF LOCAL AIDS TO NAVIGATION, OFFSHORE STRUCTURES & AQUACULTURE SITES

2022/23 REPORT

Aberdeen South Harbour and Girdleness Lighthouse

INSPECTION/AUDIT OF LOCAL AIDS TO NAVIGATION, OFFSHORE STRUCTURES & AQUACULTURE SITES – 2022/23 REPORT

This report is submitted to the Secretary of State pursuant to section 198(4) of the Merchant Shipping Act 1995, and to the Scottish Ministers in accordance with section 55 of the Scotland Act 2016.

This report covers the period April 2022 to March 2023 inclusive.

1. POLICY

1.1 Section 198(1) of the Merchant Shipping Act 1995 (the Act of 1995) empowers the General Lighthouse Authorities to inspect all lighthouses, buoys and beacons under Local Lighthouse Authority management. In addition, Section 195(1) of the Act vests in the General Lighthouse Authorities (GLA) the superintendence and management of all lighthouses, buoys and beacons within their areas.

1.2 Emphasis continues to be placed on a combination of inspecting local Aids to Navigation (AtoN) and/or auditing local AtoN Availability Statistics and Casualty Response targets against known requirements.

1.3 Under the UK Government's Port Marine Safety Code all Aids to Navigation (AtoN) maintained by Harbour Authorities and any other existing Local Lighthouse Authorities must be maintained in accordance with the availability criteria laid down by the General Lighthouse Authorities, and must be subject to periodic review. The characteristics of these aids to navigation must comply with the guidelines and recommendations as laid down by the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA). The General Lighthouse Authorities require Harbour Authorities and any other existing Local Lighthouse Authorities to be responsible for ensuring that any third party aids to navigation, within their areas of responsibility are also established and maintained to the same standards.

1.4 Within the territorial waters of the Isle of Man, the Harbours Act 2010 s.70 defines the Harbours Division of the Department of Infrastructure as the Local Lighthouse Authority for the Island.

1.5 The General Lighthouse Authorities also require those responsible for Local Aids to Navigation, which lie outwith Statutory Harbour and Local Lighthouse Authorities' areas of jurisdiction, to establish and maintain their Aids to Navigation to the same standards.

1.6 The General Lighthouse Authorities require those responsible for Local Aids to Navigation to maintain appropriate records of AtoN Availability Statistics and AtoN casualty responses and to provide summaries of these records to the relevant GLA on an annual basis.

1.7 In addition, each Authority is required to establish procedures for responding to AtoN casualties within the timescales as laid down and applied by the General Lighthouse Authorities.

2. PURPOSE

2.1 Northern Lighthouse Board, as a General Lighthouse Authority, has a statutory duty of superintendence and management, to ensure that AtoN maintained by other authorities within the NLB area of responsibility meet the agreed international standards. The Northern Lighthouse Board discharges this duty by a combination of audit, inspection, review and consenting to changes requested by any appropriate authority via the Statutory Sanction process. NLB are also routinely consulted regarding marine developments by the Marine Directorate of the Scottish Government, who are responsible for the issue of marine licences under the Marine (Scotland) Act 2010; by Transport Scotland, who are responsible for granting Harbour Empowerment and Harbour Revision Orders under the Harbours Act 1964; by the Department for Energy Security and Net Zero, who are responsible for oil and gas licensing under the Energy Act 2008; and by the Isle of Man Harbours Division.

2.2 Site visits by NLB staff give Local Lighthouse Authorities the opportunity to discuss with the Inspecting Officer all matters relating to their AtoN provision – i.e. the level of provision, recommendation for changes and/or review of their existing maintenance procedures.

2.3 Many Local Lighthouse Authorities welcome this visit, as they consider the audit/inspection to form an important external audit element of their Quality and/or Safety Management Systems.

2.4 Whilst inspection provides a snapshot of the standard of AtoN provision on a particular day, the audit of Local Lighthouse Authority records allows a more detailed examination of their performance over a longer period of time.

2.5 Within the Northern Lighthouse Board, external LLA Audits under the Port Marine Safety Code are conducted by members of the Navigation Section. Inspections of AtoN are generally carried out by Ships' staff, with other inspections undertaken during site visits and/or scheduled audits or compliance visits.

2.6 The General Lighthouse Authorities have very limited powers to follow up on deficiencies in the provision of AtoN by LLAs or other bodies; it is intended to seek clarification of these powers in the programmed revision of the Merchant Shipping Act.

3. LOCAL ATON

3.1 Inspections

3.1.1 Inspections of Aids to Navigation can fall into one or more of the following categories:

- Seaward inspection undertaken by NLB vessels (day/night) from a seaward aspect, checking the bearing, range and sectors of directional, leading and sector lights. Other aids to navigation including lights, traffic signals, lit/unlit beacons and lit/unlit buoys are also checked for light characteristic, range, conspicuity of daymark and geographical position. Automatic Identification Systems (AIS) and radio beacons (RACONS) are checked for code/signal transmitted from the aid to navigation to that received on board the vessel, including nominal range. All data is cross referenced against current Admiralty charts, and published information within the Admiralty List of Lights and Fog Signals and the Admiralty List of Radio Signals.

- Shore based inspection (day), undertaken in response to a direct request, enquiry or in conjunction with other work in the surrounding area. The inspection includes a physical check of the structure, position, description, character, daymark, colour and general condition of the light. Additional information regarding ownership and maintenance responsibilities are also verified at this time.

- Shore based inspection (night), usually undertaken as part of a sample inspection required for the purposes of auditing a Port or Harbour Authority under the Port Marine Safety Code. Inspections are either carried out from shore or via local Pilot Boat with prior agreement from the relevant Port or Harbour Authority.

3.1.2 Inspection findings are input by the Inspecting Officer into the web-based Aids to Navigation and Reporting (*AtonRep*) software, jointly developed by Irish Lights and the Northern Lighthouse Board. Inspections submitted by NLB vessels are monitored by the Navigation section, with any reported defects registered on the *AtonRep* database and notification issued to the relevant owning authority for verification/rectification.

3.1.3 Thereafter, routine checks are made against the list of outstanding defects to ensure that these are successfully closed out within the required timescale. Statistics regarding the number of inspections and associated failures are provided to NLB's Director of Operations on a monthly basis. Monthly reports regarding outstanding/overdue inspections and those scheduled for inspection in the current year are also passed to the Marine Operations Manager, to inform vessel programming.

3.2 Results of 2022/23 Local Lighthouse Authority AtoN Inspections

3.2.1 There are currently 237 authorities registered in the *AtonRep* database with responsibility for marine Aid to Navigation within NLB's area of jurisdiction.

3.2.2 At 31 March 2023 there were 2357 active LLA Aids to Navigation registered on the *AtonRep* database. The number of Aids to Navigation continues to rise steadily year on year and equates to a 20% increase over the past 10 years, these figures exclude aquaculture and offshore oil and gas sites in Scottish waters.

3.2.3 2106 of the 2357 LLA AtoN (89.35%) were inspected in 2022/23. Of these, 147 were found to be defective representing a deficiency rate of 7.0%. This represents a slight increase in failure rates over the previous year, but is consistent with historic levels.

LLA Annual Inspection Failure Trend										
Inspection Year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018 /19**	**2019 /20**	**2020 /21**	**2021 /22**	**2022 /23**
No. of AtoN	1963	2018	2034	2043	2074	2127	2238	2252	2289	2357
No. of Inspections	1350	1692	1443	1710	1614	1730	1867	1823	1667	2106
No. of Failures	108	83	64	88	71	114	107	134	111	147
Percentage Failure	8.0	4.9	4.4	5.1	4.4	6.6	5.7	7.4	6.7	7.0

Fig. 1 - LLA Annual Inspection Results

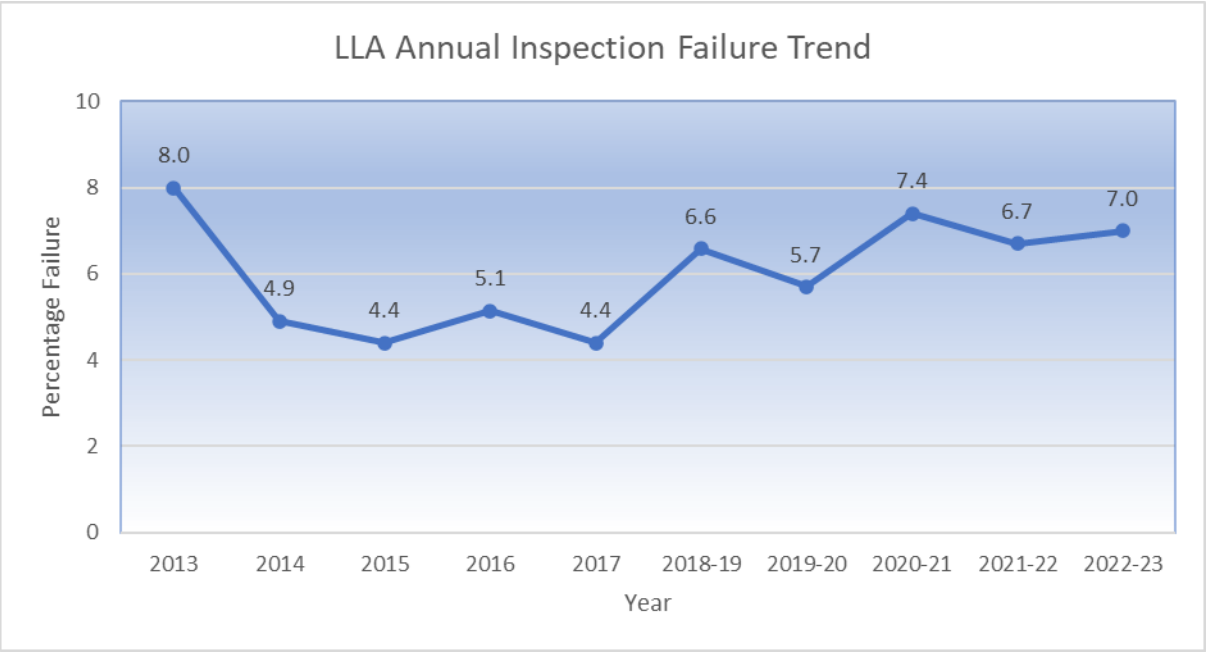


Fig. 2 - LLA Annual Inspection Failure Trend

3.3 Local AtoN Audits

3.3.1 The Department for Transport UK Ports database shows a total of 688 ports in Scottish waters, however many of these are extremely limited in size and scope of operations. 253 of these are Statutory Harbour Authorities, with their own governing legislation, but again many are limited in size and most are operated by Local Authorities. 25 are classed as Competent Harbour Authorities, with additional statutory powers relating to pilotage; in general these are the most active ports in terms of commercial activity. There are a further 8 ports within the Isle of Man. NLB undertakes an audit cycle under the Port Marine Safety Code for all Competent and major Statutory Harbour Authorities within our area of jurisdiction.

3.3.2 For all other authorities with responsibility for Marine Aids to Navigation, not deemed to be either a Competent or major Statutory Harbour Authority, a formal audit is not undertaken, however the more significant of these are subject to a compliance visit.

3.3.3 Compliance with the Port Marine Safety Code (PMSC) for these authorities is voluntary, although some sections are based on statute. Therefore emphasis is placed on encouraging the authority to follow best practice, with a view to increasing the authorities' awareness of their responsibilities with regard to the provision and maintenance of their AtoN. The authorities are also encouraged to participate in a data verification exercise to ensure that their aids to navigation are registered with the Northern Lighthouse Board, and that these are also charted and published by the UK Hydrographic Office.

3.3.4 Face to face audits continued during this period with an increased number completed to reduce the backlog associated with the impacts of Covid. Thirteen harbour authorities were re-audited in 2022/23, twelve were found to be compliant (with respect to provision and maintenance of marine aids to navigation) with the Port Marine Safety Code, corrective action has been taken by the one non-compliant authority.

3.4 Local AtoN Availability

3.4.1 Local AtoN maintained by LLA and other providers are required to be maintained in accordance with the availability criteria laid down by the General Lighthouse Authorities, which are based on IALA guidelines.

3.4.2 Availability is calculated based on a three year rolling average, with the minimum/target availability for each AtoN Category as shown below:

Category 1	(99.8% Availability)
Category 2	(99.0% Availability)
Category 3	(97.0% Availability)

3.4.3 When an AtoN is reported defective, it is regarded as a casualty when the AtoN component falls below the advertised characteristics for the station and the details are then included in the calculation for availability.

3.4.4 Northern Lighthouse Board requires all Competent and major Statutory Harbour Authorities to submit an annual return to demonstrate their performance against the required standards.

3.4.5 Utility companies and other authorities with responsibility for a large number of marine AtoN are also encouraged to maintain casualty records via access to the *Aton Reporting Online* web based database provided by the Northern Lighthouse Board. The *Aton Reporting online* system enables an electronically generated return of their achieved availability statistics to be submitted to the Northern Lighthouse Board for review.

3.5 Results of the 2022/23 Local AtoN Availability Returns

3.5.1 Of the 35 Local Lighthouse Authorities from whom Annual Returns were requested, all complied within the required timescale.

3.5.2 For the three year rolling period ending 31 March 2023, three of these authorities failed to meet the IALA standard for Category 1 AtoN; eight failed to meet the IALA standard for Category 2 AtoN and one failed to meet the IALA standard for Category 3 AtoN. In summary, ten authorities have failed to meet the required standard of availability for a particular category of AtoN.

Oxcars LED light

3.5.3 In general, when LLAs fail to meet the target availability, this is a result of difficulties in accessing more remote aids to navigation, and this is sometimes compounded by limited resources. This year has again been challenging as many LLAs have had difficulty in sourcing contractors to undertake AtoN maintenance/fault repair, long lead times for replacement equipment along with difficulties accessing (and staying at) remote locations.

3.6 Overview of Local Aids to Navigation

3.6.1 2022/23 saw a steady flow of Statutory *Sa*nction applications from port and harbour authorities, utility companies, private industry, renewable energy and aquaculture operators to alter, discontinue or exhibit marine aids to navigation.

Applications to establish new aids to navigation were received for the deployment of 61 lit buoys (including 57 special mark buoys, mostly data gathering or construction buoyage associated with offshore renewable projects); seven unlit buoys; three AIS AtoN sites with an additional 18 AIS AtoN on temporary data gathering buoys; and the establishment of 12 lights. These were primarily to improve the marking of navigable channels, harbour/marina infrastructure and multiple renewable energy developments.

Eight applications to alter existing aids to navigation were received for six lights, two lit buoys and two unlit buoys; mostly associated with harbour improvements and data collection.

Applications to discontinue existing aids to navigation were received and approved for three lights, 22 lit buoys and three unlit buoys, which were mainly associated with wind farm construction/data gathering buoyage, aquaculture data gathering, temporary harbour development construction buoyage and ongoing reviews of aids to navigation.

3.6.2 NLB is a statutory consultee for all Marine Licence applications under The Marine Licensing (Consultees) (Scotland) Order 2011. For the twelve month period April 2022 to March 2023, Northern Lighthouse Board responded to some 157 applications, 31 Pre-Application Consultations and 33 exempted activities requests (excluding Aquaculture, Offshore Oil and Offshore Renewables), as well as eight Council planning permission applications.

3.6.3 NLB has also provided comment to Scottish Ministers on a number of Harbour Designation, Enforcement and Revision Orders under the Harbours Act 1964, covering powers of harbour direction, pilotage direction, revised harbour limits and marine construction to develop existing harbours in support of offshore renewables, along with port and harbour infrastructure upgrades.

NLB have given marking and lighting advice regarding several proposed harbour developments, including the development of Stranraer Marina; harbour expansion proposals within Orkney at Kirkwall and in Scapa Flow; land remediation at sites at Bowling, River Clyde; bridge construction projects over the River Clyde and flood prevention/redevelopment works at Millport, Cumbrae. Other notable projects include oversight of rocket launch proposals from Saxavord Space Centre as well as associated temporary danger areas for another rocket launch site in the Outer Hebrides.

4. OFFSHORE RENEWABLE ENERGY DEVELOPMENTS

4.1 Licensing

4.1.1 The development of Offshore Renewable Energy installations (OREI) is the largest growth area affecting the marine environment. Developers are required to seek a number of consents; with regard to Navigational Safety this is specifically the Marine Licence administered by the Marine Directorate of the Scottish Government.

4.1.2 NLB have been involved with all developments in Scottish waters, both prior to and during the Marine Licensing process, providing guidance on what developments are acceptable and how to mitigate the risk of collision and allision with OREI. The process now includes developers being required to develop a 'Lighting and Marking Plan' covering all stages of construction and operation of an OREI site.

4.2 Offshore Wind

4.2.1 There has been considerable growth in offshore wind energy in Scottish waters over recent years, with established wind farms at **Robin Rigg** in the Solway Firth (174 MW), **Beatrice** (588 MW) and **Moray East** (950 MW) in the Moray Firth and the **European Offshore Wind Deployment Centre (EOWDC)** off Aberdeen (93.2 MW).

4.2.2 The **Hywind Scotland** floating wind farm, a world first, consisting of five 6MW turbines some 15 miles East of Peterhead, was commissioned in October 2017. The **Kincardine Floating OWF**, East of Stonehaven, is now composed of five 9.5 MW devices with the original 2 MW turbine in a deep maintenance period in the Cromarty Firth.

4.2.3 The Outer Firth of Forth/Tay region remains an area of significant activity for the offshore wind sector, with developments progressing at various phases of the consenting and construction process.

The **Seagreen** project (1.1GW) completed installation of the 114 foundation jackets in April 2023, whilst also setting a major milestone by installing the world's deepest fixed wind turbine foundation at 58.6m. Full commercial operation is expected late 2023 or early 2024, whilst the nearby **Neart na Gaoithe** wind farm (450MW) is also anticipating full commercial operation in 2024. New shore bases and Marine Control Centres have been developed at the Montrose Port and Eyemouth Harbour respectively.

The **Inch Cape OWF** project (1GW), also located within the Outer Firth of Forth, was successful in the 2022 Contract for Difference auctions, with construction of the 72 WTG project planned for 2023. **Berwick Bank OWF** (4.1GW) is continuing to progress through the Marine Directorate consenting process, with the S36 and Marine Licence application submitted at the start of the year.

The consenting process is also ongoing for a demonstrator turbine and accompanying Meteorological Mast for the **Forthwind Offshore Wind Demonstrator** project, 1.5 km from the coast of Methil, in the inner Firth of Forth.

Jacket Installation at Seagreen OWF
(seagreenwindenergy.com)

4.2.4 The Moray Firth continues to see development of offshore wind opportunities, with the **Moray West OWF** project (850 MW) commencing onshore and landfall works in early 2023. Offshore construction is scheduled to commence mid-2023.

The two 5 MW wind turbine demonstrators adjacent to the Beatrice Oil Field in the Moray Firth are now non-operational, and the operators are examining decommissioning options.

4.2.5 The **Pentland Floating OWF**, located approximately 6.5km off the coast of Dounreay, Caithness is currently also progressing through the S36/Marine Licence consenting process, and will deploy a maximum of ten floating wind turbines with an installed capacity of up to 100 MW.

4.2.6 Orsted have announced plans to build a 700MW offshore wind farm to the East of the Isle of Man; this is currently in early planning/concept stage.

4.2.7 Early 2022 saw the announcement of successful bidders for the Crown Estate Scotland (CES) 'ScotWind' leasing round, with around 25 GW of capacity proposed across 20 different sites; comprising both fixed bottom and floating projects, and ranging in capacity from 95 MW up to 3 GW. Progress on these projects has continued at pace, with Northern Lighthouse Board engaging with 16 of the projects with regard to Marine Licence exemption requests and other navigational safety issues.

Statutory Sanctions for the establishment of meteorological data gathering buoys have been issued to 11 different ScotWind projects, covering the deployment of 17 Floating LiDAR buoys and 10 wave data buoys.

The most advanced of these projects are proposed to become operational around 2030.

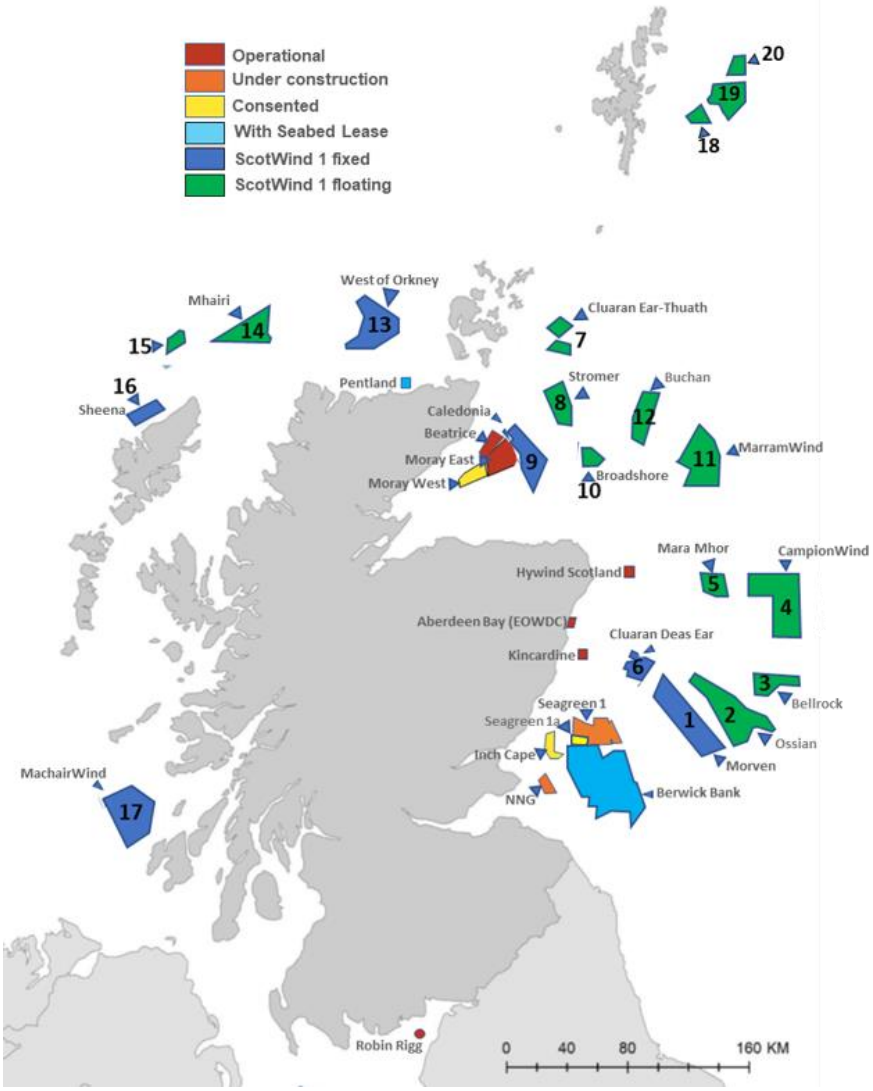


Fig. 3 - Scottish Offshore Windfarm Sites (excluding INTOG sites)
(offshorewindscotland.org.uk)

4.2.8 In March 2023, Crown Estate Scotland announced 13 successful bidders for the 'Innovation and Targeted Oil and Gas' (INTOG) leasing round. This will allow developers to apply to build offshore wind farms specifically for the purpose of providing low carbon electricity to power oil and gas installations and help to decarbonise the sector. It also provides an opportunity to enable small scale (less than 100 MW) innovation projects, including alternative outputs such as hydrogen, or shore electrical grid connections. The INTOG leasing round is expected to provide an additional 5.5GW of generating capacity.

NLB have already engaged with a number of these projects, with regard to navigational safety, Marine Licence exemption requests for survey activity and overall project briefings.

When existing, proposed, and potential capacities are combined, the total generating capacity for offshore wind in Scottish waters stands at in excess of 40 GW.

4.3 Wave & Tidal

4.3.1 Significant interest continues in the deployment of wave & tidal renewable energy devices around the coast of Scotland, however this has yet to result in any commercial scale development.

4.3.2 The **Meygen** tidal energy site, south of Stroma, started generating power to grid in December 2016, with four 1.5 MW turbines installed by February 2017. A further 80MW of capacity has been consented, with 28MW of this having been awarded a Contract For Difference (CFD).

4.3.3 Six smaller tidal turbines, total output 600 kW, have also been operated by **Nova Innovation** in Bluemull Sound, Shetland since 2016. However, the three original devices are scheduled for removal during summer 2023, whilst three more recently installed devices will remain.

Nova Innovation M100D 100kW Tidal Turbine
(novainnovation.com)

4.3.4 A single 50 kW tidal energy device proposed by the **Islay Energy Trust** for deployment within the Sound of Islay is currently going through the Marine Licensing process.

4.3.5 Tidal energy developer **Orbital Marine Power** has recently been awarded an Option Agreement by Crown Estate Scotland for a new 30MW tidal energy project in the Westray Firth, covering the potential deployment of approximately 12 tidal energy devices. NLB are involved in ongoing discussions regarding the navigational impact of this development.

4.4 Test & Development

4.4.1 Scottish waters continue to attract renewable energy developers to the wave and tidal energy test sites operated by the European Marine Energy Centre (EMEC) in Orkney. A number of wave energy devices have been trialled at the Billia Croo (Hoy Mouth) site over several years, and several tidal turbines and associated infrastructure developments continue to be tested at the Falls of Warness site near Eday. Additional nursery or secondary test sites have also been developed in Orkney at St Margaret's Hope, Scapa Flow and off Westray, for wave and tidal devices respectively.

4.4.2 Two projects of note continue to function at the EMEC Fall of Warness tidal test site; Magellanes' ATIR device and the Orbital O2 device. NLB have been involved in discussions for the potential future deployment of additional and larger iterations of the Orbital device at the Fall of Warness site.

4.4.3 Additionally, two Wave Energy Converter devices are currently undergoing various stages of testing in Orkney. Mocean's 'Blue X' device underwent scale testing within the EMEC Scapa Flow site, and has consent to deploy at a new location south of Deerness for further testing. The second device, the MPS WaveSwing, is scheduled to commence short-term scale testing at the Scapa Flow site in Q2/3 of 2022.

5 2022/23 SEAWARD INSPECTION OF OFFSHORE STRUCTURES

5.1 Inspection Procedure

5.1.1 In order to discharge its statutory duty as a General Lighthouse Authority in respect of offshore AtoN, NLB undertakes an annual inspection voyage to ensure that Offshore Oil & Gas operators are maintaining AtoN to meet the agreed international standards, specifically the Standard Marking Schedule for Offshore Installations.

5.1.2 While the inspection provides a snapshot of the standard of provision on a particular day, the combination of historical inspection records and additional reports from any operator, owner or standby/rescue vessel (ERRV) on any outage, defect or omission, gives a condition trend reflecting the response to the annual inspection and report.

5.1.3 Prior to the annual inspection, the operating companies are contacted and requested to supply information on all offshore units owned or on contract to them, they are likewise given prior warning of the inspection and a copy of the inspection details request is forwarded to them.

5.1.4 The Inspection of each Offshore Oil Installation follows the procedure below:

(a) Physical Inspection.
This inspection is carried out from on board the 'NLV Pharos'. The inspection is carried out during the hours of darkness, initially with regard to the conspicuity of the Main White morse 'Uniform' lights, with the number, range of observation and effectiveness of synchronisation being recorded. A similar inspection is made of the Subsidiary Red morse 'Uniform' lights, the installation sound signal(s), electronic aids to navigation such as RACONs and AIS where fitted, and the number and clarity of the platform Name Boards or Identification Panels. Any navigation, weather data or mooring buoys deployed in the proximity of the field will also be inspected,

(b) Inspection Records
The results of each inspection are recorded on a report sheet containing the latest details specific to each platform, MODU or FPSO/FSU at the time of inspection; these results are then compiled to produce a summary report.

(c) Defects or Faults
Any fault or defect found during the inspection will be reported directly to the Radio/Control room operator prior to the 'NLV Pharos' leaving the location. For un-manned installations, the results are passed to Standby or ERRV vessels with a request to confirm the repair and report the correct operation to NLB. Since 2013 OPRED have required the owners/operators of Offshore Installations to record any defect of Aids to Navigation via a PON-10 notification.

(d) Corrections and Additions
During the course of the inspection any changes to the information held on record with respect to the owners/operators of the installation or their contact details will be discussed when in radio contact with the personnel on board. Similarly, any additions, removal or repositioning changes to the number and/or type of AtoN used to identify and safely mark the installation will be noted at the time of inspection and transferred to the NLB's AtonRep data system.

5.2 Results of the 2022/23 Inspection Voyage

5.2.1 The 2022 Annual Seaward Inspection of Offshore Installations was conducted by the NLV Pharos, and was overseen by Coastal Inspector Adam Lewis. NLV Pharos was scheduled to depart Stornoway on 11 November 2022, however the vessel was weatherbound until Saturday 12 November. The first inspection was conducted on Sunday 13 November and 16 inspections were completed before having to shelter in the Inner Moray Firth on Monday 14 November. No further inspections were completed during this voyage.

5.2.2 NLV Pharos then undertook a second round of inspections, commencing Monday 23 January 2023. An additional 24 installations were inspected, with the last inspection being completed on Wednesday 25 January. In total 57 installations were inspected, 8 of which were Mobile Offshore Drilling Units (MODU) or Floating Accommodation Units. These were all located within the Central North Sea region. No inspections were conducted in the Northern North Sea or West of Shetland regions.

5.2.3 At the time of the inspection, Northern Lighthouse Board's area of jurisdiction within the UK sector consisted of 93 fixed or floating platforms. It should be noted that the total number of installations will fluctuate year on year depending upon ongoing commissioning/decommissioning projects, and also the location of the Mobile Offshore Units.

5.2.4 Additional time was scheduled to attempt to capture platforms in the Northern North Sea region. This was not achieved due to additional operational demands on the vessel.

5.2.5 Of the 57 installations inspected, 7 failures were noted (12%); there were no instances of 'black' platforms observed.

- 3 failures were noted for insufficient range of lights
- 1 failure was for an incorrect AIS position being broadcast
- 1 failure was for a lack of primary white light synchronisation between linked platforms
- 1 failure was recorded as the installation control room stated they were not able to manually sound their Fog Signal. This was an internal policy failure, rather than an AtoN availability issue, and has been rectified by the operator
- 1 failure was also recorded as no communication could be established with a MODU. It was later established that this MODU was in the middle of a rig move and the control room were otherwise occupied with this operation

5.2.6 All failures were subsequently reported to the Business Support Team at OPRED, and investigations undertaken. Either justification or proof of correction for the failures were then provided by the operators to OPRED, and subsequently passed to NLB.

5.3 Offshore Oil & Gas Development and Decommissioning

5.3.1. Decommissioning activity across the Scottish sector of the North Sea and West of Shetland region continues to expand. Northern Lighthouse Board have engaged with a number of operators with regard to Aid to Navigation provision on a range of different types of platforms, ranging from cold-stacked installations, jacket-only structures and legacy gravity base structures following topside removal operations.

Decommissioned FPSO 'Voyageur Spirit' Departs Kishorn Port on the Semi-Submersible Heavy Lift Vessel Xin Yao Hua for Dubai
(Karl Davies, NLB)

5.3.2. Despite this increase in decommissioning activity, new developments are occurring on the UK Continental Shelf, along with the installation of new surface infrastructure. Of note is the imminent arrival of the Penguins FPSO, and the installation of the jacket structure for the new Jackdaw development. NLB have provided Lighting and Marking recommendations to both of these developments.

6 THE AQUACULTURE INSPECTION PROCESS

6.1 Introduction

6.1.1 From small beginnings in the 1960s, marine fish and shellfish farming, mainly for salmon and mussels, has grown into a significant Scottish industry helping to underpin sustainable economic growth in Scotland's rural and coastal communities.

6.1.2 The industry is mainly based on the Scottish Islands (Western Isles, Orkney and Shetland) and the West coast of the mainland where it employs around 2,500 people (full-time equivalent) in rural communities. The industry employs roughly up to 12,000 people either directly or in support services. The industry released their 'Aquaculture Growth to 2030' strategy document, which has set out ambitious targets to double the economic value from the current £1.8 Billion to £3.6 Billion with the jobs linked to the sector forecast to reach 18,000. In 2020, Scottish farmed salmon exports totalled £614 million, which represented 40% of seafood exports for the whole of the UK.

6.1.3 The industry is heavily regulated and, under the Marine (Scotland) Act 2010 Part 4, the Scottish Government is responsible for licensing activities carried out in the Scottish inshore region. Through the process of marine licensing, and the conditions placed on licences, economically and socially beneficial activities are promoted while minimising adverse effects on the environment, human health and users of the sea.

Where obstruction or danger to navigation is caused or is likely to result from the development of aquaculture farms, a Marine Licence is required and, through statutory consultation with NLB and the Maritime and Coastguard Agency, safety of navigation issues are taken into account. Crown Estate Scotland (CES) also has a role as a pro-active landlord and Local Authorities are responsible for granting the necessary planning permissions.

6.1.4 During the period April 2022 to March 2023 the Navigation team reviewed and responded to 227 requests for formal response. The majority of these related to Regional Council and Marine Directorate applications as well as direct contact from private individuals and companies who represent the aquaculture industry.

6.2 Hazards to Navigation

6.2.1 Fish farms often encroach on charted anchorage areas and areas frequented by smaller fishing vessels and leisure craft, as well as lying adjacent to larger vessel routes. Growth of the industry has also resulted in live fish carriers and other vessels navigating much closer inshore than large vessels would traditionally venture.

6.2.2 Finfish plastic ring cages present a collision hazard and are often accompanied by sizeable steel or concrete feed barges. Mussel lines are perceived to offer a particular hazard, due to their low visual conspicuity and potential to foul propellers. Oyster beds are sited in shallow water but may project steelwork constructions with the ability to damage vessels or foul anchors. Most sites have significant mooring arrangements, often with outlying buoys and trailing lines, with the capacity to foul propellers or anchors. This practice is strongly discouraged by NLB in responses to licence applications and during site inspections.

6.2.3 As the finfish sector continues to develop there are a growing number of proposed sites of a larger nature, in more exposed positions with recent examples of farms being considered further from shore in areas like the Minch. These sites would have up to 200m circumference ring cages and are being designed to survive in the range of conditions these sites are expected to have.

6.2.4 There can be specific hazards when sites are left fallow, with the AtoN removed but with remaining surface or sub-surface obstructions; or with the abandonment of (usually mussel) sites. The latter often require protracted multi-agency efforts to rectify.

6.2.5 The algal sector has seen much recent interest, fuelled partly by the launch of the Seaweed Academy at SAMS (Scottish Association for Marine Science), which is resulting in a growing number of sites which pose similar navigational risk to that of mussel farms, although much larger farms are also proposed. One option is for sites with a mixture of Seaweed and Shellfish, such as algal farms which also grow Oysters.

6.3 Hazard Mitigation

6.3.1 Hazard mitigation is provided by ensuring that aquaculture sites are marked as accurately as possible on charts and by requiring the site operator to provide aids to navigation. These are usually in the form of yellow Special Mark poles or buoys, with or without short range navigation lights. These are generally sited on the seaward side of the farm, or to mark the navigable route through a channel. Where sites are connected to on shore feed facilities the associated surface supply pipework is requested to be marked with yellow hi-vis buoys at regular intervals.

6.3.2 Where any significant work is taking place during the introduction, modification or removal of a site, operators are requested to promulgate notices to mariners to ensure those in the area are aware of the additional activity and the vessels involved.

6.4 The Aquaculture Inspection Process

6.4.1 The initial stage of a site inspection involves an examination of the site's Marine Licence, to establish that the NLB's marking and lighting recommendations are present and correctly correspond to NLB records. The site manager is requested to produce any further documentation appertaining to all on site AtoN inspection and maintenance activities.

6.4.2 A boat visit to the site (s) is requested, and the following procedures carried out:

- GPS co-ordinates (WGS 84 datum) of the site extremities and navigational markers are recorded.

- Any navigational lights are tested to check they are operating properly and display the correct lighting characteristic.

- All navigational marks are inspected to ensure they are in a suitable condition.

6.4.3 The inspection concludes with a discussion with the site manager. The Coastal Inspector provides a brief summary of their findings and what actions the stakeholder is required to take. Where necessary, the Coastal Inspector will also highlight the importance of ensuring sites are correctly marked for the safety of the mariner, and that correct navigational marking is part of the organisations lease agreement, Planning Permission and Marine Licence and that repeated failures may result in revocation of any of these.

6.4.4 Subsequent to the inspection, a detailed written report is forwarded to the site operator.

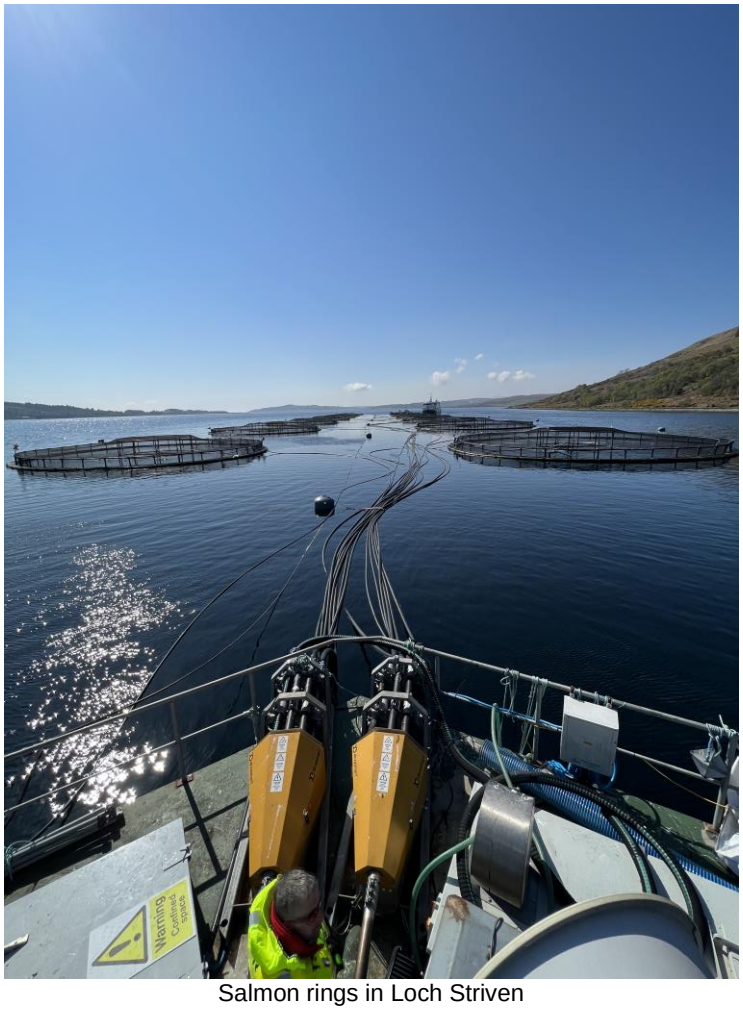
6.5 2022/23 Inspections

6.5.1 Following the lifting of COVID-19 pandemic restrictions and the appointment of a new Coastal Inspector (Aquaculture), NLB were able to carry out a full programme of physical site inspection throughout 2022/23.

6.5.2 One hundred and sixty nine aquaculture site were included for inspection. Eleven of these were found to be out of the water for a variety of reasons, resulting in the remaining one hundred and fifty eight sites being reviewed, with the following results observed:

Site Type	Number Inspected	Correctly Marked as per Marine Licence	Partially Marked	Fail (no operating lights)	Percentage Marked Correctly
Shellfish	64	27	35	2	42.2%
Finfish	93	36	49	8	38.7%
Algal	1	1	0	0	100 %
Combined	158	64	84	10	40.5%

Fig. 4 – Aquaculture Inspection Results



Salmon rings in Loch Striven

6.6 Finfish Compliance Follow-up

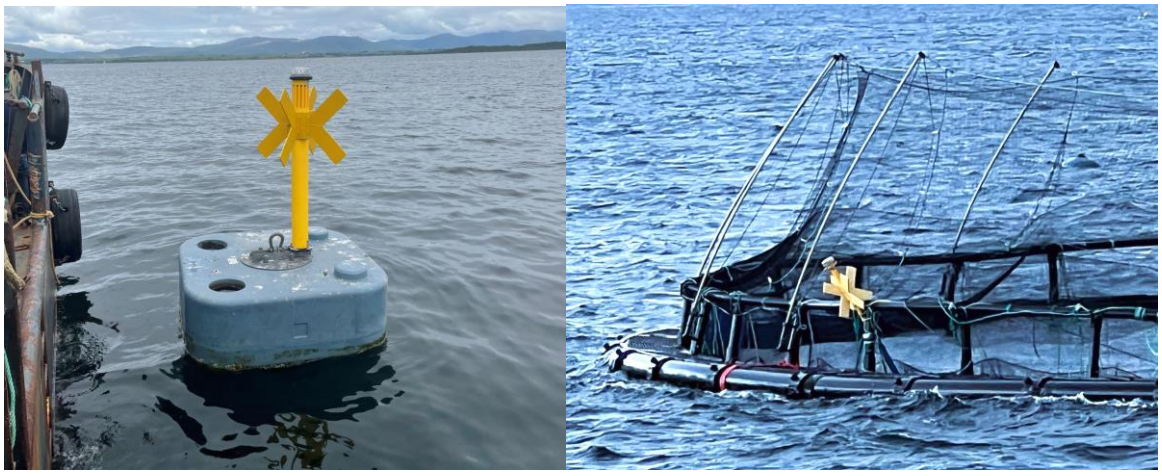
6.6.1 Following the first full twelve-month period of inspections being resumed post the lifting of COVID 19 restrictions, the inspection programme is getting back on track and a good deal of work has been done by the NLB and marine farms at a management level, which has seen NLB engagement with the health and safety staff for the larger operators and directly with the smaller owner operators. During 2022 both electronic and where possible face to face meetings were held with H&S teams from companies such as Mowi Scotland Ltd, Scottish Sea Farms and Bakkafrost Scotland Ltd (formerly Scottish Salmon Company) to discuss lighting and marking as well as general safety of sites.

6.7 Collaboration with Other Agencies

6.7.1 The NLB, MCA, CES and MD-LOT continue to work collaboratively to address issues and seek improvements to the Scottish aquaculture regulatory regime, to ensure the industry operates under best practice for the safety of both itself and that of other marine users.

6.8 Working with the industry towards improvement

6.8.1 Following on from discussions with a major finfish producer NLB have made changes to finfish conditions to allow for mounting of marks directly to cushion buoys. During inspections there are often signs of marks and lights having suffered collision from workboats and from becoming tangled in netting on the cages. Sites had previously either been marked by Lit Special Mark Buoys or by Lit Special Mark Poles (attached directly to cage guard rails) Mounting poles on the outer cushion buoys rather than the cages moved them out from the heavy work areas and also away from possible entanglement with netting. The images below show an example of a special mark pole that had become misaligned and also the new arrangement which results in less chance of marks being damaged during normal farm operations.



New preferred light fitting on cushion buoys, compared to misaligned pole mark on cage